

Kongunadu College of Engineering and Technology

(Autonomous)

Affiliated to Anna University, Chennai

B.Tech - Agricultural Engineering

Regulations: R2024 Choice Based Credit System

I to VIII Semesters Curricula & Syllabi

Semester I							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24MC001	Induction Programme	MC	-	-	-	0
Theory							
2	24EN101	Communicative English	HSMC	3	0	0	3
3	24MA101	Matrices and Calculus	BSC	3	1	0	4
4	24PH101	Engineering Physics	BSC	3	0	2	4
5	24CY101	Engineering Chemistry	BSC	3	0	2	4
6	24GE102	Engineering Graphics	ESC	3	0	2	4
7	24TA101	தமிழர் மரபு / Heritage of Tamils	HSMC	1	0	0	1
Practicals							
8	24GE104L	Engineering Practices Laboratory	ESC	0	0	4	2
9	24EEC101L	Interpersonal Communication Laboratory	EEC	0	0	2	1
Total				16	1	12	23

Semester II							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
Theory							
1	24EN201	Technical English	HSMC	3	0	0	3
2	24MA203	Vector Calculus and Statistics	BSC	3	1	0	4
3	24MC002	Universal Human Values 2: Understanding Harmony	HSMC	2	1	0	3
4	24CY201	Environmental Science	BSC	3	0	0	3
5	24GE101	Computer Fundamentals and C Programming	ESC	3	0	0	3
6	24AG201	Principles and Practices of Crop Production	PCC	3	0	0	3
7	24TA201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	1
Practicals							
8	24GE103L	C Programming Laboratory	ESC	0	0	3	1.5
9	24AG202L	Crop Husbandry Field Laboratory	PCC	0	0	3	1.5
10	24EEC201L	Professional Communication Laboratory	EEC	0	0	2	1
Total				18	2	8	24



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Semester III							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
Theory							
1	24MA302	Probability and Mathematical Techniques	BSC	3	1	0	4
2	24AG301	Thermodynamics and Heat Transfer	PCC	3	0	0	3
3	24AG302	Hydraulics and Hydraulic Pumps	PCC	3	0	2	4
4	24AG303	Unit Operations in Agricultural Processing	PCC	3	0	0	3
5	24CE303	Surveying	PCC	3	0	0	3
6	24EC307	Electronic Devices and Microprocessor	ESC	3	0	2	4
Practicals							
7	24CE306L	Surveying Laboratory	PCC	0	0	2	1
8	24EEC301L	Soft Skills Development	EEC	0	0	2	1
Total				18	1	8	23

Semester IV							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
Theory							
1	24AG401	Strength of Materials for Agricultural Engineering	PCC	3	0	0	3
2	24AG402	Tractors and Farm Engines	PCC	2	0	2	3
3	24AG403	Design of Basic Machine Elements	PCC	3	0	0	3
4	24AG404	Soil Science and Engineering	PCC	3	0	0	3
5	24EC408	Sensors and Transducers	ESC	3	0	2	4
6	24MC003	Constitution of India	MC	2	0	0	0
Practicals							
7	24CE405L	Strength of Materials Laboratory	PCC	0	0	2	1
8	24AG406L	Soil Science and Engineering Laboratory	PCC	0	0	2	1
9	24EEC401L	Life Skills and Personality Development	EEC	0	0	2	1
Total				16	0	10	19


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Semester V							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
Theory							
1	24AG501	Irrigation and Drainage Engineering	PCC	3	0	0	3
2	24AG502	Farm Machinery and Equipments	PCC	3	0	2	4
3	24AG503	Soil and Water Conservation Engineering	PCC	3	0	0	3
4	24EC508	Embedded Systems	ESC	3	0	0	3
5		Professional Elective I	PEC	3	0	0	3
6		Open Elective I	OEC	3	0	0	3
Practicals							
7	24AG504L	Irrigation Field Laboratory	PCC	0	0	2	1
8	24EC509L	Embedded Systems Laboratory	ESC	0	0	2	1
9	24EEC501L	Professional Skills and Career Development	EEC	0	0	2	1
Total				18	0	8	22

Semester VI							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
Theory							
1	24AG601	Post Harvest Technology	PCC	3	0	0	3
2	24AG602	Food and Dairy Engineering	PCC	3	0	0	3
3	24EC704	IoT in Agriculture Systems	ESC	3	0	0	3
4		Professional Elective II	PEC	3	0	0	3
5		Professional Elective III	PEC	3	0	0	3
Practicals							
6	24AG603L	Post Harvest Technology Laboratory	PCC	0	0	2	1
7	24EC705L	IoT in Agriculture Systems Laboratory	ESC	0	0	2	1
8	24AG604L	Mini Project-I	EEC	0	0	2	1
9	24EEC601L	Employability Skills	EEC	0	0	2	1
Total				15	0	8	19


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Semester VII							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
Theory							
1	24AG701	Remote Sensing and Geographical Information System	PCC	3	0	0	3
2	24AG702	Renewable Energy in Agricultural Engineering	PCC	3	0	0	3
3		Professional Elective IV	PEC	3	0	0	3
4		Professional Elective V	PEC	3	0	0	3
5		Open Elective II	OEC	3	0	0	3
Practicals							
6	24AG703L	Remote Sensing and GIS Laboratory	PCC	0	0	2	1
7	24AG704L	Renewable Energy Laboratory	PCC	0	0	2	1
8	24AG705L	Mini Project-II	EEC	0	0	2	1
Total				15	0	6	18

Semester VIII							
S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
Theory							
1		Professional Elective VI	PEC	3	0	0	3
2		Professional Elective VII	PEC	3	0	0	3
Practicals							
3	24AG801L	Project Work	EEC	0	0	20	10
Total				6	0	20	16

TOTAL NO. OF CREDITS: 164


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PROFESSIONAL ELECTIVE COURSES: VERTICALS

S. No	Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V	Vertical VI	Vertical VII
	Food Processing and Quality Management	Farm Machinery and Power Engineering	Water Conservation Engineering	Renewable Energy Engineering	Smart Agriculture Systems	Agricultural Business Management	Crop Production
1	Fundamentals of Food Process Engineering	Applied Ergonomics	Hydrology and Water Resources Engineering	Biochemical and Thermochemical Conversion of Biomass	IT in Agriculture Systems	Agricultural Business Management	Soil Fertility and Fertilizers
2	Storage and Packaging Technology	Farm Power and Machinery Management	Watershed Hydrology	Solar Energy Engineering and Technology	Automation in Agriculture	Sustainable Agriculture and Food Security	Basics of Crop Breeding and Plant Biotechnology
3	Process Engineering of Fruits and Vegetables	Mechanics of Tillage and Traction	Groundwater and Well Engineering	Wind Energy Technology	Instrumentation and Control Engineering in Agriculture	Organic Farming for Sustainable Agricultural Production	Modern Concepts in Crop Production
4	Thermal Operations in Food Process Engineering: Theory and Applications	Special Farm Equipment	Water Quality Management Practices	Waste and By-product Utilization	Mechatronics in Agricultural Engineering	Agricultural Economics and Farm Management	Seed Processing Technology
5	Refrigeration and Cold Storage	Advanced IC Engines	Natural Resources Management	Green Buildings	Drone Technology for Agriculture	Total Quality Management	Integrated Farming System
6	Food Process Equipment and Design	Advances in Farm Machinery and Power Engineering	On Farm Water Management	Energy Conservation in Agro-Based Industry	System Analysis in Agricultural Engineering	Professional Ethics in Engineering	Protected Cultivation
7	Novel Technologies for Food Processing and Shelf Life Extension	Design of Farm Machinery	Advanced Irrigation Systems	Farm Level Energy Auditing	Machine Learning for Soil and Crop Management	Project Management for Managers	Climate Change and Adaptation for Agriculture
8	Quality and Safety Monitoring in Dairy Industry	Testing and Evaluation of Farm Machinery and Equipment	Reservoir and Farm Pond Design	Energy Management and Environment Utilities	Artificial Intelligence for Agriculture	Principles of Management	Extension Methodology and Transfer of Technology

Registration of Professional Elective Courses from Verticals:

- Professional Elective Courses will be registered in Semesters V to VIII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI, VII and VIII.
- The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E./B.Tech (Honours) or Minor degree also.


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PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I: FOOD PROCESSING AND QUALITY MANAGEMENT

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24AG101PE	Fundamentals of Food Process Engineering	PEC	3	0	0	3
2	24AG102PE	Storage and Packaging Technology	PEC	3	0	0	3
3	24AG103PE	Process Engineering of Fruits and Vegetables	PEC	3	0	0	3
4	24AG104PE	Thermal Operations in Food Process Engineering: Theory and Applications	PEC	3	0	0	3
5	24AG105PE	Refrigeration and Cold Storage	PEC	3	0	0	3
6	24AG106PE	Food Process Equipment and Design	PEC	3	0	0	3
7	24AG107PE	Novel Technologies for Food Processing and Shelf Life Extension	PEC	3	0	0	3
8	24AG108PE	Quality and Safety Monitoring in Dairy Industry	PEC	3	0	0	3

VERTICAL II: FARM MACHINERY AND POWER ENGINEERING

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24AG201PE	Applied Ergonomics	PEC	3	0	0	3
2	24AG202PE	Farm Power and Machinery Management	PEC	3	0	0	3
3	24AG203PE	Mechanics of Tillage and Traction	PEC	3	0	0	3
4	24AG204PE	Special Farm Equipment	PEC	3	0	0	3
5	24ME104PE	Advanced IC Engines	PEC	3	0	0	3
6	24AG205PE	Advances in Farm Machinery and Power Engineering	PEC	3	0	0	3
7	24AG206PE	Design of Farm Machinery	PEC	3	0	0	3
8	24AG207PE	Testing and Evaluation of Farm Machinery and Equipment	PEC	3	0	0	3

VERTICAL III: WATER CONSERVATION ENGINEERING

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24CE105PE	Hydrology and Water Resources Engineering	PEC	3	0	0	3
2	24AG301PE	Watershed Hydrology	PEC	3	0	0	3
3	24AG302PE	Groundwater and Well Engineering	PEC	3	0	0	3
4	24AG303PE	Water Quality Management Practices	PEC	3	0	0	3
5	24AG304PE	Natural Resources Management	PEC	3	0	0	3
6	24AG305PE	On Farm Water Management	PEC	3	0	0	3
7	24AG306PE	Advanced Irrigation Systems	PEC	3	0	0	3
8	24AG307PE	Reservoir and Farm Pond Design	PEC	3	0	0	3


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VERTICAL IV: RENEWABLE ENERGY ENGINEERING

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24AG401PE	Biochemical and Thermochemical Conversion of Biomass	PEC	3	0	0	3
2	24EE606PE	Solar Energy Engineering and Technology	PEC	3	0	0	3
3	24AG402PE	Wind Energy Technology	PEC	3	0	0	3
4	24AG403PE	Waste and By-Product Utilization	PEC	3	0	0	3
5	24AG404PE	Green Buildings	PEC	3	0	0	3
6	24AG405PE	Energy Conservation in Agro-Based Industry	PEC	3	0	0	3
7	24AG406PE	Farm Level Energy Auditing	PEC	3	0	0	3
8	24AG407PE	Energy Management and Environment Utilities	PEC	3	0	0	3

VERTICAL V: SMART AGRICULTURE SYSTEMS

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24AG501PE	IT in Agriculture Systems	PEC	3	0	0	3
2	24AG502PE	Automation in Agriculture	PEC	3	0	0	3
3	24AG503PE	Instrumentation and Control Engineering in Agriculture	PEC	3	0	0	3
4	24AG504PE	Mechatronics in Agricultural Engineering	PEC	3	0	0	3
5	24AG505PE	Drone Technology for Agriculture	PEC	3	0	0	3
6	24AG506PE	System Analysis in Agricultural Engineering	PEC	3	0	0	3
7	24AG507PE	Machine Learning for Soil and Crop Management	PEC	3	0	0	3
8	24AG508PE	Artificial Intelligence for Agriculture	PEC	3	0	0	3

VERTICAL VI: AGRICULTURAL BUSINESS MANAGEMENT

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24AG601PE	Agricultural Business Management	PEC	3	0	0	3
2	24AG602PE	Sustainable Agriculture and Food Security	PEC	3	0	0	3
3	24AG603PE	Organic Farming for Sustainable Agricultural Production	PEC	3	0	0	3
4	24AG604PE	Agricultural Economics and Farm Management	PEC	3	0	0	3
5	24ME705PE	Total Quality Management	PEC	3	0	0	3
6	24ME706PE	Professional Ethics in Engineering	PEC	3	0	0	3
7	24ME707PE	Project Management for Managers	PEC	3	0	0	3
8	24ME708PE	Principles of Management	PEC	3	0	0	3



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VERTICAL VII: CROP PRODUCTION

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24AG701PE	Soil Fertility and Fertilizers	PEC	3	0	0	3
2	24AG702PE	Basics of Crop Breeding and Plant Biotechnology	PEC	3	0	0	3
3	24AG703PE	Modern Concepts in Crop Production	PEC	3	0	0	3
4	24AG704PE	Seed Processing Technology	PEC	3	0	0	3
5	24AG705PE	Integrated Farming System	PEC	3	0	0	3
6	24AG706PE	Protected Cultivation	PEC	3	0	0	3
7	24AG707PE	Climate Change and Adaptation for Agriculture	PEC	3	0	0	3
8	24AG708PE	Extension Methodology and Transfer of Technology	PEC	3	0	0	3



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Open Elective Course (OEC)

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories)

Open Elective I (Semester-V)

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24BM101OE	Medical Instruments	OEC	3	0	0	3
2	24BM102OE	Food, Nutrition and Health	OEC	3	0	0	3
3	24CE101OE	Industrial Waste Management	OEC	3	0	0	3
4	24CE102OE	Ecological Engineering	OEC	3	0	0	3
5	24CS101OE	Python Programming for Data Science	OEC	3	0	0	3
6	24CS102OE	Programming and Data Structures	OEC	3	0	0	3
7	24EC101OE	Principles of Signal Processing	OEC	3	0	0	3
8	24EC102OE	Consumer Electronics	OEC	3	0	0	3
9	24EE101OE	Power Generation Systems	OEC	3	0	0	3
10	24EE102OE	Electrical Wiring and Lighting	OEC	3	0	0	3
11	24ME101OE	Production Technology	OEC	3	0	0	3
12	24ME102OE	Alternative Energy Fuels	OEC	3	0	0	3
13	24AD101OE	Introduction to Artificial Intelligence	OEC	3	0	0	3
14	24AD102OE	Introduction to Data Science	OEC	3	0	0	3
15	24IT101OE	Fundamentals of Software Engineering	OEC	3	0	0	3
16	24IT102OE	Wireless Sensor Networks	OEC	3	0	0	3

Open Elective II (Semester-VII)

S. No	Course Code	Course Title	Course Category	No of Hours / Week			Credit
				L	T	P	
1	24BM201OE	Traditional Indian Foods	OEC	3	0	0	3
2	24BM202OE	Fundamentals of Cell and Molecular Biology	OEC	3	0	0	3
3	24CE201OE	Global Warming and Climate Change	OEC	3	0	0	3
4	24CE202OE	Building Services	OEC	3	0	0	3
5	24CS201OE	Fundamentals of Operating Systems	OEC	3	0	0	3
6	24CS202OE	Introduction to Database	OEC	3	0	0	3
7	24EC201OE	Basics of Virtual Instrumentation	OEC	3	0	0	3
8	24EC202OE	Telecommunications for Society	OEC	3	0	0	3
9	24EE201OE	Energy Audit and Management	OEC	3	0	0	3
10	24EE202OE	Electric Vehicles	OEC	3	0	0	3
11	24ME201OE	Basics of Automotive Components	OEC	3	0	0	3
12	24ME202OE	Unconventional Machining Processes	OEC	3	0	0	3
13	24AD201OE	Basics of Visualization Tools	OEC	3	0	0	3
14	24AD202OE	Fundamentals of Machine Learning	OEC	3	0	0	3
15	24IT201OE	Introduction to Web Development	OEC	3	0	0	3
16	24IT202OE	Principles of Multimedia	OEC	3	0	0	3


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SUMMARY

S.NO	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL	PERCENTAGE
		I	II	III	IV	V	VI	VII	VIII		
1	HSMC	4	7	-	-	-	-	-	-	11	6.71
2	BSC	12	7	4	-	-	-	-	-	23	14.02
3	ESC	6	4.5	4	4	4	4	-	-	26.5	16.16
4	PCC	-	4.5	14	14	11	7	8	-	58.5	35.67
5	PEC	-	-	-	-	3	6	6	6	21	12.80
6	OEC	-	-	-	-	3	-	3	-	6	3.66
7	EEC	1	1	1	1	1	2	1	10	18	10.98
8	MC	-	-	-	-	-	-	-	-	0	0.00
	TOTAL	23	24	23	19	22	19	18	16	164	100

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ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

- A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.
- For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.
- For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes. Moreover, for minor degree the student can register for courses from any one of the following verticals also.

VERTICAL FOR MINOR DEGREE (In addition to all the verticals of other programmes)

Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5
Fintech and Block Chain	Entrepreneurship	Public Administration	Business Data Analytics	Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable Infrastructure Development
Fundamentals of Investment	Team Building and Leadership Management for Business	Elements of Public Administration	Data Mining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiency for Sustainable Development


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(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL 1: FINTECH AND BLOCK CHAIN

S. No	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M101	Financial Management	PEC	3	0	0	3
2	24M102	Fundamentals of Investment	PEC	3	0	0	3
3	24M103	Banking, Financial Services and Insurance	PEC	3	0	0	3
4	24M104	Introduction to Blockchain and its Applications	PEC	3	0	0	3
5	24M105	Fintech Personal Finance and Payments	PEC	3	0	0	3
6	24M106	Introduction to Fintech	PEC	3	0	0	3

VERTICAL 2: ENTREPRENEURSHIP

S. No	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M201	Foundations of Entrepreneurship	PEC	3	0	0	3
2	24M202	Team Building and Leadership Management for Business	PEC	3	0	0	3
3	24M203	Creativity and Innovation in Entrepreneurship	PEC	3	0	0	3
4	24M204	Principles of Marketing Management for Business	PEC	3	0	0	3
5	24M205	Human Resource Management for Entrepreneurs	PEC	3	0	0	3
6	24M206	Financing New Business Ventures	PEC	3	0	0	3

VERTICAL 3: PUBLIC ADMINISTRATION

S. No	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M301	Principles of Public Administration	PEC	3	0	0	3
2	24M302	Elements of Public Administration	PEC	3	0	0	3
3	24M303	Public Personnel Administration	PEC	3	0	0	3
4	24M304	Administrative Theories	PEC	3	0	0	3
5	24M305	Indian Administrative System	PEC	3	0	0	3
6	24M306	Public Policy Administration	PEC	3	0	0	3

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VERTICAL 4: BUSINESS DATA ANALYTICS

S. No	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M401	Statistics for Management	PEC	3	0	0	3
2	24M402	Data Mining for Business Intelligence	PEC	3	0	0	3
3	24M403	Human Resource Analytics	PEC	3	0	0	3
4	24M404	Marketing and Social Media Web Analytics	PEC	3	0	0	3
5	24M405	Operation and Supply Chain Analytics	PEC	3	0	0	3
6	24M406	Financial Analytics	PEC	3	0	0	3

VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

S. No	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M501	Sustainable Infrastructure Development	PEC	3	0	0	3
2	24M502	Sustainable Agriculture and Environmental Management	PEC	3	0	0	3
3	24M503	Sustainable Bio Materials	PEC	3	0	0	3
4	24M504	Materials for Energy Sustainability	PEC	3	0	0	3
5	24M505	Green Technology	PEC	3	0	0	3
6	24M506	Environmental Quality Monitoring and Analysis	PEC	3	0	0	3
7	24M507	Integrated Energy Planning for Sustainable Development	PEC	3	0	0	3
8	24M508	Energy Efficiency for Sustainable Development	PEC	3	0	0	3



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This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.”

“One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. “ Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don't's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.


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(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science. Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References: Guide to Induction program from AICTE


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OBJECTIVES:

The students should be made to:

- Develop basic communication skills in English.
- Enhance the speaking skills for academic, professional and social purposes.
- Use of the electronic media such as internet and other online resources for their language development.
- Inculcate the habit of reading and writing for the purpose of effective communication
- Develop confidence in learners to communicate in English for all purposes

UNIT I BASICS OF COMMUNICATION 9

Listening: Basics of listening-Intensive and Extensive Listening, Barriers to Effective Listening; Speaking: Speaking about Future plans- Giving instruction to use the product, Reading: Skimming and Scanning, Writing: Writing about one's leisure time activities, hometown, everyday activities etc., Grammar: Parts of speech, Prepositions, Vocabulary: Word formation.

UNIT II CREATIVE COMMUNICATION 9

Listening: Listening to short lectures /talks, Speaking: Telephonic interview, Reading: Reading Editorial and Opinion Blogs, Writing: Biographical writing - Writing a paragraph (Cause and Effect/Compare and Contrast/Narrative/Analytical) - Grammar: Gerund and Infinitive - Present Tense, Vocabulary: Abbreviations & Acronyms.

UNIT III FUNCTIONAL COMMUNICATION 9

Listening: Listening to radio and TV and taking notes - Focused audio tracks, Speaking: Role Play - Group Interaction, Reading: Reading magazines, Writing: Letter (Informal /Formal - Industrial Visit, Internship, etc), Writing a set of instructions, Grammar: Past Tense -Subject - Verb Agreement, Vocabulary: Question Tags.

UNIT IV ANALYTICAL SKILLS 9

Listening: Listening to select talks by eminent personalities, speaking: Speaking in mock Interviews, Reading: Reading advertisements, Writing: Writing a set of recommendations, Interpreting Visual Materials (Line Graphs, Pie Charts etc.), Grammar: Sentence Pattern, Future Tense, Articles, Vocabulary: Single word substitutes.

UNIT V PROFESSIONAL COMMUNICATION 9

Listening: Understanding different Accents, Listening to TED talks, Speaking: Giving impromptu talks- Making presentations, Reading: Reading and comprehending a passage, Writing: Letter to the editor- Check list, Grammar: Direct and Indirect Speech, Vocabulary: Phrasal Verbs.

TOTAL: 45 PERIODS


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OUTCOMES:

On successful completion of the course, the students will be able to,

- Use suitable vocabulary with confidence and express their ideas both in speech and writing.
- Write intelligibly avoiding grammatical errors, using a range of vocabulary, organizing their ideas logically on a topic.
- Speak confidently, with one or many listeners using appropriate communicative strategies.
- Read different genres of texts adopting various reading strategies.
- Understand different spoken discourses/excerpts in different accents.

TEXT BOOKS:

1. Kumar, Sanjay and Lata, Pushp, "Communication Skills", Oxford University Press. 2018.

REFERENCES:

1. DuttP. Kiranmai and Rajeevan Geeta, "Basic Communication Skills", Foundation Books, 2007.
2. Mohan, Krishna and Banerji Meera, "Developing Communication Skills", Macmillan Publishers India Ltd., Delhi: 2009.
3. Martin Hewings "Advanced English Grammar: A self study reference and Practice book for advanced South Asian students" Cambridge University Press, Delhi: 2016.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	2	-	-	2	-	1	2	3	-	2
CO2	-	-	2	-	2	-	-	2	3	1	-
CO3	-	-	2	-	2	1	2	3	3	2	2
CO4	-	-	-	2	2	1	2	3	3	2	2
CO5	2	3	-	2	3	-	2	-	3	1	2


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OBJECTIVES:

The students should be made to:

- Introduce the matrix techniques and to illustrate the nature of the matrix.
- Remember the basic concepts of solving algebraic and transcendental equations.
- Apply the formula for the curvature of a curve defined in Cartesian coordinates.
- Analyze the Partial differentiation, concept of total derivative, finding maxima and minima of function of two variables.
- Evaluate the techniques of integration in finding area and volume.

UNIT I MATRICES

9+3

Eigenvalues and eigenvectors of a real matrix - Properties of eigenvalues and eigenvectors - Cayley-Hamilton theorem (Without proof) - Application of Cayley - Hamilton theorem (A^{-1} , A^n)- Nature of quadratic forms - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II SYSTEM OF LINEAR EQUATIONS

9+3

Newton Raphson method- Bisection Method -Solution of linear system of equations by matrix method, Gauss-Jordan, Gauss- Jacobi and Gauss-Seidel methods- Eigen values of a matrix by Power method.

UNIT III DIFFERENTIAL CALCULUS

9+3

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normal.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

9+3

Partial derivatives - Total derivative - Differentiation of implicit functions - Jacobians - Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

UNIT-V MULTIPLE INTEGRALS IN CARTESIAN COORDINATES

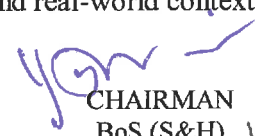
9+3

Double integration- Change of order of integration- Area between two curves- Triple integration- Volume as triple integrals.

TOTAL: (45+15) PERIODS**OUTCOMES:**

On successful completion of the course, the students will be able to,

- Develop problem-solving skills using systems of equations and matrix transformations.
- Evaluate the efficiency of numerical methods based on the number of iterations required to achieve a desired level of accuracy.
- Compute the radius of curvature and interpret its significance for different types of curves.
- Expand a given function into a series and determine the maximum and minimum of multivariate functions.
- Apply the concepts of double and triple integrals in mathematical and real-world contexts.



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TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2018.

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2018.
2. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 4th Edition, New Delhi, 2021.
3. Ramana B V "Higher Engineering Mathematics", New Delhi Tata McGraw- Hill Education India Private Limited., 2021
4. Gerald. C.F., and Wheatley. P.O. "Applied Numerical Analysis" 7th Edition, Pearson Education India, 2017.

Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	-	-	-	-	-	2
CO2	3	3	2	3	2	-	-	-	-	-	2
CO3	3	3	2	2	2	1	-	-	-	-	2
CO4	3	3	2	3	3	1	-	-	-	-	2
CO5	3	2	3	3	3	2	-	-	-	-	3

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19/02/25

24PH101

ENGINEERING PHYSICS
(Common to All Branches)

L T P C
3 0 2 4

OBJECTIVES:

The students should be made to:

- Recall the mechanical properties of materials.
- Gain knowledge on electrical properties of materials.
- Understand the properties of magnetic and superconducting materials.
- Examine basic quantum mechanical concepts and their applications.
- Acquire the basic knowledge about nano phase materials and their properties.

UNIT I MECHANICAL PROPERTIES OF SOLIDS 9

Elasticity and Plasticity - stress-strain diagram and its uses - Hooke's law - factors affecting elastic modulus - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment – I shaped girders and its applications.

UNIT II ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory of metals - Electrical conductivity and thermal conductivity of metals - Wiedemann - Franz law - Failures of classical free electron theory - Success of Quantum free electron theory - Fermi distribution function and its variation with temperature - Density of energy states-carrier concentration of metals.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Classification of magnetic materials - Domain theory of ferromagnetism - Hysteresis - Soft and Hard magnetic materials - Superconducting materials – Meissner effect - Isotopic effect - BCS theory of superconductors - Type I & Type II superconductors - Applications of superconductors.

UNIT IV QUANTUM PHYSICS 9

Black body radiation - Planck's theory (derivation) - Deduction of Wien's displacement law and Rayleigh Jeans' Law from Planck's theory-de-Broglie wavelength - Properties of matter waves - Schrodinger's wave equations - Time independent and time dependent wave equations - Physical significance of wave function - Particle in a one dimensional potential box.

UNIT V NEW ENGINEERING MATERIALS 9

Metallic glasses - Types - Preparation - Properties and applications - Shape Memory Alloys (SMA) - Characteristics and applications - Advantages and disadvantages of shape memory alloys - Synthesis of nanomaterials - Top down approaches (Ball Milling) and Bottom up approaches (CVD and PVD).

TOTAL: 45 PERIODS


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LIST OF THE EXPERIMENTS – PHYSICS LABORATORY

1. Determination of Young's modulus of the material by Non-uniform bending method.
2. Determination of Rigidity modulus of the wire using Torsion Pendulum.
3. Determination of band gap energy of a semiconductor.
4. Determination of thickness of the thin film/wire by forming the fringe using Air wedge method.
5. Determination of velocity of ultrasonic waves in a liquid and compressibility of liquid using ultrasonic Interferometer.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of the course, the students will be able to,

- Identify the mechanical properties of materials and their significance in engineering applications.
- Interpret the electrical properties of materials and their role in various technological applications.
- Illustrate the magnetic and superconducting properties of materials and their practical implications.
- Apply fundamental quantum mechanical concepts to understand material behavior at the atomic level.
- Explore the properties and applications of smart materials in modern engineering solutions.

TEXT BOOKS:

1. M.N. Avadhanulu, P.G. Kshirsagar, TVS Arun Murthy "A Text book of Engineering Physics", S.Chand and Company Ltd, New Delhi, 11th Edition, 2022.
2. Rajendran. V. "Materials Science", McGraw Hill Education (India) Private Limited, New Delhi, 2017.
3. S.O Pillai, "Solid State Physics" New Age International Publishers, New Delhi, 10th Edition, 2022.

REFERENCES:

1. R. K. Gaur and S.L. Gupta, "Engineering Physics", Dhanpat Rai Publications, New Delhi, Reprint 2022.
2. Wahab. M.A, "Solid State Physics" Narosa Publishing House, New Delhi, 4th Edition. 2023.
3. D. Halliday, R. Resnick and J. Walker, Principles of Physics, Wiley (11th Edition), 2020.
4. Malik.K and Singh. A.K, "Engineering Physics" TMH, New Delhi 2nd Edition - 2020.


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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
PHYSICS LABORATORY

S.No.	Name of Equipment	Quantity Required
1	Torsional pendulum with accessories	6 Nos.
2	Non - Uniform bending with accessories	6 Nos.
3	Ultrasonic interferometer.	6 Nos.
4	Air wedge with accessories	6 Nos.
5	Band gap kit	6 Nos.



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Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	1	1	-	-	-	-	-	1
CO2	3	2	2	3	2	-	-	-	-	-	2
CO3	3	3	2	3	2	1	-	-	-	-	-
CO4	3	2	2	3	3	-	-	-	-	-	2
CO5	2	2	2	2	2	2	-	-	-	-	3


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OBJECTIVES:

The student should be made to:

- Gain knowledge on various sources of water and its industrial applications.
- Explore the essentials of electrochemistry, types of corrosion and its prevention.
- Examine the fundamentals of polymer, various engineering plastics and composites.
- Study the concept of Phase diagrams, different types of energy storage devices and emerging batteries.
- Assess the types of fuels and its quality estimation.

UNIT I WATER TECHNOLOGY**9**

Sources of water - Hard and soft water - Boiler feed water-requirements - disadvantages of using hard water in boilers (Scale, Sludge, Caustic Embrittlement, Priming and Foaming) - Municipal water treatment (screening, sedimentation, coagulation, filtration and disinfection - ozonolysis, UV treatment, chlorination). Internal conditioning (Phosphate, Calgon, Colloidal and Carbonate conditioning methods) - External conditioning - Zeolite and demineralization process - desalination by reverse osmosis.

UNIT II ELECTROCHEMISTRY AND CORROSION SCIENCE**9**

Electrochemistry - Nernst equation & its Applications - Electrochemical (EMF) series - Corrosion - Types - Chemical and Electrochemical corrosions - Galvanic corrosion - Differential aeration corrosion - Pitting corrosion - Corrosion control - material selection and design - sacrificial anodic method and impressed current cathodic protection method - Organic coatings - Paint and its constituents.

UNIT III POLYMERS AND COMPOSITES**9**

Introduction: Functionality - degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces) - Mechanism of free radical polymerization - Engineering Plastics: Polyamides, Polycarbonates and Polyurethanes.

Composites: Need, Composition of composites - Definition, examples and applications of Metal matrix composites (MMC), Ceramic matrix composites (CMC) and Polymer matrix composites (PMC)

UNIT IV PHASE RULE AND ENERGY STORAGE DEVICES**9**

Phase Rule - Terms involved - One Component system (water system) - Two component system (Lead-Silver system) - Storage devices - types - primary battery (dry cell), secondary battery (lead acid, lithium-ion battery) - Emerging batteries - Aluminum air battery, batteries for automobiles and satellites - Fuel cells - Hydrogen - Oxygen fuel cell.

UNIT V FUELS AND COMBUSTION**9**

Fuels - Introduction - Classification of fuels - coal - Analysis of coal (proximate and ultimate) - Carbonization - Manufacture of metallurgical coke (Otto Hoffmann method) - Petroleum - Manufacture of synthetic petrol (Bergius process) - Knocking - Anti knocking - Octane number - Cetane number - Gaseous fuels - LPG, CNG - Combustion: Calorific value - higher and lower calorific values - Theoretical calculation of calorific value - Flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

1/3/25
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19/02/25

LIST OF THE EXPERIMENTS - CHEMISTRY LABORATORY

1. Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of Chloride content of water sample by Argentometric method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Estimation of Copper content by spectrophotometer.
6. Estimation of iron content of the given solution using potentiometer.
7. Conductometric titration of strong acid Vs strong base.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of the course, the students will be able to,

- Understand the various water treatment methodologies and its applications.
- Recognize corrosion protection techniques and appropriate mitigation strategies.
- Assess different types of polymers, composites and their industrial applications.
- Illustrate the concept of phase diagram, working principles of batteries, emerging energy storage technologies and their applications.
- Analyze the various fuels and their properties.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing, Company, New Delhi, 2015.
2. S. S. Dara, "A Text Book of Engineering Chemistry", Chand & Co. Ltd., New Delhi, 2013.

REFERENCES:

1. Shika Agarwal, "Engineering Chemistry", Cambridge University Press, Delhi, 2016.
2. B. Sivashankar, "Engineering Chemistry", Tata Mc. Graw-Hill Publishing Company, Ltd., Delhi, 2012.
3. G Palanna, "Engineering Chemistry", Tata Mc. Graw Hill Education Private Limited, Delhi, 2017.
4. Prasanta Rath, "Engineering Chemistry", Cengage Learning India Pvt. Ltd., Delhi, 2018.



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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
CHEMISTRY LABORATORY

S.No.	Name of Equipment	Quantity Required
1	pH Meter	10 Nos.
2	Digital Conductivity Meter	10 Nos.
3	Digital Potentiometer	10 Nos.
4	Electronic Balance	5 Nos.
5	Deionizer unit	1 No.
6	Spectrophotometer	5 Nos.


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Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	2	3	2	-	-	-	-
CO2	3	2	-	-	2	3	2	-	-	-	-
CO3	3	-	2	2	3	2	-	-	-	-	-
CO4	3	2	1	-	3	2	-	-	-	-	2
CO5	3	3	1	-	2	3	2	-	-	-	2


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OBJECTIVES:

The student should be made to:

- Understand the various basic concepts like dimensioning, standards, curves and free hand sketching
- Develop the skills on projection of points, lines and plane surfaces
- Impart knowledge on projection of solids like prisms and pyramids
- Illustrate the section of solids and development of surfaces for various objects
- Acquire skills on viewing of solid objects in Isometric and Perspective projections

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)

2

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and geometric dimensioning

UNIT I PLANE CURVES AND FREE HAND SKETCHING

9+6

Curves used in engineering practices: Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method - Construction of cycloid and involutes of square and circle- Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles - Representation of Three Dimensional objects - Layout of views – Free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

9+6

Projection of points - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true length and true inclination by rotating line method - Projection of planes inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS

7+6

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

9+6

Sectioning of solids: prisms, pyramids, cylinder, cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids: prisms, pyramids, cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS**9+6**

Principles of isometric projection - isometric scale - isometric projections of simple solids, truncated and frustum of solids: Prisms, pyramids, cylinder, cone - Perspective projection of simple solids: Prisms, pyramids and cylinder by visual ray method.

TOTAL: 75 (45+30) PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Relate the engineering knowledge on dimensioning, standards, curves and free hand sketching objects
- Identify the various views on the projection of points, straight lines and plane surfaces
- Apply the knowledge on projection of solids like prisms and pyramids
- Analyze the section of solids and development of surfaces
- Develop the isometric views and perspective projection of simple solids

TEXT BOOKS:

1. Natarajan K V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2023.
2. Venugopal K and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2024.

REFERENCES:

1. Bhatt N D and Panchal V M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2023.
2. Basant Agarwal and Agarwal C M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2019.
3. Gopalakrishna K R., "Engineering Drawing" (Vol. I & II combined), Subhas Stores, Bangalore, 2017.

Special points applicable to End Semester Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use an appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	-	-	-	-	3	-	2
CO2	3	2	2	-	-	-	-	-	3	-	2
CO3	3	2	2	-	-	-	-	-	3	-	2
CO4	3	2	2	-	-	-	-	-	3	-	2
CO5	3	2	2	-	-	-	-	-	3	-	2

CHAIRMAN
(BoS / MECH)

24TA101

HERITAGE OF TAMILS
(Common to All Branches)

L T P C
1 0 0 1

OBJECTIVES:

The students should be made to:

- Learn the extensive literature of classical Tamil.
- Analyze rock art paintings to modern art.
- Understand folk and martial arts.
- Apply the concepts of Thinaï in Tamils.
- Realize the contribution of Tamils in Indian freedom struggle.

UNIT I LANGUAGE AND LITERATURE

3

Language Families in India - Dravidian Languages –Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

**UNIT II HERITAGE-ROCK ART PAINTINGS TO MODERN ART–
SCULPTURE**

3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yath and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS

3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS

3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

**UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT
AND INDIAN CULTURE**

3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India– Self-Respect Movement- Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL: 15 PERIODS


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OUTCOMES:

On successful completion of the course, the students will be able to,

- Recognize the extensive literature Tamil and classical nature.
- Understand the heritage of sculpture, painting and musical instruments.
- Classify the folk and martial arts of Tamil people.
- Realization of Thina concepts, trade and victory of Chozha dynasty.
- Interpret the contribution of Tamils in Indian freedom struggle, Self- esteem movement and siddha medicine.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருறை - ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatananian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	2	1	2	-	1
CO2	-	-	-	-	-	-	2	1	2	-	1
CO3	-	-	-	-	-	-	2	1	2	-	1
CO4	-	-	-	-	-	-	2	1	2	-	1
CO5	-	-	-	-	-	-	2	1	2	-	1

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நோக்கங்கள்:**மாணவர்கள் கண்டிப்பாக அறிய வேண்டுவன:**

- செம்மொழியான தமிழ் மொழியின் விரிவான இலக்கியத்தைப் பற்றி அறிதல்.
- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை உள்ள கலைகளை பகுப்பாய்வு செய்தல்.
- நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகளைப் புரிந்துகொள்ளுதல்.
- தமிழர்களின் திணைக் கோட்பாடுகளைச் செயல்படுத்துதல்.
- இந்திய விடுதலைப் போராட்டத்திற்கும் பண்பாட்டிற்கும் தமிழர்களின் பங்களிப்பை உணருதல்

அலகு 1 மொழி மற்றும் இலக்கியம்

3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் -சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம்-திருக்குறளில் மேலாண்மைக் கருத்துக்கள்- தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமணப் பௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் -தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை

3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் -குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை , வீணை , யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்

3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்

3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள்

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போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் -சங்ககால நகரங்களும் துறை முகங்களும் -சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்க - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

TOTAL: 15 PERIODS

முடிவுகள்:

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன:

- தமிழ் மொழியின் செம்மொழி தன்மையையும் சங்க இலக்கியத்தின் முக்கியத்துவத்தையும் உணர்வார்கள்.
- தமிழர்களின் சிற்ப, ஓவிய, இசை மரபுகளை புரிந்துகொள்வார்கள்.
- நாட்டுப்புறக் கலைகளையும் வீர விளையாட்டுகளையும் வகைப்படுத்துவார்கள்.
- தமிழர்களின் திணைக் கோட்பாடுகளும் சங்ககால வர்த்தகமும் புரிந்துகொள்வார்கள்.
- இந்திய விடுதலைப் போராட்டம், சுயமரியாதை இயக்கம், சித்த மருத்துவம் ஆகியவற்றில் தமிழர்களின் பங்களிப்பை விளக்குவார்கள்.

உரை மற்றும் குறிப்பு புத்தகங்கள்:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)


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9. Keeladi – ‘Sangam City Civilization on the banks of the river Vaigai’ (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	2	1	2	-	1
CO2	-	-	-	-	-	-	2	1	2	-	1
CO3	-	-	-	-	-	-	2	1	2	-	1
CO4	-	-	-	-	-	-	2	1	2	-	1
CO5	-	-	-	-	-	-	2	1	2	-	1


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OBJECTIVES:

The student should be made to:

- Acquire knowledge in calculation of area and volume of various 2D and 3D shapes and gain practical exposure in pipeline connections and carpentry
- Develop the fundamental skills in welding, machining, sheet metal and foundry works
- Illustrate the basic working principles of air conditioner, industrial robot and washing machine
- Learn the domestic, industrial wiring circuits and measure the electrical parameters
- Demonstrate the basic electronic components in PCB, assemble of smart phone, computer and LED TV

GROUP A (CIVIL & MECHANICAL)**I. CIVIL ENGINEERING PRACTICES**

15

Basic Measurements

1. Calculation of area and volume for various solid and hollow shapes, including cubical, spherical, cylindrical and conical models with different scale conversions.

Carpentry

2. Study of industrial trusses and joints in doors and windows using models.
3. Sawing and planing- Making joints: T-joint, Mortise joint, and Tenon joint.

Plumbing

4. Laying pipe connections for suction and delivery sides of the pumps and preparation of plumbing line sketches for water supply and sewage works.
5. Connecting various pipe fittings using different materials (metal, plastic, and flexible pipes) and other components which are commonly used in household appliances.

II. MECHANICAL ENGINEERING PRACTICES

15

Welding:

- a) Arc Welding
 - i) Butt joint
 - ii) Lap joint
- b) Gas welding practice

Basic Machining:

- a) Turning and Facing
- b) Drilling and tapping

Sheet Metal work:

- a) Making of a funnel
- b) Making of a tray

Foundry work:

- a) Making a mould using solid pattern
- b) Making a mould using split pattern

Study Experiments

- a) Study of components in Air conditioner
- b) Study of components in Industrial robot
- c) Study of components in Washing machine



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GROUP B (ELECTRICAL AND ELECTRONICS)

III. ELECTRICAL ENGINEERING

15

1. Residential house wiring using switches, fuse, indicator, circuit breaker, lamp and Energy meter
2. Stair case wiring
3. Industrial wiring using switches, fuse, indicator and Energy meter
4. Measurement of electrical quantities - voltage, current, power, power factor and energy in RLC circuit
5. Calculation of energy consumption for different lamps
6. Study of fan with regulator, Iron Box and Emergency Lamp

IV. ELECTRONICS ENGINEERING

15

1. Study and identification of electronic components -Resistors, Capacitors and Inductors
2. Assembling and testing electronic components in small PCB
3. Assembling and dismantling of Computer/Laptop
4. Assembling and dismantling of LED TV
5. Study of elements in smart phone

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Interpret engineering knowledge on calculation of area and volume of different geometric shapes, connecting various household fittings and making carpentry joints
- Apply engineering skills to do welding, machining, sheet metal and foundry works
- Gain knowledge on Air conditioner, Industrial robot and washing machine
- Understand the domestic, industrial wiring circuits and measure the various electrical parameters
- Analyze the basic components of electronic circuits, computer, laptop, smart phone and LED TV

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	2	2	-	2	-	-	2
CO2	3	2	2	-	2	2	-	2	-	-	2
CO3	3	2	1	-	2	2	-	2	-	-	2
CO4	3	2	1	-	2	2	-	2	-	-	2
CO5	3	2	2	-	2	2	-	2	-	-	2


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24GE104L ENGINEERING PRACTICES LABORATORY

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

GROUP A (CIVIL & MECHANICAL)

S. No	Name of Equipment	Quantity Required
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CIVIL ENGINEERING PRACTICES

Basic Measurements

1.	Sphere	03 Nos.
2.	Cylinder	03 Nos.
3.	Cone	03 Nos.
4.	Cube	03 Nos.
5.	Cuboid	03 Nos.

Carpentry

6.	Industrial truss	03 Nos.
7.	Door Joint	03 Nos.
8.	Window Joint	03 Nos.
9.	Try Square	15 Nos.
10.	Hand Saw	15 Nos.
11.	Carpentry bench vice	15 Nos.
12.	Firmer Chisel	15 Nos.
13.	Motrin Chisel	15 Nos.
14.	Iron Jack	15 Nos.
15.	Mallet	15 Nos.
16.	Bench hold fastens (C Clamp)	15 Nos.
17.	Wood Cutting Machine	2 Nos.
18.	Planer machine	2 Nos.
19.	Hand drilling Machine	2 Nos.
20.	Jig Saw	2 Nos.

Plumbing

21.	Pipe Vice	15 Nos.
22.	Die Holder with Die set	10 Nos.

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S. No	Name of Equipment	Quantity Required
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MECHANICAL ENGINEERING PRACTICES

Welding

- | | | |
|----|------------------|--------|
| 1. | Arc welding unit | 5 Nos. |
| 2. | Gas welding unit | 2 Nos. |

Basic Machining

- | | | |
|----|-------------------|--------|
| 3. | Lathe Machines | 3 Nos. |
| 4. | Drilling Machines | 2 Nos. |

Sheet Metal work

- | | | |
|-----|-------------------|--------|
| 5. | Steel rule | 5Nos. |
| 6. | Bend snips | 5 Nos. |
| 7. | Straight snips | 5 Nos. |
| 8. | Scriber | 5 Nos. |
| 9. | Divider | 5 Nos. |
| 10. | Trammel | 5 Nos. |
| 11. | Prick Punches | 5 Nos. |
| 12. | Centre punches | 5 Nos. |
| 13. | Pliers | 5 Nos. |
| 14. | Ball peen hammer | 5 Nos. |
| 15. | Cross peen hammer | 5 Nos. |
| 16. | Bull wart hammer | 5 Nos. |
| 17. | Mallet | 5 Nos. |
| 18. | Anvil | 3 Nos. |
| 19. | Swage block | 3 Nos. |
| 20. | Wire gauges | 2 Nos. |

Foundry work

- | | | |
|-----|-------------------|--------|
| 21. | Cope and Drag Box | 5 Nos. |
| 22. | Solid pattern | 5 Nos. |
| 23. | Split pattern | 5 Nos. |
| 24. | Runner | 5 Nos. |
| 25. | Riser | 5 Nos. |
| 26. | Sprue pin | 5 Nos. |
| 27. | Sand rammer | 5 Nos. |
| 28. | Trowel | 5 Nos. |

Study Experiments

- | | | |
|-----|----------------------|-------|
| 29. | Air-conditioner unit | 1 No. |
| 30. | Industrial Robot | 1 No. |
| 31. | Washing Machine | 1 No. |


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LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity Required (Nos)
Part III: Electrical Engineering		
1.	Single phase house wiring setup	5
2.	Three phase house wiring setup	3
3.	Staircase wiring setup	3
4.	Fluorescent lamp and LED with wiring setup	Each 3
5.	Emergency lamp wiring setup	2
6.	Iron box wiring setup	2
7.	Fan with Regulator	2
8.	AC Voltmeter, Ammeter, Wattmeter and Energy Meter	Each 4
9.	R-Load	4
10.	Inductive and Capacitive Load	Each 1
Part IV: Electronics Engineering		
1.	Soldering Iron, Lead	10 Set
2.	Multi meter	10
3.	Continuity tester	10
4.	Used Laptop	3
5.	Used desktop computer	3
6.	Used LED TV	3
7.	Used Smart Phone	3
8.	DC Regulated power supply (0-30V)	2
9.	Resistors	200
10.	Capacitors	200
11.	Diodes	100
12.	Transistors	50


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 BoS(EEE) 26/02/25

OBJECTIVES:

The students should be made to:

- Improve the communicative competence of learners
- Help learners use language effectively in academic/work contexts
- Develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- Build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- Use language efficiently in expressing their opinions via various media.

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6

Listening for general information-specific details - conversation: Introduction to classmates (formal & informal); Telephone conversation; Speaking - Self Introduction-Introducing a friend; - politeness strategies - making polite requests, making polite offers, replying to polite requests and offers - understanding basic instructions (filling out a bank application for example).

UNIT II NARRATION AND SUMMATION 6

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events- Talking about current and temporary situations & permanent and regular situations - describing experiences and feelings, engaging in small talk- describing requirements and abilities.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT 6

Listening - Listen to product and process descriptions, a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities (large & small)- talking about precautions.

UNIT IV FUNCTIONAL COMMUNICATION 6

Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.

UNIT V PROFESSIONAL SKILLS 6

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic.

TOTAL: 30 PERIODS



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OUTCOMES:

On successful completion of the course, the students will be able to,

- Listen to and comprehend general as well as complex academic information.
- Listen to and understand different points of view in a discussion.
- Speak fluently and accurately in formal and informal communicative contexts.
- Describe products and processes and explain their uses and purposes clearly and accurately.
- Express their opinions effectively in both formal and informal discussions.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	2	3	-	2
CO2	-	-	-	-	-	-	2	2	3	-	2
CO3	-	-	2	-	3	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	2	3	-	2
CO5	-	-	-	-	-	3	2	2	3	-	-


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LIST OF EQUIPMENTS
Requirements for a batch of 30 students

Sl. No.	Description of Equipment/Software	Quantity required (Nos)
1	Computer	30
2	Headphones	30
3	Software: Globarena	30


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OBJECTIVES:

The students should be made to:

- Improve understanding of commonly used English usage by cultivating listening skills through informal interactions.
- Enrich their speaking abilities through scenario-based conversations to understand how language functions in context.
- Develop their ability to read critically by analyzing newspaper articles.
- Use group discussion techniques to improve cooperative communication.
- Enhance your ability to write professionally by creating organized reports.

UNIT I CONVERSATION

9

Listening: Listening to informal conversations, Speaking: Short conversations in varied situations in student life, Reading: Reading Short text and longer passages for comprehension at deeper levels, Writing: Writing reviews (book / film), Grammar: Compound Nouns - Numerical Expression, Vocabulary: Cause and Effect Expressions.

UNIT II LANGUAGE IN USE

9

Listening: Listening to Situation based Dialogues, Speaking: Asking about Routine actions and giving directions, Reading: Reading a short story for appreciation and understanding, Writing: Writing Emails - Dialogue writing, Grammar: Purpose expressions - Adverbs, Vocabulary: Imperative sentences.

UNIT III ENGLISH FOR SPECIFIC PURPOSE

9

Listening: Listening strategies for deeper understanding, Speaking: Using dictionary for learning pronunciation, stress and syllable divisions, Reading: an article from Newspaper - Critical reading, Writing: Note-Making / Note-Taking - Essay writing, Grammar: Definition, Degrees of Comparison, Vocabulary: Model verbs.

UNIT IV ENGLISH FOR CAREER

9

Listening: Listening to the interviews of CEOs / entrepreneur, Speaking: Group Discussion skills, Reading: pre reading and post reading tasks, Writing - Job application - Cover letter & Resume, Grammar: Active and Passive voice, Relative Pronouns, Vocabulary: Synonyms and Antonyms.

UNIT V REPORT WRITING

9

Listening: Listening and making notes, Speaking: Discussion on problems and solutions (case studies), Reading: Reading abstracts / Journal Articles, Writing: Minutes of meeting, Reports (Feasibility / Accident / Survey Report), Grammar: If Clause, Vocabulary: Idioms and their Meanings.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of the course, the students will be able to,

- Respond to informal conversations with effectiveness, exhibiting understanding.
- Appreciate and critically engage with short stories, articulating insights.
- Utilize dictionaries to comprehend syllable structures and pronounce words correctly.
- Engage in healthy group discussions by answering peers' questions and sharing ideas.
- Acquire constructive criticism in case study by describing issues.

TEXT BOOKS:

1. Bhatnagar, Nitin and Bhatnagar, Mamta, "Communicative English for Engineering and Professionals", Pearson Education India, 2010.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha, "Technical Communication Principles and Practice", Oxford University Press, Delhi, 2019.
2. Andrea J, Rutherford. "Basic Communication Skills for Technology", Pearson Education, Inc., 2013.
3. Rizvi M, Ashraf. "Effective Technical Communication", Tata McGraw Hill Education Pvt.Ltd., Delhi, 2017.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	1	-	-	2	3	-	2
CO2	-	-	1	-	-	2	2	-	3	-	2
CO3	-	-	-	-	2	-	2	-	3	-	-
CO4	-	-	-	2	-	-	2	3	3	-	-
CO5	-	2	-	2	-	2	2	2	3	-	-


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OBJECTIVES:**The Student should be made to:**

- Grasp the fundamental ideas of vectors, vector fields, and scalar fields.
- Identify the field of engineering in ODE as an effective tool for resolving practical issues.
- Interpret the geometric implications of analytic functions in terms of conformal mapping.
- Differentiate knowledge of hypothesis testing to small and large samples that play an important role in real-life problems.
- Analyze differences among group means, while controlling the Type I error rate.

UNIT I VECTOR CALCULUS**9+3**

Gradient of a Scalar point function - Divergence, Curl, Solenoidal and irrotational of a vector point function - Directional Derivative - Green's, Gauss divergence and Stoke's theorems (without proof)

UNIT II ORDINARY DIFFERENTIAL EQUATIONS**9+3**

Higher order linear differential equations with constant coefficients ($e^{ax}V, x^nV$) - Method of variation of parameters - Cauchy's linear differential equations - Legendre's linear differential equations

UNIT III ANALYTIC FUNCTIONS**9+3**

Functions of a complex variable - Analytic functions: Necessary condition - Cauchy-Riemann equations and sufficient condition (statement only) Harmonic and orthogonal properties of analytic function - Construction of analytic functions by Milne's method - Conformal mapping ($w = z + k, 1/z, kz$) - Bilinear transformation.

UNIT IV TESTING OF HYPOTHESIS**9+3**

Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Small sample tests based on t distributions for testing of means and F distributions for testing of variances - Chi-square - Contingency table (test for Independency) - Goodness of fit.

UNIT V ANALYSIS OF VARIANCE**9+3**

One way classifications - two way classifications - Completely randomized design - Randomized block design - Latin square design

TOTAL: (45+15) PERIODS
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OUTCOMES:

On successful completion of the course, the students will be able to,

- Understand the concepts of gradient, divergence, and curl in vector calculus.
- Apply suitable techniques for solving second and higher-order differential equations.
- Utilize conformal mapping and analytic functions to transform complex functions between different domains.
- Formulate the null and alternative hypotheses based on research questions and real-life scenarios.
- Classify the one-way and two-way ANOVA and interpret their applications in statistical analysis.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Richard A. Johnson., "Probability and Statistics for Engineers", Pearson Education, 8th Edition, 2019.

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2018.
2. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition New Delhi, 2013.
3. Devore. J.E., "Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, 8th Edition, 2021.
4. Spiegel Schiller "Probability and Statistics" Tata McGraw-Hill Publishing Company Limited, New Delhi. 3rd Edition, 2018.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	-	-	-	-	-	2
CO2	3	3	3	3	2	2	-	-	-	-	2
CO3	3	3	3	-	3	-	-	-	-	-	1
CO4	3	3	-	3	2	-	-	-	-	-	2
CO5	3	3	2	3	2	1	-	-	-	-	2


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**24MC002 UNIVERSAL HUMAN VALUES 2 - UNDERSTANDING
HARMONY
(Common to All Branches)**

**L T P C
2 1 0 3**

OBJECTIVES:

The students should be made to:

- Demonstrate an understanding of ethical principles and human values
- Apply critical thinking to analyze ethical dilemmas and conflicts
- Communicate effectively about ethical issues and human values
- Appreciate the importance of harmony in personal, social, and environmental contexts
- Engage in practices that promote ethical behavior and societal harmony

UNIT I INTRODUCTION TO VALUE EDUCATION 6+3

Value Education – need and process, Self-Exploration – process, Basic Human Aspirations - Continuous Happiness and Prosperity, Basic requirement for fulfilment of Human Aspirants, Understanding Happiness and Prosperity – Continuity of Happiness from Physical Facility.

UNIT II HARMONY IN THE HUMAN BEING 6+3

Human being as a co-existence of the self and the Body - The needs of Self and Body, Body as an Instrument - The Self as the Seer- Doer-Enjoyer, Harmony in the self, Harmony of the Self with the Body –Programme for Self – regulation and health.

UNIT III HARMONY IN THE FAMILY AND SOCIETY 6+3

Family as the basic unit of human interaction , Understanding Relationship, Trust as the foundational value, Respect as the Right Evaluation, Harmony in the society – Understanding Human Goal, Harmony from Family Order to World Family Order – Universal Human Order - Scope.

UNIT IV HARMONY IN THE NATURE AND EXISTENCE 6+3

Nature - as Collections of Units, Classification of Units into Four Orders, Interconnectedness, and mutual fulfilment among the four orders of nature, self-regulation in Nature, Understanding Existence as Units in Space, Existence as Co-existence.

**UNIT V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF
HARMONY ON PROFESSIONAL ETHICS 6+3**

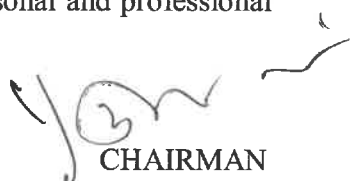
Natural Acceptance of Human Values - Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Constitution, Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production System and Management Models – Typical case, Strategies for Transition towards value based life and profession.

TOTAL: (30+15) PERIODS

OUTCOMES:

On successful completion of the course, the students will be able to,

- Understand the significance of value education and distinguish between values and skills
- Understand the concept of harmony within the self and how it relates to human values
- Analyze the role of family and society in fostering harmony
- Evaluate the relationship between human values and harmony in nature
- Develop skills to resolve conflicts and promote harmony in personal and professional life


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TEXT BOOKS:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi, 2nd Revised Edition, 2019.

REFERENCES:

1. Tripathi A N, "Human Values", New Age Intl. Publishers, New Delhi, 2009.
2. Govindarajan M, Natrajan S and Senthilkumar V S, "Engineering Ethics (Including Human Values)" Eastern Economy, PHI, 12th Edition, 2011.
3. Govindarajan M and Natrajan S, "Professional Ethics and Human Values", PHI, 2011.
4. Banerjee B P, "Foundation of Ethics and Management", Excel Publication, 2005.
5. Bajpai B L, "Indian Ethos and Modern Management", New Royal Book Co, Lucknow, Reprinted 2008.
6. Seebauer and Robert L Berry, "Fundamentals of Ethics for Scientist and Engineers", Oxford University Press, 2000.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	3	3	-	-	-	3
CO2	-	-	-	-	-	3	3	-	-	-	3
CO3	-	-	-	-	-	3	3	-	2	-	3
CO4	-	-	-	-	-	3	3	-	2	-	3
CO5	-	-	-	-	-	3	3	-	2	-	3



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BoS (S&H)

OBJECTIVES:

The students should be made to:

- Understand the structure and function of different ecosystems and concepts of biodiversity.
- Recognize the causes and effects of environmental pollutants and disaster management.
- Explore the natural resources and their sustainability.
- Examine the principles of sustainable development and Green Chemistry.
- Analyze the impacts of population on environment and human health.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment - concept of an ecosystem - structure and function of an ecosystem - ecological succession - food chain - food web - structure and function of the (a) forest ecosystem (b) desert ecosystem (c) aquatic ecosystem - (pond and ocean) - Biodiversity: Hot spots of biodiversity - threats to biodiversity - values of biodiversity - endangered and endemic species - conservation of biodiversity: In-situ and ex-situ conservation methods.

UNIT II ENVIRONMENTAL POLLUTION AND NATURAL CALAMITIES 9

Definition - causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Nuclear hazards - solid waste and E-waste Management: role of an individual in prevention of pollution-disaster management: flood, earthquake, cyclone and landslides.

UNIT III NATURAL RESOURCES 9

Forest resources: deforestation, mining, dam and their effects on forest and tribal people - Water resources: Use and over - utilization of surface and ground water - dams-benefits and problems - Food resources: World food problems - effects of modern agriculture - fertilizer - pesticide problems, water logging, salinity - Energy resources: renewable energy sources - Solar energy, Tidal energy, Wind energy sources. Land resource: land degradation, Soil erosion and desertification - role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND SUSTAINABILITY 9

Water conservation - rain water harvesting- resettlement and rehabilitation of people; its problems and concerns - environmental ethics - acid rain, ozone layer depletion - waste land reclamation - Air (Prevention and Control of Pollution) act - Water (Prevention and control of Pollution) act - Wildlife protection act - Forest conservation act. Sustainable development- Green Chemistry: Principles of green chemistry - Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transportation.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations - population explosion - family welfare programme - environment and human health - value education - HIV / AIDS - threatening of communicable diseases for human population and its prevention - women and child welfare - role of information technology in environment and human health.

TOTAL: 45 PERIODS
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OUTCOMES:

On successful completion of the course, the students will be able to,

- Articulate the significance of ecosystems and biodiversity.
- Evaluate the preventive measures of pollution and calamities.
- Identify the strategies for the conservation of natural resources.
- Retrieve the measures of green chemistry to real-world scenarios.
- Evaluate the issues of overpopulation and communicable diseases on the environment.

TEXT BOOKS:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, Delhi, 2nd Edition, 2018.
2. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 3rd Edition, 2016.

REFERENCES:

1. G. Tyler Miller, St. Andrews Presbyterian, "Introduction to Environmental Science", Cengage Learning India Pvt., Ltd., 2010.
2. Dharmendra S. Sengar, "Environmental Law", Prentice hall of India Pvt. Ltd, Delhi, 2007.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	-	3	2	-	-	-	-
CO2	2	2	-	-	-	3	3	-	-	-	-
CO3	-	1	3	-	2	3	-	-	-	-	-
CO4	2	-	3	-	3	-	3	-	-	-	-
CO5	1	2	-	-	-	2	-	-	2	-	-


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24GE101	COMPUTER FUNDAMENTALS AND C PROGRAMMING	L	T	P	C
	(Common to All Branches)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Learn the fundamentals of Computer and Programming.
- Understand the basics of C programming and decision making statements.
- Learn how to construct programs using array and pointer.
- Understand the concept of string and function.
- Study the concept of structure, union and files.

UNIT I FUNDAMENTALS OF COMPUTER AND PROGRAMMING 9

Computer System - Components of Computer Hardware - Data Representation - Number System and Conversion - Program Development Life Cycle - Algorithm - Control Structures - Flowchart – Pseudo code - Programming Paradigms.

UNIT II BASICS OF C PROGRAMMING 9

Overview of C - C Character Set - Identifiers and Keywords - Variable Declaration - Data types - Type Qualifiers and Type Modifiers - Structure of a C Program - Executing a C Program - Operators and Expressions - Decision-Making and Looping Statements.

UNIT III ARRAYS AND POINTERS 9

Introduction to Arrays - Types of Array - Pointers - void Pointer - Null Pointer - Arrays of Pointers - Pointer to a Pointer - Pointer to an Array - Pointer Arithmetic.

UNIT IV STRINGS AND FUNCTIONS 9

Strings - Reading String Input - String Library Functions - Command Line Arguments - Functions: Types - Declaration - Definition - Function Call - Pass by Value - Pass by Reference - Passing arrays to functions - Recursion.

UNIT V STRUCTURE, UNION AND FILES 9

Structures - Pointers to Structures - Array of Structures - Structures within a Structure - Functions and Structures - Unions - Storage Classes - Files: Streams - File type - File operations.

TOTAL: 45 PERIODS


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BoS (IT) 27/11

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the fundamentals of computer and programming.
- Choose appropriate data types, variables and statements for solving simple problems.
- Construct programs using arrays and pointers for a given scenario.
- Build programs using strings and functions in C language.
- Develop programs using structure, union and files for a given scenario.

TEXT BOOKS:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Pearson India Education Services Pvt. Ltd., 2016.

REFERENCES:

1. Ajay Mital, "Programming in C - A Practical Approach", Pearson Education, 2015.
2. Dromey R G, "How to Solve it by Computer", Pearson Education, Fifteenth Impression, 2014.
3. Herbert Schildt, "C - The Complete Reference", Tata McGraw-Hill, 2013.
4. Ashok N Kamthane, "Computer Programming", Pearson Education, Second Edition, 2012.
5. Juneja B L and Anita Seth, "Programming in C", Cengage Learning India Pvt. Ltd., 2011.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	2	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	2	2	-
CO3	3	2	2	2	-	-	-	-	2	2	1
CO4	3	2	2	2	2	-	-	-	2	2	1
CO5	3	2	2	2	2	-	-	-	2	2	1



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BoS (IT) 27/11

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BoS (AGE) 03/04/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basic principles of successful crop production with an engineering approach
- Apply engineering knowledge in field preparation practices for enhanced productivity
- Assess the different management techniques, including engineering-based solutions to control pest and diseases
- Analyze the field crop production practices with an engineering perspective
- Explain the innovative engineering techniques applied in the cultivation of horticultural crops

TEXT BOOKS:

1. Rajendra Prasad, "Textbook of Field Crops Production, Volume 1 and 2", Indian Council of Agricultural Research, New Delhi, 2017.
2. Reddy S R, "Principles of Agronomy", Kalyani Publishers, New Delhi, 2018.

REFERENCES:

1. Crop Production Guide, Tamilnadu Agricultural University Publication, Coimbatore, 2020.
2. Kumar N, "Introduction to Spices, Plantation crops, Medicinal and Aromatic plants", Oxford and IBH Publishing Co. Pvt. Ltd., 2nd Edition, 2018.
3. Kumar N, "Introduction to Horticulture", Medtech Publications, 8th Edition, 2018.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	-	-	-	-	-	-	-	-	-	2	2	2
CO3	3	2	2	1	2	2	-	-	-	-	2	2	2
CO4	3	-	-	1	2	2	-	1	-	1	2	2	2
CO5	3	-	-	1	2	2	-	1	-	1	2	2	2



CHAIRMAN
BoS (AGE) 03/04/25

OBJECTIVES:**Students should be made to:**

- Gain knowledge about weaving and ceramic Technology
- Creating a design and construction Technology
- Analyzing manufacturing Technology
- Applying agriculture and irrigation Technology
- Remembering scientific and scientific Tamil and Tamil computing

UNIT I WEAVING AND CERAMIC TECHNOLOGY**3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY**3**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo -Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY**3**

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY**3**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing Knowledge of Sea - Fisheries– Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING**3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL: 15 PERIODS**OUTCOMES:****On successful completion of the course, the students will be able to,**

- Understand weaving under ceramic Technology.
- Develop new design and construction Technology.
- Identify the manufacturing Technology.
- Understand agriculture and irrigation.
- Knowledge of scientific Tamil and Tamil computing.



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TEXT-CUM-REFERENCE BOOKS

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை-
(வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள்
கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்
(தொல்லியல் துறை வெளியீடு)
4. பொருறை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை
வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL
- (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published
by:International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
(Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by :
International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of the river Vaigai' (Jointly
Published by: Department of Archaeology & Tamilnadu Textbook and Educational
Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay)
(Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu
Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) --
Reference Book.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	2	1	-	-	1
CO2	-	-	-	-	-	-	2	1	-	-	1
CO3	-	-	-	-	-	-	2	1	-	-	1
CO4	-	-	-	-	-	-	2	1	-	-	1
CO5	-	-	-	-	-	-	2	1	-	-	1



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நோக்கம்:**மாணவர்கள் கண்டிப்பாக அறிய வேண்டுவன:**

- நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் பற்றிய அறிவைப் பெறுதல்.
- வடிவமைப்பு மற்றும் கட்டுமான தொழில் நுட்பத்தை உருவாக்குதல்.
- உற்பத்தி தொழில் நுட்பத்தை பகுப்பாய்வு செய்தல்.
- விவசாயம் மற்றும் நீர்ப்பாசனத் தொழில் நுட்பத்தைப் பயன்படுத்துதல்.
- அறிவியல் மற்றும் அறிவியல் தமிழ் மற்றும் தமிழ் கணிப்பொறி தொடர்பான அறிவை நினைவில் கொள்ளுதல்.

அலகு 1 நெசவு மற்றும் பானை தொழில் நுட்பம் 3
சங்க காலத்தில் நெசவுத்தொழில் - பானை தொழில் நுட்பம் - கருப்பு, சிவப்பு பாண்டங்கள் - பாண்டுகளில் கீறல் குறியீடுகள்.

அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் நாயக்கர் கால கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.

அலகு 3 உற்பத்தித் தொழில்நுட்பம் 3
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடிகள் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்பு துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம் 3
அணை, குளங்கள், மதகு - சோழர்கால குமுளி தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்து குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.


CHAIRMAN

BoS (S&H) 19/02/25

அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்

3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL: 15 PERIODS

முடிவுகள்:

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன:

- பீங்கான் மற்றும் நெசவு தொழில்நுட்பத்தைப் புரிந்து கொள்ளுதல்.
- புதிய வடிவமைப்பு மற்றும் கட்டுமான தொழில் நுட்பத்தை உருவாக்குதல்.
- உற்பத்தித் தொழில் நுட்பத்தை அடையாளம் காணுதல்.
- விவசாயம் மற்றும் நீர்ப்பாசனத்தைப் புரிந்து கொள்ளுதல்.
- அறிவியல் தமிழ் மற்றும் தமிழ் கணிப்பொறி தொடர்பான அறிவை பெறுதல்.

உரை மற்றும் குறிப்பு புத்தகங்கள்:

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை- (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.


CHAIRMAN

BoS (S&H) 19/12/25

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	-	-	-	-	-	-	2	1	-	-	1
C02	-	-	-	-	-	-	2	1	-	-	1
C03	-	-	-	-	-	-	2	1	-	-	1
C04	-	-	-	-	-	-	2	1	-	-	1
C05	-	-	-	-	-	-	2	1	-	-	1



CHAIRMAN

BoS (S&H) 19/02/25

OBJECTIVES:**The Student should be made to:**

- Learn how to develop C programs using conditional and looping statements
- Understand the concept of functions, arrays and strings
- Learn how to access memory using pointers
- Group different kinds of data related to a single entity
- Understand the manipulation of data in permanent storage

LIST OF EXPERIMENTS:

1. Programs using decision making statements.
2. Programs using looping statements.
3. Programs using user defined functions and recursive functions.
4. Programs using one dimensional and two dimensional arrays.
5. Solving problems using string functions.
6. Programs using pointers and dynamic memory allocation.
7. Programs using structures and unions.
8. Programs using pointers to structures and other data types.
9. Programs using text files.
10. Programs using binary files.

TOTAL: 45 PERIODS**OUTCOMES:****On successful completion of this course, the students will be able to,**

- Implement C programs using control statements.
- Write C programs using functions, arrays and strings.
- Write C programs to access data in memory using pointers.
- Develop C programs using structures and other user defined data structures to manipulate heterogeneous data.
- Build C programs to manipulate data stored on permanent storage.

List of Equipment for a Batch of 30 Students:

- Standalone desktops with C compiler or Server with C compiler for 30 Nos.

Mapping of COs with POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	2	-	-	-	2	3	-	-
CO2	3	2	3	2	-	-	-	2	3	-	-
CO3	3	2	3	2	-	-	-	2	3	-	2
CO4	3	2	3	2	2	-	-	2	3	-	2
CO5	3	2	3	2	2	-	-	2	3	-	2



 CHAIRMAN
BoS (IT)

27/11

OBJECTIVES:

The students should be made to:

- Acquire knowledge to identify and field preparation for field crops and horticultural crops
- Illustrate the seed concept and seed rate requirement
- Impart basic knowledge on nutrient, water, pest and disease management
- Learn the basic principles of crop monitoring
- Understand the science of harvesting and post harvesting

LIST OF EXPERIMENTS:

1. Identification of field crops and horticultural crops
2. Studies of field preparation for field crops
3. Studies of Seed selection, sowing and treatment procedures
4. Estimation of seed rate and germination of seeds
5. Studies of Nutrient management
6. Practicing Water management and Irrigation scheduling
7. Practicing different weed management practices
8. Study the integrated pest and diseases management practices
9. Practicing the biometric observation of crops
10. Study the Harvesting and Post harvesting methods

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the field crops and horticultural crops and their field preparation using engineering principles
- Understand the basic knowledge of seed selection and estimation of seed rate with an engineering approach
- Illustrate the different management practices in crops by integrating agricultural engineering techniques
- Analyze crop monitoring data using engineering knowledge for successful crop production
- Explain the new engineering techniques and tools to harvest the crops

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	2	-	-	2	-	-	-	-	-	2	2	1
CO4	3	2	2	-	2	-	-	2	-	1	2	2	1
CO5	3	-	-	-	-	-	-	2	1	1	2	2	1

CHAIRMAN
BoS (AGE) 03/04/25

24AG202L

CROP HUSBANDRY FIELD LABORATORY

Requirements for a batch of 30 students

1. A wet land / garden land for a minimum of 5 cents area for each / group of students 01
2. An open / borewell as water source to support cultivation 01

V. Gopale

CHAIRMAN

BoS (AGE) 03/04/25

OBJECTIVES:

The students should be made to:

- Establish effective time management techniques and professional grooming routines.
- Make progress on their own presentations by utilizing visual aids and interacting with the audience.
- Obtain the ability to participate in group conversations effectively and comprehend group dynamics.
- Recognize the protocol required for different types of interviews.
- Develop strategies for stress management, time management, and professional networking.

UNIT I SOFT SKILLS DEVELOPMENT**6**

Introduction to Soft Skills - Hard skills & soft skills - Employability and Career Skills - Grooming as a professional with values - Time Management - General awareness of Current Affairs.

UNIT II DEVELOPING SELF ESTEEM**6**

Self-Introduction-organizing the material - Introducing oneself to the audience - introducing the topic - answering questions - individual presentation practice - presenting the visuals effectively - Five minutes presentation

UNIT III PROFESSIONAL SKILLS**6**

Introduction to Group Discussion - Participating in group discussions - understanding group dynamics - brainstorming the topic - questioning and clarifying - GD strategies - activities to improve GD skills

UNIT IV COMMUNICATION ETIQUETTES**6**

Interview etiquette - dress code - body language - attending job interviews - telephonic interview - one to one interview & panel interview - FAQs related to job interviews

UNIT V MANAGEMENT SKILLS**6**

Recognizing the differences between groups and teams - managing time - managing stress-networking professionally- respecting social protocols - understanding career management-developing a long- term career plan-making career changes.

TOTAL: 30 PERIODS**OUTCOMES:**

On successful completion of the course, the students will be able to,

- Develop employability skills such as communication, teamwork, adaptability, and problem-solving.
- Enhance confidence and competence in answering questions effectively during presentations and discussions.
- Apply group discussion techniques and real-world exercises to improve debating abilities.
- Prepare for various job interviews, including panel, one-on-one, and telephone interviews.
- Formulate a comprehensive career plan, focusing on networking and career progression.


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BoS (S&H) 19/02/25

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	-	-	-	-	-	3	2	-	3
CO3	-	-	-	-	-	-	-	2	3	-	3
CO4	-	-	-	-	-	-	-	3	3	-	3
CO5	-	-	-	-	-	-	-	3	2	-	2


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BoS (S&H) 19/02/25

LIST OF EQUIPMENTS
Requirements for a batch of 30 students

Sl. No.	Description of Equipment/Software	Quantity required (Nos)
1	Computer	30
2	Headphones	30
3	Software: Globarena	30


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BoS (S&H) 19/02/25

OBJECTIVES:

The Student should be made to:

- Introducing the basic concepts of probability and random variable
- Finding solution for probabilistic models using various distribution
- Construct numerical integration for given data
- Remember the concepts of Fourier series for solving problems in engineering disciplines
- Applying the standard techniques for solving boundary value problem

UNIT I PROBABILITY AND RANDOM VARIABLES**9+3**

Introduction to probability: Axioms of probability - Conditional probability - Total probability - Baye's theorem - Simple problems on Baye's theorem.

Random variables: Discrete and continuous random variables - Distribution function of random variable - Properties, probability mass function - Probability density function - Mathematical expectation - Properties- Moments - Moment generating functions and their properties.

UNIT II PROBABILITY DISTRIBUTIONS**9+3**

Discrete distributions: Binomial - Poisson - Geometric distribution and their properties. Continuous distributions: Uniform - Exponential - Gamma - Normal distributions and their properties.

UNIT III NUMERICAL INTEGRATION**9+3**

General quadrature formula of numerical integration - Trapezoidal rule, Simpsons one - third and three - eight's rule's - Romberg's method - Two point and three point Gaussian quadrature formulae.

UNIT IV FOURIER SERIES**9+3**

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range sine series - Half range cosine series - Complex form of Fourier series - Parseval's identity - Harmonic analysis.

UNIT V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**9+3**

Classification of PDE - Method of separation of variables - Fourier Series Solutions of one dimensional wave equation - One dimensional equation of heat conduction - Steady state solution of two dimensional equation of heat conduction.

TOTAL: (45+15) PERIODS**OUTCOMES:**

On successful completion of the course, the students will be able to,

- Relate real life problems with concept of probability and random variables
- Apply the concept of probability distributions in solving engineering problems
- Analyze the numerical integration for the given data
- Identify the Fourier series for standard periodic wave forms
- Evaluate the solutions of wave and heat equations using Fourier series


CHAIRMAN
BoS (S&H)

09/10

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2017.
2. Bali N.P, and Manish Goyal, " A Text Book of Engineering Mathematics", Ixmi Publications(P) Ltd., 9th Edition, 2014.

REFERENCES:

1. Gerald C.F. and Wheatley P.O., "Applied Numerical Analysis", Pearson Education Asia, 8th Edition, New Delhi, 2014.
2. Grewal B.S. and Grewal J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi, 2014.
3. Veerarajan T., "Probability Statistics & Random Processes with Queuing Theory & Queuing Networks" TMH Publications, 2018.
4. Ibe O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Indian Reprint, 2014.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	-	-	-	2	1	-	1
CO2	3	2	2	1	-	-	-	2	1	-	1
CO3	3	3	3		-	-	-	2	1	-	1
CO4	3	2	2		-	-	-	2	1	-	2
CO5	3	3	3	2	-	-	-	2	1	-	2


CHAIRMAN
BoS (S&H) 09/10

OBJECTIVES:

The students should be made to:

- Understand the basic concepts and different law of thermodynamics
- Apply the second law of thermodynamics and concept of entropy
- Examine the conduction heat transfer rate in steady and unsteady conditions
- Analyze the heat transfer mechanisms associated with free and forced convection in external and internal flows
- Evaluate the phenomena of radiation and heat exchangers

(Use of standard HMT data book permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS 9

Basic concepts - concept of continuum, micro, macroscopic approach, thermodynamic systems - closed, open and isolated. Property, state, path, process and quasi-static process. Work - modes of work. Zeroth law of thermodynamics, First law of thermodynamics - Application of closed systems. Steady flow energy equation for various thermal equipments.

UNIT II SECOND LAW AND ENTROPY 9

Second law of thermodynamics - Kelvin-Planck and Clausius statements of second law. Carnot cycle, Reversed Carnot cycle, Carnot's theorem - Heat engine - efficiency - Refrigerator, Heat pump - COP. Inequality of Clausius - Concept of entropy, principle of increase in entropy, absolute entropy.

UNIT III CONDUCTION 9

General Differential equation of Heat Conduction- Cartesian and Polar Coordinates - One Dimensional Steady State Heat Conduction - Plane and Composite Systems - Extended Surfaces - Unsteady Heat Conduction - Lumped Analysis.

UNIT IV CONVECTION 9

Free and Forced Convection - Hydrodynamic and Thermal Boundary Layer. Free and Forced Convection during external flow over Plates, Cylinders and Internal flow through tubes.

UNIT V RADIATION AND HEAT EXCHANGERS 9

Black Body Radiation - Grey body radiation - Radiation Shields. Heat Exchanger - Types - Overall Heat Transfer Coefficient - Fouling Factors - Analysis - LMTD method - NTU method.

TOTAL: 45 PERIODS



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BoS (AGE) 03/04/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the various thermodynamic systems and processes to get engineering knowledge
- Apply the second law of thermodynamics in heat engines, heat pump and refrigerator to solve complex engineering problems
- Examine the heat transfer rate in one dimensional systems and composite systems for analysis and interpretation of data
- Analyze the phenomenon of free and forced convective heat transfer in external and internal flows for development of solutions
- Evaluate the heat transfer rate in radiation and the thermal performance of heat exchangers using LMTD and NTU method for designing and validation

TEXT BOOKS:

1. Nag P K, "Engineering Thermodynamics", Tata McGraw Hill Publishing Company, New Delhi, 6th Edition, 2017
2. Holman, J P, "Heat and Mass Transfer", Tata McGraw Hill, 10th Edition, 2017

REFERENCE BOOKS:

1. Rajput R K, "Engineering Thermodynamics", Laxmi Publications, New Delhi, 5th Edition, 2016
2. Arora C P, "Thermodynamics", Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Kothandaraman, C P, "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 4th Edition 2012
4. Yunus A Cengel, "Heat and Mass Transfer: Fundamentals & Applications in SI Units", Tata McGraw Hill, 6th Edition 2020

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	1	1	2	2
CO2	3	3	2	2	1	-	-	-	-	1	1	2	2
CO3	3	3	2	2	1	1	-	-	-	1	1	2	2
CO4	3	3	3	2	1	1	-	-	-	1	1	2	2
CO5	3	3	2	2	1	1	-	-	-	1	1	2	2



CHAIRMAN
BoS (AGE) 03/04/25

OBJECTIVES:

The student should be made to:

- Understand the fundamental fluid properties
- Explain the functionality and applications of flow measuring devices
- Understand the Darcy-Weisbach equation and its application in calculating head losses in pipe systems
- Illustrate the different types of flow in channels, including uniform flow and critical flow
- Analyze the various types of pumps performance

UNIT I PROPERTIES OF FLUIDS**9**

Properties of fluids – definition – units of measurement. Fluid pressure and measurement – simple, differential and micro manometers - Mechanical gauges – calibration. Hydrostatic forces on surfaces – total pressure and centre of pressure - Horizontal- vertical and inclined plane surface - Pressure diagram – total pressure on curved surface. Archimedes principles – buoyancy– meta centre – metacentric height.

UNIT II FLOW MEASUREMENT**8**

Bernoulli's equation – applications - Venturimeter – orifice meter – nozzle meter - rotameter – elbow meter - pitot tube – Orifice – sharp edged orifice discharging free – submerged orifice – mouth piece - Flow through orifice under variable head – time of emptying a tank with and without inflow.

UNIT III FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS**10**

Reynolds experiment – Laminar flow through circular pipe – Darcy-Weisbach equation – Moody diagram – Major and minor losses in pipe flow – Total energy line – Hydraulic gradient line – Siphon – Pipes in series and parallel– Equivalent pipes. Dimensional analysis – Fundamental dimensions – dimensional homogeneity – Rayleigh's method and Buckingham Pi-Theorem – Important non dimensional numbers.

UNIT IV OPEN CHANNEL FLOW**9**

Types of flow in channel – uniform flow – most economical section of channel – rectangular – trapezoidal. Specific energy and critical depth - momentum in open channel flow – specific force – critical flow – computation. Flow measurement in channels – notches – rectangular, Cipolletti and triangular – float method - Flow measurement in rivers/ streams/ canals – weirs – free and submerged flow – current meter – Parshall flume.



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UNIT V PUMPS

9

Pump terminology – suction lift, suction head, delivery head, discharge, water horse power – selection of pump capacity. Centrifugal pumps – components – working – types of impellers - Priming – cavitation – specific speed – characteristic curves. Submersible pumps - Jet pump – air lift pump - reciprocating pump - sludge pump and vacuum pump - Hydraulic ram.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

Flow Measurement

1. Flow through of Rotameter
2. Flow through Venturimeter
3. Flow through a circular Orifice
4. Determination of mean velocity by Pitot tube
5. Flow through a Triangular Notch
6. Flow through a Rectangular Notch

Losses in Pipes

7. Determination of friction coefficient in pipes
8. Determination of losses due to bends, fittings and elbows

Pumps

9. Characteristics of Centrifugal pump
10. Characteristics of Submersible pump
11. Characteristics of Reciprocating pump

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Recall the mathematical principles and fluid mechanics concepts to solve complex engineering problems involving fluid behavior and pressure measurements.
- Understand the complex fluid flow problems using Bernoulli's equation with venturimeters, orifice meters and rotameters with engineering knowledge
- Explain the principles of dimensional homogeneity and its significance with engineering equations
- Analyze the concepts of specific energy, critical depth and their significance in open channel flow using modern tools
- Classify the pumping systems that meet specific needs, ensuring considerations for complex conditions

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TEXT BOOKS:

1. Bansal RK, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2019.
2. Modi PN and Seth S M, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2022.

REFERENCE BOOKS:

1. Graebel W P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011.
2. Kumar K L, "Engineering Fluid Mechanics", Eurasia Publishing House Pvt. Ltd., New Delhi, 2016
3. Robert W Fox, Alan T McDonald and Philip J Pritchard, "Fluid Mechanics and Machinery", John Wiley and Sons, 9th Edition, 2015.
4. Streeter VL and Wylie EB, "Fluid Mechanics", McGraw Hill Publishing Co., 2017.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	2	3	3
CO2	3	2	2	1	-	-	-	-	-	-	2	3	3
CO3	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	2	2	1	-	-	-	-	2	3	3
CO5	3	3	3	2	1	-	-	-	-	-	2	3	3



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OBJECTIVES:**The student should be made to:**

- Understand the engineering knowledge in processing equipment like evaporation and concentration
- Compare the different mechanical separation equipment involved in agricultural processing
- Apply the basic principle in involved in various size reduction equipment for agricultural processing
- Illustrate the contact equilibrium separation processes, including gas-liquid and solid-liquid equilibrium
- Explain crystallization and distillation processes, including equipment construction, operation and factors influencing efficiency

UNIT I EVAPORATION AND CONCENTRATION**9**

Unit operations in food processing -conservation of mass and energy -overall view of an engineering process—dimensions and units - dimensional and unit consistency - dimensionless ratios—evaporation-definition - liquid characteristics - single and multiple effect evaporation performance of evaporators and boiling point elevation - capacity – economy and heat balance types of evaporators - once through and circulation evaporators - short tube evaporators and long tube evaporators – agitated film evaporator.

UNIT II MECHANICAL SEPARATION**9**

Filtration - definition - filter media - types and requirements-constant rate filtration - constant pressure filtration - filter cake resistance-filtration equipment - rotary vacuum filter - filter press sedimentation - gravitational sedimentation of particles in a fluid - Stoke's law, sedimentation of particles in gas-cyclones – settling under sedimentation and gravitational sedimentation–centrifugal separations – rate of separations - liquid - liquid separation - centrifuge equipment.

UNIT III SIZE REDUCTION**9**

Size reduction - grinding and cutting - principles of comminuting - characteristics of comminuted products - particle size distribution in comminuted products-energy and power requirements in comminuting - crushing efficiency – Rittinger's, Bond's and Kick's laws for crushing-size reduction equipment- crushers - jaw crusher, gyratory crusher-crushing rolls - grinders - hammer mills - rolling compression mills - attrition, rod, ball and tube mills – construction and operation.

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UNIT IV CONTACT EQUILIBRIUM SEPARATION

9

Contact equilibrium separation processes – concentrations – gas-liquid and solid-liquid equilibrium – equilibrium concentration relationships – operating conditions-calculation of separation in contact – equilibrium processes-gas absorption – rate of gas absorption – stage – equilibrium gas – absorption equipment-properties of tower packing – types – construction – flow through packed towers-extraction – rate of extraction – stage equilibrium extraction-equipment for leaching coarse solids – intermediate solids – basket extractor-extraction of fine material – Dorr agitator – continuous leaching – decantation systems – extraction towers-washing – equipment.

UNIT V CRYSTALLISATION AND DISTILLATION

9

Crystallization-Equilibrium –Rate of crystal growth stage-Equilibrium crystallization Crystallizers – Equipment – Classification- Construction and operation – Crystallizers-Tank Agitated batch – Swenson-Walker and Vacuum crystallizers – Distillation-Binary mixtures-Flash and differential distillation-Steam distillation –Theory-Continuous distillation with rectification – Vacuum distillation - Batch distillation-Operation and process-Advantages and limitation-Distillation equipment- Construction and operation-Factors influencing the operation.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the engineering fundamentals in evaporation and concentration process to provide a suitable solution for complex problems
- Explain the engineering principles for filtration and mechanical separation equipment to provide suitable equipment for agricultural produces
- Apply the principle of comminution to identify and develop size reduction equipment and to meet specific needs
- Identify the principles of equilibrium concentration relationships to analyze gas-liquid and solid-liquid separation process
- Apply the process of crystallization and distillation to identify and design processing equipment

TEXT BOOKS:

1. Sahay K M and Singh K K, “Unit operations of Agricultural Processing”, Vikas publishing House Pvt Ltd, New Delhi, 2007.
2. Earle R L and Earle M D, “Unit Operations in Food Processing”, Pergamon Press Ltd., 2nd Edition, 2013.

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REFERENCE BOOKS:

1. Geankoplis C J, "Transport Processes and Separation Process Principles", Pearson India Education Services Pvt Ltd, 4th Edition, 2017.
2. McCabe W L, Smith J C and Harriot P, "Unit Operations of Chemical Engineering", McGraw - Hill Inc, Kosaide Printing Ltd, 7th Edition, Tokyo, 2017.
3. Coulson J M and Richardson J F, "Chemical Engineering", Volume I to V, The Pergamon Press, New York, 1999.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	2	2	2
CO2	3	2	2	2	2	-	-	-	-	-	2	2	2
CO3	3	3	2	2	2	-	-	-	-	-	2	2	2
CO4	3	2	2	2	2	-	-	-	-	-	2	3	2
CO5	3	2	2	2	2	-	-	-	-	-	2	3	2


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SURVEYING

(Common to Civil and AGE)

L	T	P	C
3	0	0	3

The students should be made to:

- **Recognize** basic engineering knowledge about principles and fundamentals of surveying.
- **Explain** various methods in levelling and theodolite surveying for field construction.
- **Manipulate** skills using tacheometric surveying and triangulation.
- **Demonstrate** principles, calculations for azimuth in astronomical surveying.
- **Analyze** different types of advanced surveying techniques for various civil engineering projects.

Definition - Principles - Classification - Scales - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Compass Surveying - Bearing - Systems and conversions - Local attraction - True and magnetic meridians - Magnetic declination - Dip - Plane table and its accessories - Merits and Demerits - Radiation - Intersection - Resection - Plane table traversing.

Datum - Benchmarks - Levels - Temporary and permanent adjustments - Methods of Levelling - Fly and check levelling - contouring - Characteristics of contours - Methods of contouring -Theodolite - description and uses - temporary and permanent adjustments - horizontal - vertical angles - heights and distances - traversing - closing error and distribution.

Tacheometry - principle - tangential - stadia methods - horizontal and inclined sights - staff - vertical and normal - fixed and movable hairs - stadia constants - anallatic lens - Gale's table - Triangulation - classification - Signals and towers - Baseline measurement - Instruments and accessories - Tape corrections - extension of baseline - Satellite stations - Reduction to centre.

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UNIT IV ASTRONOMICAL SURVEYING

9

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Spherical trigonometry - Latitude and longitude of a place - Field observations and calculations for azimuth.

UNIT V OVERVIEW OF MODERN SURVEYING

9

EDM - Total Station Working Principles - Advantages - Fundamental quantities measured - Parts and accessories - GPS - Accessories - Advantages and Disadvantages - Different segments - space, control and user segments

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Outline** the accessories, methods employed in fundamental surveying
- **Illustrate** elevation, horizontal and vertical angles using dumpy level and theodolite instruments
- **Develop** bearing, distances, height required in construction sites using tacheometric constants
- **Experiment** with apparent altitude, latitude, longitude, field observation using astronomical surveying
- **Examine** applications of modern instruments in construction field for various infrastructure projects.

TEXTBOOKS:

1. Punmia.B.C, Ashok K.Jain and Arun K.Jain, “Surveying Vol.I. and II”, Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition , 2016.
2. Kanetkar.T.P and Kulkarni.S.V, “Surveying and Levelling”, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2019



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REFERENCES:

1. Arora K.R., "Surveying Vol I , II and III", Standard Book house, 17th Edition 2019.
2. Satheesh Gopi, Sathishkumar R, Madhu N, "Advanced Surveying, Total Station, GPS and Remote Sensing", Pearson education, 2nd Edition, 2017.
3. Roy S.K "Fundamentals of Surveying", Prentice Hall of India, 2011.
4. Ramamrutham S, "Plane and Geodetic Surveying", Dhanpat Rai, Publishing Company, New Delhi, 2nd Edition, 2016

MAPPING OF COs WITH POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	-	1	-	-	-	-	2
CO2	3	3	3	3	3	2	-	-	-	-	1
CO3	3	3	3	3	1	1	-	-	-	-	2
CO4	3	3	3	3	3	1	-	-	-	-	1
CO5	3	3	3	3	3	2	-	-	-	-	2



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OBJECTIVES:

The student should be made to:

- Introduce basic semiconductor devices, their characteristics and application
- Familiarize the student with the principle of operation of BJT and FET
- Learn basic techniques for the design of digital circuits and op-amp
- Enable the students to understand the fundamental concepts of 8085 Microprocessors
- Understand the interfacing techniques and applications

UNIT I SEMICONDUCTORS AND RECTIFIERS 9

Classification of solids based on energy band theory - Intrinsic semiconductors - Extrinsic semiconductors - P type and N type- PN junction - Zener effect - Zener diode characteristics - Half wave and full wave rectifiers - Voltage regulation.

UNIT II TRANSISTORS AND AMPLIFIER 9

Bipolar junction transistor - CB, CE, CC configuration and characteristics-Biasing circuits - Class A, and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier- SCR, Diac, Triac, UJT-Characteristics and simple applications-Switching Transistors-Concept of feedback-Negative feedback- Application in temperature and motor speed control.

UNIT III DIGITAL ELECTRONICS AND OPAMP 9

Binary number system – AND, OR, NOT, NAND, NOR circuits -Boolean algebra- Exclusive OR gate – Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion. Ideal OP-AMP characteristics. linear and non-linear applications of OP-AMP (adder, subtractor, integrator, comparator. differentiator. OP-AMP voltage regulators. D/A converter, successive approximation A/D converter

UNIT IV 8085 MICROPROCESSOR 9

Hardware Architecture, pin diagram – Functional Building Blocks of Processor – Instruction set- Addressing modes -Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts. - Simple programs using arithmetic and logical operations.

UNIT V INTERFACING AND APPLICATIONS OF MICROPROCESSOR 9

Basic interfacing concepts – Interfacing of Input and Output devices - Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

LIST OF EXPERIMENTS:

1. To study V-I characteristics of p-n junction diode
2. To study Half wave, Full wave and bridge rectifier
3. To study Transistor Characteristics in CE configurations
4. To study about AND, NOT, and OR gates.
5. To study an OP-AMP IC 741 as Inverting and Non-inverting Amplifier


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6. To study an OP-AMP IC741 as Differentiator amplifier;
7. Simple arithmetic operations: Addition / Subtraction / Multiplication / Division
8. Interface Experiments with 8085
 - (i) A/D Interfacing,
 - (ii) D/A Interfacing
 - (iii) Traffic light Controller.

TOTAL: 75 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the concept of diode in rectifiers filter circuits and transistors
- Interpret the concept of semiconductors in biasing of transistors and explore the characteristics and operation of JFET and MOSFET.
- Compile the different building blocks in digital electronics using logic gates and design simple circuits like amplifiers (inverting and non-inverting) using OPAMPS.
- Ability to perform performing on 8085 Microprocessor to control devices
- Create the circuits using microprocessor for given applications

TEXT BOOKS:

1. Salivahanan S, SureshKumar N, Vallavaraj A, “Electronic Devices and Circuits”, 1st Edition, Tata McGraw-Hill, 2022.

REFERENCES:

1. Jacob Millman and C. Halkias, “Integrated Electronics”, Tata Mc-Graw Hill, 2009.
2. A.Kumar Anand, “Digital Electronics”. PHI learning private limited, 2016.
3. Gupta Sanjeev and Sonthosh Gupta, “Electronic Devices and Circuits”, Danapath Rai Publications, 2010.
4. Douglas V. Hall, “Microprocessor and Interfacing, Programming and Hardware”, Tata McGraw-Hill, 1999.

MAPPING OF COs WITH POs AND PSOs

Course Outcomes	Program Outcomes											Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	2	-	-	1	1	-	2	-	2	2	1
CO2	3	1	2	-	-	1	1	-	2	-	2	2	1
CO3	3	1	2	-	-	1	1	-	2	-	2	2	1
CO4	3	1	2	-	1	1	1	-	2	-	2	2	-
CO5	3	1	2	-	1	2	1	-	2	-	2	2	-


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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. CRO (Min 30MHz) - (05 Nos)
2. Signal Generator / Function Generators (2 MHz) - (05 Nos)
3. Dual Regulated Power Supplies (0 -30V) - (05Nos)
4. Digital Multimeter - (05 Nos)
5. Transistor (BJT-NPN-PNP) - (20Nos)
8. Components and Accessories: Transistors, Resistors, Capacitors, Inductors, Diodes, Bread Boards, Transformers.
9. 8085 Microprocessor Kits – (05 Nos.)
10. Interfacing Kits – (Each 02)


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24CE306L

SURVEYING LABORATORY

(Common to Civil and AGE)

L T P C

0 0 2 1

OBJECTIVES:

The students should be made to:

- **Recognize** basic engineering knowledge about principles and fundamentals of chain and plane table surveying.
- **Discuss** compass traversing and plot the layout of the building.
- **Describe** fly and check levelling using dumpy level and measurement of angles.
- **Illustrate** tacheometric constants by using stadia and tangential tacheometry.
- **Calculate** elevation of object using single plane method and using trigonometric levelling.

LIST OF EXPERIMENTS

1. Study of chains and its accessories, aligning, ranging, chaining and marking perpendicular offset.
2. Distance between two inaccessible points using plane table surveying.
3. Compass Traversing – Measuring bearings & arriving included angles.
4. Plot the layout of given plan of building.
5. Fly and check levelling using dumpy level.
6. Measurements of horizontal angles and vertical angles by reiteration and repetition methods.
7. Determination of tacheometric constants.
8. Determination of distance and elevation by stadia and tangential tacheometry.
9. Determination of elevation of an object using single plane method when base is accessible/ inaccessible.
10. Determination of elevation of point by trigonometric levelling.

TOTAL: 30 PERIODS


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OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Explain** applications of conventional surveying using chain and plane table accessories.
- **Summarize** bearings and plot the layout of the building.
- **Apply** fly and check levelling and to measure horizontal and vertical angles
- **Develop** the additive and multiplying constants to calculate the linear and angular measurements
- **Examine** height of an accessible/ inaccessible points using single plane method and trigonometric levelling

REFERENCES:

1. Arora K.R, "Surveying Vol I , II and III", Standard Book house, 17th Edition, 2019.
2. Sathesh Gopi, Sathishkumar R, Madhu N, "Advanced Surveying, Total Station, GPS and Remote Sensing", Pearson education, 2nd Edition, 2017.
3. Roy S.K "Fundamentals of Surveying", Prentice Hall of India, 2011.
4. Ramamrutham S, "Plane and Geodetic Surveying", Dhanpat Rai, Publishing Company, New Delhi, 2nd Edition, 2016.

Mapping of Cos with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	2	-	-	-	-	2
CO2	3	3	3	3	2	1	-	-	-	-	2
CO3	3	3	3	2	-	2	-	-	-	-	2
CO4	3	3	3	3	-	1	-	-	-	-	1
CO5	3	3	3	3	2	2	-	-	-	-	1


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OBJECTIVES:

The students should be made to:

- Enhance the development of students by focusing on soft skills
- Develop skills of the students through individual and group activities
- Shape students' attitude and behaviour through activities
- Analyze the characteristics of the students for self-development
- Prepare themselves for the recruitment processes

UNIT I SOFT SKILLS ARE IMPORTANT FOR SUCCESS **6**
Importance of Soft Skills - Types - Industrial needs - Development of skills – Employees' expectation - Success of employees.

UNIT II CORPORATE COMMUNICATION **6**
Needs and Development of Communication - Customers Relationship - Improving informal communication - Formation of presentations - Public Speaking - Telephone and Email Etiquettes.

UNIT III DISCUSSIONS **6**
Introduction to Discussion - Importance and types of discussion - Spontaneous conversation - Plan for discussions - Panel discussions - Visual Aid discussions - Debate.

UNIT IV SELF ANALYSIS **6**
Who am I - Identifying or searching one's own Strength, Weakness - Opportunities and Threats (SWOT Analysis) - Benefits of SWOT Analysis - Importance of Self Confidence, Self Esteem, Self Development and Self Introspection.

UNIT V CREATIVITY AND GOAL SETTING **6**
Thinking out of the box - Lateral thinking - Positive thinking - Results of smart work - Application of creativities - Short Term and Long Term Goals - Lifetime goals.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learners will recognize the importance of Soft skills in Professional life.
- Improve oral and Listening Skills.
- Enhance students' ability in GDs, Presentations and interviews.
- Develop one's strength in setting of goals and developing creative.
- Become a good team worker in the society.


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TEXT BOOKS:

1. "SOFT SKILLS", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES:

1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Carnegie Dale, "How to win Friends and Influence People", New York: Simon & Schuster, 1998.
3. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, 2011.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	2	-	2	2	-	-
CO2	-	3	-	3	2	-	3	2	2	2	2
CO3	2	-	-	-	3	-	2	3	2	2	2
CO4	2	-	2	-	-	2	-	3	2	3	-
CO5	-	3	2	1	-	2	2	3	2	-	-


CHAIRMAN
BoS (S&H) 14/10

OBJECTIVES:

The students should be made to:

- Basics concepts of simple stresses, strains and deformation in components due to external loads
- Interpret the stability and load distribution based on centroid and moment of area analysis.
- Draw the shear force and bending moment due to external loads in beams and their effect on stresses
- Apply torsion equation in design of circular shafts and springs
- Evaluate the slope and deflection of beams under different load conditions

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNIT II PROPERTIES OF SURFACES 9

Centroid - First moment of area and second moments of plane area of sections - Rectangle, circle, triangle from integration - Symmetrical and Unsymmetrical Sections - Parallel axis theorem and perpendicular axis theorem.

UNIT III TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending – bending stress distribution – Shear stress distribution - Flitched beams.

UNIT IV TORSION 9

Torsion formula - stresses and deformation in circular and hollow shafts – Stepped shafts – Stresses in helical springs – Deflection of helical springs - carriage springs.

UNIT V DEFLECTION OF BEAMS 9

Computation of slopes and deflections in determinate beams - Double Integration method – Macaulay's method – Area moment method – Conjugate beam method.

TOTAL: 45 PERIODS



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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the stress, strain and elastic constant relations for simple and compound bars to get engineering knowledge.
- Apply the centroid and moment of inertia for various sections to get solution for complex engineering components.
- Analyze the shear force, bending moment diagrams and bending stresses in beams to develop engineering fundamentals.
- Estimate the deflection and stiffness in shaft and helical springs under axial loads to interpret the data for providing valid conclusions.
- Evaluate the slope and the deflection of beams to get knowledge engineering specialization.

TEXT BOOKS:

1. Bansal R K, "Strength of Materials", Laxmi Publications, New Delhi, 6th Edition, 2019.
2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd. Pearson; 1st edition, New Delhi, 2012

REFERENCES:

1. Rajput R K, "Strength of Materials", S Chand & Company Private Ltd, New Delhi, 7th Edition, 2018.
2. Khurmi R S and Khurmi N, "Strength of Materials", S Chand, New Delhi, 26th Edition, 2019
3. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2007.
4. Ferdinand P. Beer, Russell Johnson, J.R. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2005.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	2	1	-	-	1	2	1	1
CO2	3	3	3	2	-	2	1	-	-	1	2	1	1
CO3	3	3	3	2	-	2	1	-	-	1	2	1	1
CO4	3	3	3	2	-	2	1	-	-	1	2	1	1
CO5	3	3	3	2	-	2	1	-	-	1	2	1	1



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OBJECTIVES:

The students should be made to:

- Illustrate the types of tractors and its components
- Explain the principle of tractor engine system and draw the valve timing diagram
- Construct the principles and operation of hydraulic systems and tractor chassis mechanics
- Apply the thermodynamics process in otto and diesel cycle to determine the efficiency
- Analyze the various test code for performance testing of tractors and power tillers

UNIT I TRACTORS **5**
Classification of tractors - Tractor engines – construction of engine blocks, cylinder head and crankcase - features of cylinder, piston, connecting rod and crankshaft.

UNIT II TRACTOR ENGINE SYSTEMS **7**
Working principles, Valve timing diagram - Cooling systems - lubricating systems - fuel system. Transmission - clutch - gear box, Differential, final drive and wheels - Steering geometry - steering systems - front axle and wheel alignment

UNIT III HYDRAULIC SYSTEMS **6**
Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction - tractive efficiency – tractor chassis mechanics - stability – longitudinal and lateral.

UNIT IV ENGINE CYCLES **6**
Air Standard Cycles – Otto and Diesel – Cycle Analysis, Performance and Comparison

UNIT V POWER TILLER AND TRACTOR TESTING **6**
Power tiller – working, special features - clutch - gear box - steering and brake. Makes of tractors and power tillers. Types of tests- test procedure - need for testing & evaluation of farm tractor -Test code for performance testing of tractors and power tillers.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the different types of tractors and its components to gain the engineering knowledge.
- Demonstrate the working principle of farm engines and the valve timing diagram to get the knowledge of engineering fundamentals.
- Infer the knowledge on hydraulic system in farm equipment's to provide the solution for real world problems
- Apply thermodynamic principles to identify the performance of Otto and Diesel cycle engines
- Evaluate the function of key components in power tillers and its performance metrics for sustainable development.



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TEXTBOOKS:

1. Jain S C and Rai C R, "Farm tractor maintenance and repair", Standard publishers and distributors, New Delhi, 2012.
2. Barger E L, Liljedahl J B and McKibben E C, "Tractors and their Power Units", Wiley Eastern Pvt. Ltd, New Delhi, 1997.

REFERENCES:

1. Domkundwar A V, "A course in internal combustion engines", Dhanpat Rai & Co. Pvt Ltd, Delhi, 2018.
2. Black P O, "Diesel engine manual", Taraporevala Sons & Co, Mumbai, 1996.
3. Crouse W H and Anglin D L, "Automotive mechanics", Macmillan McGraw- Hill, 10th Edition, New Delhi, 2017.

List of Experiments

1. Study about various functional components of a Tractor engine and identification of its.
2. Study the working of two stroke and four stroke engines.
3. Study the valve system of an internal combustion engine and drawing valve timing diagram.
4. Study of different engine systems.
5. Study the three-point linkage of a tractor and draft control.
6. Performance test on four – stroke Diesel Engine.
7. Demonstrate the working of tractors in the Agri field.

TOTAL: 30 PERIODS**Mapping of COs with POs and PSOs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	-	2	2	1	-	1	1	1	2
CO2	3	2	2	2	-	2	2	1	-	1	1	1	2
CO3	3	2	2	2	-	2	2	1	-	1	1	1	2
CO4	3	2	2	2	-	2	2	1	-	1	1	1	2
CO5	3	2	2	2	-	2	2	1	-	1	1	1	2



CHAIRMAN
BoS (AGE) 03/04/25

OBJECTIVES:

The students should be made to:

- Understand the basic stresses in machine elements
- Demonstrating the knowledge on design of transmission systems
- Identify the effect of torque, bending moment and axial loads on shaft, keys and couplings design.
- Examine the effects of constant and varying loads on spring performance.
- Evaluate the forces acting on gear teeth and determine their strength under different conditions.

(Use of PSG Design Data book is permitted)

UNIT I STRESSES IN MACHINE MEMBERS 9

Introduction to design process - factor influencing the machine design, selection of material based on mechanical properties - Direct, bending and torsional stress equations - calculation of Principal stresses for combined loading. Theories of failure-stress concentration - design of variable loading - Soderberg and Goodman relations.

UNIT II DESIGN OF POWER TRANSMISSION SYSTEMS 9

Selection of V-Belts and pulleys - flat belts and pulleys - wire ropes and pulleys - chains and sprockets.

UNIT III	DESIGN OF SHAFTS AND COUPLINGS	9
-----------------	---------------------------------------	----------

Design of solid and hollow shafts based on strength and rigidity- Design of keys, keyways and splines- Design of rigid and flexible couplings. Design of bolts and nuts - knuckle and cotter joints.

UNIT IV DESIGN OF ENERGY STORING ELEMENTS 9

Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs.

UNIT V DESIGN OF GEARS AND BEARINGS 9

Gears - spur gear and helical gear - terminology - strength of gear teeth - Lewis equation - Buckingham equation. - Failure of gear teeth- Applications of different types of Gears - Types of bearings – sliding contact and rolling contact types. – Bearing selection based on application - Lubrication in journal bearings – calculation of bearing dimensions.

TOTAL: 45 PERIODS

V. GORDON

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BoS (AGE) 03/04/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamental concepts of various stresses and material properties in machine elements to get engineering knowledge.
- Select appropriate power transmission components based on real-world requirements and constraints.
- Develop the design criteria of shafts and couplings to get creative solutions for complex engineering problems.
- Analyze the stress, deflection and fatigue resistance of springs under constant and varying loads using appropriate analytical techniques and methods
- Determine the design procedure of gears and bearings for investigations of complex engineering problems

TEXTBOOKS:

1. Khurmi R S, Gupta J K, “A Textbook of Machine Design”, S.Chand & Company Pvt. Ltd, 25th edition, 2020.
2. Bhandari V B, “Design of Machine Elements”, Tata McGraw-Hill Book Co, 4th edition, 2017.

REFERENCES:

1. Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine component Design”, 6th Edition, Wiley, 2017.
2. Joseph Shigley, Richard G. Budynas and J. Keith Nisbett “Mechanical Engineering Design”, 10th Edition, Tata McGraw-Hill, 2015.
3. Ansel C Ugural, “Mechanical Design – An Integral Approach”, 1st Edition, Tata McGraw-Hill Book Co, 2004.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	-	2	2	-	-	1	2	2	2
CO2	3	3	3	3	-	2	2	-	-	1	2	2	2
CO3	3	3	3	3	-	2	2	-	-	1	2	2	2
CO4	3	3	3	3	-	2	2	-	-	1	2	2	2
CO5	3	3	3	3	-	2	2	-	-	1	2	2	2



CHAIRMAN
BoS (AGE) 03/04/25

OBJECTIVES:

The students should be made to:

- Classify soil water into capillary and non-capillary and understand plasticity, soil air, temperature.
- Compare different types and methods of soil survey and interpret field mapping, mapping units, and base maps.
- Construct the mechanisms of nutrient transport to plants and analyze factors affecting nutrient availability.
- Analyze the factors affecting soil compaction and demonstrate field and laboratory methods for compaction.
- Determine the shear strength of cohesive and cohesionless soils using Mohr-Coulomb failure theory

UNIT I INTRODUCTION AND SOIL PHYSICS 9

Soil - definition - major components – Soil forming minerals and processes - soil profile – Physical properties - texture – density-porosity – consistence – colour - specific gravity - capillary and non-capillary - plasticity. Soil air - soil temperature - soil water - classification of soil water - Movement soil water. Soil colloids – organic and inorganic matter - Ion exchange - pH – Plant nutrient availability.

UNIT II SOIL CLASSIFICATION AND SURVEY 9

Soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping- mapping units - base maps -preparation of survey reports - concepts and uses - land capability classes and subclasses - soil suitability - Problem soils – Reclamation for sustainable development.

UNIT III SOIL FERTILITY AND NUTRIENT 9

Soil fertility and plant nutrition - Criteria of essentiality - Role, deficiency and toxicity symptoms of essential plant nutrients - Mechanisms of nutrient transport to plant, factors affecting nutrient availability to plants - Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.

UNIT IV PHASE RELATIONSHIP AND SOIL COMPACTION 9

Phase relations - Gradation analysis - Atterberg Limits and Indices - Engineering Classification of soil – Soil compaction - factors affecting compaction - field and laboratory methods.

UNIT V ENGINEERING PROPERTIES OF SOIL 9

Shear strength of cohesive and cohesionless – Mohr - Coulomb failure theory - Measurement of shear strength, direct shear, Triaxial and vane shear test – Permeability - Coefficient of Permeability - Darcy's law - field and lab methods - Assessment of seepage - Compressibility.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 03/04/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand engineering knowledge to classify soil water into capillary and non-capillary types and explain the concepts of plasticity, soil air and temperature
- Illustrate different soil survey methods using problem analysis and interpret field mapping, mapping units and base maps
- Apply the role of essential nutrients in plant nutrition and analyze the mechanisms of nutrient transport to plants to develop solutions.
- Examine complex problems to investigate soil compaction factors and demonstrate effective compaction methods
- Analyze the shear strength of soils using Mohr-Coulomb failure theory by applying Engineering Knowledge

TEXTBOOKS:

1. Nyle C Brady, "The Nature and Properties of Soil", Macmillan Publishing Company, 15th Edition, New York, 2016.
2. Punmia B C, "Soil Mechanics and Foundation" Laxmi Publishers, 16th Edition, New Delhi, 2017.

REFERENCES:

1. Edward J Plaster, "Soil Science and Management", Cengage Learning India Ltd, 6th Edition, New Delhi, 2013.
2. Arora K R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2020.
3. Murthy V N S, "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2018.
4. Sehgal S B, "Text Book of Soil Mechanics", CBS Publishers and Distributors, 3rd Edition, New Delhi, 2012.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	1	-	-	-	-	-	2	3
CO2	3	3	2	2	1	1	-	-	-	-	-	2	3
CO3	3	3	2	2	1	1	-	-	-	-	-	2	3
CO4	3	3	3	3	3	2	-	-	-	-	-	2	3
CO5	3	3	3	3	3	2	-	-	-	-	-	2	3



CHAIRMAN
BoS (AGE) 03/04/25

OBJECTIVES:

The students should be made to:

- Understand static and dynamic characteristics of measurement systems.
- Study about various types of sensors for different applications.
- Understand the design concepts and signal conditioning of self-generating sensors.
- Understand the concept of Signal conditioning and self-generating motors
- Study about the performance of digital and semiconductor sensors

UNIT I INTRODUCTION TO MEASUREMENT SYSTEMS 9

Introduction to measurement systems: general concepts and terminology, measurement systems, sensor classification, general input-output configuration, methods of correction, performance characteristics: static characteristics of measurement systems, accuracy, precision, sensitivity, other characteristics: linearity, resolution, systematic errors, random errors.

UNIT II RESISTIVE AND REACTIVE SENSORS 9

Resistive sensors: potentiometers, strain gages, resistive temperature detectors, magneto resistors, Signal conditioning for resistive sensors: Wheatstone bridge, sensor bridge calibration and compensation, sources of interference and interference reduction, Reactance variation and electromagnetic sensors, inductive sensors, linear variable differential transformers (LVDT), magneto elastic sensors, hall effect sensors.

UNIT III SELF-GENERATING SENSORS 9

Self-generating sensors: thermoelectric sensors, piezoelectric sensors, pyroelectric sensors, photovoltaic sensors, electrochemical sensors, Signal conditioning for self-generating sensors: chopper and low-drift amplifiers, offset and drifts amplifiers, electrometer amplifiers, charge amplifiers, noise in amplifiers.

UNIT IV FLOW MEASUREMENT 9

Basic principle of flow meter, Differential pressure flow meters, Variable area flow meter, Volumetric flow meter, Hotwire anemometer, Magnetic and ultrasonic flow meter, Rota meter, Hall effect transducer working and measurement techniques.

UNIT V DIGITAL SENSORS AND SEMICONDUCTOR DEVICE SENSORS 9

Digital sensors: position encoders, variable frequency sensors - quartz digital thermometer, vibrating cylinder sensors, saw sensors, digital flow meters, Sensors based on semiconductor junctions: thermometers based on semiconductor junctions, photodiodes and phototransistors, sensors based on MOSFET transistors, CCD imaging sensors, ultrasonic sensors, fiber - optic sensors.

LIST OF EXPERIMENTS

1. Measurement of strain using strain gauges
2. Characteristics of temperature sensors
3. Study of AC and DC Characteristics of LVDT
4. Measurement of Natural frequency and damping ratio of the given system
5. Characteristics of Opto coupler
6. Level Measurement using proximity sensors
7. Loading effects of Potentiometer


CHAIRMAN
BOS/ECE 14/07/25

8. Characteristics of Hall effect sensor.

TOTAL: 75 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand how physical quantities are measured and how they are converted to electrical or other forms.
- Explain the construction and operation of variable resistance transducer and demonstrate the knowledge of inductance transducers.
- Utilize the Self-generating sensors in application.
- Understand working principles of actuators and its characteristics.
- Design State-of-the-art digital and semiconductor sensors

TEXT BOOKS:

1. Clarence W. de Silva, "Sensors and Actuators Control Systems Instrumentation", CRC Press, 2016.
2. Nathan Ida, "Sensors, Actuators, and their Interfaces" A Multidisciplinary Introduction University of Akron, SciTech Publishing, an imprint of the IET, 2014.

REFERENCES:

1. Andrzej M. Pawlak, "Sensors and Actuators in Mechatronics Design and Applications", 2007.
2. Johnson D, "Process Control Instrumentation Technology", John Wiley and Sons, 8th Edition, 2014.
3. Patranabis, "Sensors and Transducers", Prentice Hall India Pvt. Ltd, 2nd Edition, 2003.
4. Herman K P. Neubrat, "Instrument Transducers - An Introduction to Their Performance and Design", Oxford University Press, 2nd Edition, 1975.

MAPPING OF COs WITH POs AND PSOs

Course Outcomes	Program Outcomes											Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	-	--	1	1	-	2	-	2	2	1
CO2	2	1	2	-	--	1	1	-	2	-	2	2	1
CO3	2	1	2	-	--	1	1	-	2	-	2	2	1
CO4	2	1	2	-	1	1	1	-	2	-	2	2	1
CO5	2	1	2	-	3	2	1	-	2	-	2	2	1


CHAIRMAN
BOS/ECE

OBJECTIVES:**The students should be made to:**

- Apply the understanding of fundamental rights and duties to real life situations and legal case studies.
- Illustrate the roles and responsibilities parliamentary framework.
- Analyze the general structure of the state executive roles in the state level.
- Investigate the powers and judicial responsibilities of the higher Judiciary.
- Judge the strength and limitations of India's federal power structure in practice.

UNIT 1 INTRODUCTION 6

Historical background - Government of India act - Indian councils act - Making of the constitution - Philosophy of the Indian constitution - Preamble.

UNIT II GOVERNMENT OF THE UNION 6

Powers and Functions of President and Prime Minister - Council of Ministers – President in relation to his council - Legislature structure and functions of Lok Sabha and Rajya Sabha - Speaker.

UNIT III GOVERNMENTS OF THE STATES AND LOCAL GOVERNMENT 6

The state executive: General structure - Governor - Council of ministers - State legislature. Local government - Panchayat - Municipality - Power authority and responsibilities municipalities.

UNIT IV THE JUDICATURE 6

Organization and Composition of Judiciary – Constitution – Appointment - Qualifications - Powers and functions of the supreme court– High courts – Control over subordinate courts.

UNIT V THE FEDERAL SYSTEM 6

Distribution of financial powers: Need, principles-Underlying distribution of tax revenues-Distribution of legislative power – Interstate relation - Emergency provisions.

TOTAL: 30 PERIODS**OUTCOMES:****On successful completion of the course, the students will be able to,**

- Distinguish and apply constitutional principles and democratic values of the Indian constitution.
- Emphasize on the powers and interactions of the president, prime ministers in the parliamentary structure.
- Evaluate the structure, powers and functions of state and local governance.
- Demonstrate the Indian judiciary, structure and functions of courts.
- Explore the financial, legislative provisions of Indian federation.


CHAIRMAN
BoS (S&H) 20/06/23

TEXT BOOKS:

1. Basu D.D, "Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C, "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

REFERENCES:

1. Pylee M.V, "Introduction to the Constitution of India", Vikas Publishing House, New Delhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.
3. The Constitution of India, 1950 (Bare Act), Government Publication.
4. Jain M P, Indian Constitution Law, 7th Edition. Lexis Nexis, 2014.
5. Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.

Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	3	3	-	-	-	2
CO2	-	-	-	-	-	3	3	2	2	2	3
CO3	-	-	-	-	-	3	3	2	2	2	3
CO4	-	-	-	-	-	3	3	-	2	2	3
CO5	-	-	-	-	-	3	3	-	-	3	2


CHAIRMAN
BoS (S&H)

OBJECTIVES:

The Students should be made to:

- **Identify** the mechanical behavior of mild steel and HYSD bars subjected to tension, torsion loading.
- **Evaluate** the compressive strength of wood, brick, and concrete.
- **Investigate** the performance of open and close coiled helical springs.
- **Assess** the impact resistance and hardness of various materials.
- **Determine** bending and shear strength of mild steel.

LIST OF EXPERIMENTS:

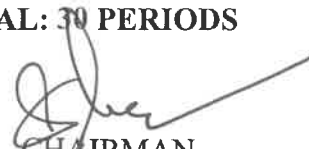
1. Tension test on mild steel, structural steel plate and HYSD bars.
2. Torsion test on mild steel rod and HYSD bars.
3. Compression test on wood.
4. Compression test on brick and concrete.
5. Tests on open coiled helical springs.
6. Tests on close coiled helical springs.
7. Izod and charpy impact tests.
8. Determination of rockwell and brinell hardness number.
9. Deflection test on metal beam.
10. Maximum shear strength of mild steel using double shear test.

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Illustrate** the behaviour of mild steel and HYSD bars under the action of tensile and torsional load.
- **Relate** compression tests on wood, brick, and concrete to determine its load bearing capacity.
- **Identify** stiffness and load deflection characteristics of open and close coiled helical springs.
- **Experiment** with impact resistance and hardness tests to assess various material properties.
- **Examine** bending and shear strength properties of mild steel using the double shear test.

TOTAL: 30 PERIODS


CHAIRMAN
BoS (CIVIL) 01/10/20

REFERENCES:

1. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, SMTS - I “Strength of Materials”, Laxmi publications, New Delhi, 10th Edition, 2024.
2. Singh. D.K, “Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 4th Edition, 2020.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	-	2	2	-	-	2
CO2	3	3	3	3	2	-	2	2	-	-	2
CO3	3	3	3	2	2	-	2	2	-	-	2
CO4	3	3	3	3	2	-	2	2	-	-	1
CO5	3	3	3	3	2	-	2	2	-	-	1



CHAIRMAN
BoS (CIVIL)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No	Description of Equipment	Quantity (nos)
1	UTM of minimum 400 kN capacity	1
2	Torsion testing machine	1
3	Izod/Charpy impact testing machine	1
4	Hardness testing machine (Rockwell, Brinell)	1 each
5	Beam deflection test apparatus	1
6	Extensometer	1
7	Compressometer	1
8	Dial gauges	Few
9	Le Chatelier's apparatus	2
10	Vicat apparatus	2
11	Mortar cube moulds	10


CHAIRMAN
BoS (CIVIL) 01/12/25

OBJECTIVES:

The student should be made to:

- Identify and classify different types of rocks and minerals
- Illustrate the electrical conductivity (EC), pH and organic carbon content present in water samples
- Analyze the nitrogen, phosphorus, and potassium (NPK) content in soil samples using standard testing methods
- Evaluate soil properties through standardized methods for determining texture, specific gravity and grain size distribution
- Examine the field density of soil using the core cutter method and the sand replacement method

List of Experiments

1. Identification of Rocks and minerals
2. Determination of soil moisture, EC and pH
3. Estimation of organic carbon
4. Determination of available Nitrogen in soil
5. Determination of available phosphorus in soil
6. Determination of available potassium in soil
7. Textural analysis of soils by International pipette method
8. Determination of specific gravity by pycnometer
9. Grain size analysis by using mechanical shaker
10. Determination of field density by core cutter method and Sand replacement method

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate the ability to identify and classify various types of rocks and minerals by applying engineering knowledge
- Determine the electrical conductivity (EC), pH and organic carbon content in water samples using engineering principles
- Examine the nitrogen, phosphorus and potassium (NPK) content in soil samples through engineering fundamentals analysis and standard testing methods
- Evaluate soil properties such as texture, specific gravity and grain size distribution by developing engineering concepts.
- Assess the field density of soil using the core cutter method and the sand replacement method through engineering analysis application



CHAIRMAN
BoS (AGE) 03/04/25

REFERENCES:

1. Punmia B C, "Soil Mechanics and Foundation Engineering", Laxmi Publishers, New Delhi. 2007.
2. Laboratory Manual, "Centre for Water Resources, Anna University", Chennai. 2012

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	1	1	1	-	2	-	-	-	2	3
CO2	3	3	2	3	3	2	-	2	-	-	-	2	3
CO3	3	3	2	3	3	2	-	2	-	-	-	2	3
CO4	3	3	2	3	3	2	-	2	-	-	-	2	3
CO5	3	3	2	3	3	2	-	2	-	-	-	2	3



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BoS (AGE) 03/04/25

List of Equipment's

Sl. No.	Description of Equipment
1	Igneous Rock - (Any 4)
2	Sedimentary Rock - (Any 4)
3	Metamorphic Rock - (Any 4)
4	Minerals - (Any 4)
5	Hot air oven
6	EC meter, potassium chloride, 100 ml beaker
7	pH meter, buffer tablet pH 4.0, 7.0 or 9.2, 100 ml beaker
8	Core sampler, aluminum tray, oven, balance upto 5 Kg, knife, spatula
9	Sand pouring cylinder, Calibrating can, Metal tray with a central hole, Dry sand (passing through 600 micron sieve), Balance of capacity 15 kg
10	A pycnometer, an analytical balance, filter paper, clean and dry cloth
11	A sieve shaker, complete set of I.S Sieve sizes generally 4.75 mm, 2.00mm, 1.18 mm, 425microns, 300microns, 150 microns and 75 microns along with a pan and a lid, Balance of 0.01 g sensitivity
12	500 ml conical flasks, Pipette, Burette, Potassium dichromate ($K_2Cr_2O_7$), Ferrous sulfate heptahydrate ($FeSO_4 \cdot 7 H_2O$), Sulfuric acid (H_2SO_4) concentrated, Diphenylamine indicator
13	Saturated calcum sulphate, Ammonium chloride-Ammonium hydroxide buffer, Erichrome black-T indicator, EDTA, mechanical shaker, whatman No. 3 filter paper, 100 ml conical flasks, Pipette, Burette
14	Direct Shear test apparatus
15	Vane Shear test apparatus
16	Proctor Compaction test apparatus



CHAIRMAN
BoS (AGE) 03/04/25

24EEC401L LIFE SKILLS AND PERSONALITY DEVELOPMENT
(Common to All Branches)

L T P C
0 0 2 1

OBJECTIVES:

The students should be made to:

- Create self- confident among the students by the training
- Develop good personality for mature outlook in different circumstances
- Encourage effective presentation skills
- Dramatize role play by assigning the best role
- Enhance team building and time management skills

UNIT I CAREER PLANNING

6

Introduction - Benefits of Career Planning - Expectation and Development - Guidelines for choosing a Career - Future planning - Evaluation of planning.

UNIT II ATTITUDE

6

Introduction - Rightness of Attitude and behaviour - Formation of Attitudes - Evolving Behaviour of a person - Creating right attitudes - Approaches of Challenges - Lessons from Attitude.

UNIT III ROLE PLAYING

6

Introduction - settings of role plays - Principles and Purpose - importance of communication in role plays - Arrangement of points and character - Extempore Talk - Debates - Emotional Intelligence.

UNIT IV TEAM BUILDING

6

Purpose of Creating Team - Exploring Team roles and Processes - Importance of Building and Developing Strong Team - Leadership Qualities - Success of Team Building.

UNIT V TIME MANAGEMENT

6

Value of time - Concept and applications of time management - Causes for wasting of time - Methods of Time Management - Diagnosing Time Management - Planning for presentation - To - do - list - Prioritizing work

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Improve the leadership skills by identifying the strengths of a team
- Learn to lead a team on a project in an organization
- Helps students to perform on a distinct role and learn to face the challenges
- Build a strong team to achieve their goals with the right choice of people
- Develop the time management skills to achieve success


CHAIRMAN
BoS (S&H) 14/10

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES:

1. Thomas A Harris, "I Am Ok, You Are Ok", Harper and Row, New York 1972.
2. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.
3. Nira Konar, "Communication Skills for Professionals", Eastern Economy Edition, 2010.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	1	2	2	1	1	2	3	1	3
CO2	1	2	1	2	2	1	1	2	3	1	3
CO3	1	2	1	2	2	1	1	3	3	1	3
CO4	1	2	1	2	2	1	1	3	3	1	3
CO5	1	2	1	2	2	1	1	3	3	1	3


CHAIRMAN
BoS (S&H) 14/10

24AG501

**IRRIGATION AND DRAINAGE ENGINEERING
(COMMON TO AGE AND CIVIL)**

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to,

- Explain the principles of water resources development, irrigation requirements and scheduling methods
- Plan the various irrigation methods, diversion works and canal irrigation components.
- Apply hydraulic design principles for irrigation structures, canals and pipeline
- Inspect the canal design and command area development measures for optimal water distribution
- Analyze the drainage practices to manage salt-affected waterlogged soils for sustainable crop production

UNIT I WATER RESOURCES AND IRRIGATION REQUIREMENT 9

Water Resources– River basins –Development and Utilization in India and Tamil Nadu – Irrigation – duty and delta – Rooting characteristics – Moisture use of crop, Evapotranspiration – ET plot – Crop water requirement – Effective rainfall – Scheduling – Irrigation requirement – Irrigation frequency and Irrigation efficiencies.

UNIT II METHODS OF IRRIGATION 9

Methods of Irrigation – Surface and Subsurface methods – Drip and Sprinkler – Hydraulics and design – Erodible and non-erodible, Kennedy's and Lacey's theories, Materials for lining water courses and field channel, Water control and diversion structure – Underground pipeline irrigation system.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Head works –Weirs and Barrage – Types of impounding structures – Factors affecting, location of dams –Forces on a dam – Design of Gravity dams –Earth dams, Arch dams – Spillways – Energy dissipaters.

UNIT IV CANAL IRRIGATION AND COMMAND AREA DEVELOPMENT 9

Classification of canals –Alignment of canals – Design of irrigation canals– Regime theories – Canal Head works – Canal regulators –Canal drops – Cross drainage works – Canal Outlet, Escapes –Lining and maintenance of canals – Excess irrigation and waterlogging problem – Command area – Concept, Components of CADP –On Farm Development works, Farmer's committee –its role for water distribution and system operation –rotational irrigation system.

UNIT V DRAINAGE AND RECLAMATION SOILS 9

Agricultural drainage – Salt balance concept – Leaching requirement and management practices under drained conditions – Salt-affected waterlogged areas in India – Water quality criteria and use of brackish water for agriculture – Drainage requirements for crop growth under salt-affected waterlogged soils – Disposal of drainage effluents – Case study on reclamation of salt-affected waterlogged areas.

TOTAL: 45 PERIODS


CHAIRMAN

BoS (AGE) 28/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain water resources, irrigation needs and scheduling using engineering principles
- Identify the irrigation methods, diversion works and canal systems for effective water conveyance
- Utilize the canals, lining and on-farm systems for efficient irrigation
- Examine the water distribution and water logging issues in command areas
- Analyze and develop solutions for salt balance, drainage, and reclamation of salt-affected soils

TEXTBOOKS:

1. Michael A M, "Irrigation Engineering", Vikas Publishers, New Delhi, 2nd Edition, 2008
2. Ritzema H P, "Drainage Principles and Applications", International Institute of Land Reclamation and Improvement, Netherlands, Revised Edition, 1994

REFERENCES:

1. Basak N N, "Irrigation Engineering", Tata McGraw - Hill Publishing Co Ltd., New Delhi, 2017
2. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2nd Edition, 2013
3. Kessler J, "Drainage Principles and Applications", International Institute of Land Reclamation and Improvement, Netherlands, 1979

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	2	-	-	-	-	-	1
CO2	3	3	3	2	2	-	-	-	-	-	1
CO3	3	3	3	2	2	-	-	-	-	-	1
CO4	3	3	3	2	2	-	-	-	-	-	1
CO5	3	3	3	2	2	-	-	-	-	-	1



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Explain the objectives of farm mechanization and classify various tillage implements used in different soil conditions
- Demonstrate the construction, working principles and types of primary and secondary tillage implements used in various soil and crop conditions
- Implement proper calibration techniques and operational practices for sowing and fertilizing equipment to enhance crop productivity
- Analyze the design and performance of weeding and plant protection equipment to optimize efficiency in various cropping systems
- Evaluate different types of harvesting machinery to identify suitable options based on crop type, land condition, and harvesting efficiency

UNIT I FARM MECHANIZATION 9

Farm mechanisation – objectives- scopes and benefits, status of farm mechanization in India. Tillage – objectives – methods – primary tillage implements – secondary tillage implements – animal drawn ploughs – construction. Types of farm implements – trailed, mounted. Field capacity – forces acting on tillage tool.

UNIT II PRIMARY AND SECONDARY TILLAGE IMPLEMENTS 9

Mould board plough – attachments – mould board shapes and types. Disc plough – force representation on disc – Types of disc ploughs – Subsoiler plough – Rotary plough. Cultivators – types – construction. Disc harrows – Bund former – ridger – leveller. Basin lister – Wetland preparation implements.

UNIT III SOWING AND FERTILIZING EQUIPMENT 9

Crop planting – methods – row crop planting systems – Devices for metering seeds – furrow openers – furrow closers- types – Types of seed drills and planters – calibration-fertilizer metering devices – seed cum fertilizer drills – paddy transplanters – nursery tray machines.

UNIT IV WEEDING AND PLANT PROTECTION EQUIPMENT 9

Weeding equipment – hand hoe – long handled weeding tools – dryland star weeder – wetland Cono weeder and rotary weeder – Engine operated and tractor weeders. Sprayers – types – classification – methods of atomization, spray application rate, droplet size determination – volume median diameter, numerical median diameter – drift control.

UNIT V HARVESTING MACHINERY 9

Principles of cutting crop, types of harvesting machinery, vertical conveyor reaper and binder combine harvesters, balers, threshers, tractor on top combine harvester, combine losses.

TOTAL: 45 PERIODS



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List of Experiments

1. Identification of major systems of a tractor and general guidelines on preliminary check measures before starting a tractor – procedure for starting, running and stopping the tractor
2. Identification of components of power tiller and study on preliminary check measures before starting a power tiller – procedure for starting, running and stopping the power tiller
3. Field operation and adjustments of ploughs
4. Field operation and adjustments of harrows
5. Field operation and adjustments of cultivators
6. Field operation of sowing and planting equipment and their adjustments
7. Field operation of plant protection equipment
8. Field operation on mowers and reapers
9. Field operation of combine and determination of field losses
10. Field operation of threshers and their performance evaluation

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the role and importance of farm mechanization and identify suitable tillage tools for various field conditions
- Select and operate suitable primary and secondary tillage implements for different field and crop conditions
- Apply sowing and fertilizing equipment effectively through proper calibration and settings to improve planting accuracy
- Examine the effectiveness of different weeding and plant protection equipment in enhancing crop health and minimizing labor input
- Analyze various harvesting machines to determine the best-suited technology based on field conditions, crop types and efficiency parameters

TEXTBOOKS:

1. Nekesah T, Wafullah and Munene C K “Farm Mechanization”. Delve Publishing, 2022
2. Senthilkumar T, “A Textbook of Farm Machinery and Equipment: Principles and Practice”. Brillion Publishing, 2025

REFERENCES:

1. Sahay J, “Elements of Agricultural Engineering” Standard Publishers Distributors, 8th Edition, 2022
2. Sinha and Abhay Kumar, “Introduction to Agricultural Engineering”. NIPA Publications, 2025



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BoS (AGE)

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	1	-	-	-	-	2	2	2
CO2	3	3	3	2	2	1	-	-	-	-	2	2	2
CO3	3	3	3	2	2	1	-	-	-	-	2	2	2
CO4	3	3	3	2	2	1	-	-	-	-	2	2	2
CO5	3	3	3	2	2	1	-	-	-	-	2	2	2

CHAIRMAN
BoS (AGE) 16/10/25

24AG503	SOIL AND WATER CONSERVATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to,

- Understand causes, agents and mechanics of soil erosion
- Apply the SCS-CN method for runoff estimation
- Identify and design grassed waterways for safe water disposal
- Assess the role of retaining walls in water conservation
- Analyze present land use for preparing watershed development plans

UNIT I SOIL EROSION PRINCIPLES 9

Approaches to soil conservation – Soil conservation in India - Erosion – Agents – Causes – Mechanics of water erosion – Soil erosion problems – Types of water erosion – Raindrop erosion, Sheet erosion, Rill erosion, Gully erosion, Stream bank erosion – Classification of Gully – Gully Control Structures – Drop Spillway, Drop Inlet, Chute Spillways – Prerequisites for soil and water conservation measures.

UNIT II ESTIMATION OF SOIL EROSION 9

Runoff computation for soil conservation – SCS – CN method – Evolution of Universal Soil Loss Equation – Applications and Limitations – Modified Universal Soil Loss Equation – Revised Universal Soil Loss Equation – Permissible erosion – Land use capability classification – Classification of eroded soils.

UNIT III EROSION CONTROL MEASURES 9

Agronomic practices – contour cultivation – strip cropping – tillage practices – Soil management practices. Bunding – Types and design specifications – Mechanical measures for hill slopes. Terracing – Classification and design specification of bench terrace. Grassed waterways – Location, construction and maintenance – Types of temporary and permanent gully control structures.

UNIT IV WATER CONSERVATION MEASURES 9

In-situ soil moisture conservation – Water harvesting principles and techniques: Micro catchments, catchment yield using morphometric analysis – Farm ponds – Components, Design, Construction and Protection – Check dams – Earthen dam – Retaining wall.

UNIT V SEDIMENTATION 9

Sediment: Sources – Types of sediment load – Mechanics of sediment transport – Estimation of bed load – Sediment Graph - Reservoir sedimentation: Basics - Factors affecting sediment distribution pattern, Rates of reservoir sedimentation - Silt Detention Tanks – sediment control methods.

TOTAL: 45 PERIODS



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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the knowledge of soil science to know the causes, agents and mechanics of erosion
- Formulate erosion prediction problems using USLE, MUSLE and RUSLE considering their applications and limitations
- Apply grassed waterways to meet safe water disposal needs considering environmental sustainability
- Interpret data on check dams, earthen dams and retaining walls to provide valid conclusions for water conservation planning
- Analyze present land use and develop watershed development plans addressing sustainability and societal needs

TEXTBOOKS:

1. Suresh R. "Soil and Water Conservation Engineering". Standard Publication, New Delhi, 2021
2. Ghanshyam Das. "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2nd Edition, 2009

REFERENCES:

1. Murthy V V N, "Land and Water Management Engineering". Kalyani Publishers, Ludhiana, 3rd Edition, 2023
2. Mal B C. "Introduction to Soil and Water Conservation Engineering". Kalyani Publishers, New Delhi, 2022

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	1	-	-	-	-	2	2	3
CO2	3	3	2	2	1	1	-	-	-	-	2	2	3
CO3	3	3	2	2	1	1	-	-	-	-	2	2	3
CO4	3	3	3	3	2	1	-	-	-	-	2	2	3
CO5	3	3	3	3	2	1	-	-	-	-	2	2	3



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The Student should be made to:

- Understand 8051 architecture, programming, and interfacing.
- Apply embedded system design principles using ARM processors.
- Analyze embedded networking protocols and interfaces.
- Understand real-time operating systems and process management.
- Develop embedded applications through practical case studies.

UNIT I 8051 MICROCONTROLLER**9**

Microcontrollers for an Embedded System – 8051 – Architecture – Addressing Modes – Instruction Set – Program and Data Memory – Stacks – Interrupts – Timers/Counters – Serial Ports – Programming.

UNIT II EMBEDDED SYSTEMS**9**

Embedded System Design Process – Model Train Controller – ARM Processor – Instruction Set Preliminaries – CPU – Programming Input and Output – Supervisor Mode – Exceptions and Trap – Models for programs – Assembly, Linking and Loading – Compilation Techniques – Program Level Performance Analysis.

UNIT III EMBEDDED NETWORKING**9**

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols - RS232 standard – RS422 – RS485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.

UNIT IV PROCESSES AND OPERATING SYSTEMS**9**

Structure of a real – time system – Task Assignment and Scheduling – Multiple Tasks and Multiple Processes – Multirate Systems – Pre emptive real – time Operating systems – Priority based scheduling – Interprocess Communication Mechanisms – Distributed Embedded Systems – MPSoCs and Shared Memory Multiprocessors

UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT**9**

Case Study of Washing Machine- Farm Automation in Agriculture- Smart card System Application

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to:

- Explain 8051 architecture, instruction set, and communication features.
- Design and implement ARM-based embedded systems.
- Analyze and apply embedded networking protocols and device drivers.
- Apply RTOS concepts for task and process management.
- Develop and evaluate real-time embedded applications through case studies


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BoS (ECE) 16/10/25

TEXT BOOK:

1. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", 3rd Edition, McGraw Hill Education, 2021.
2. Peckol, "Embedded system Design", John Wiley & Sons, 2010.
3. Lyla B Das, "Embedded Systems-An Integrated Approach", Pearson, 2013

REFERENCES:

1. Kenneth J. Ayala, "The 8051 Microcontroller: Architecture, Programming and Applications", 3rd Edition, Cengage Learning, 2004.
2. Frank Vahid and Tony Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", Wiley India, 2002.
3. Jonathan W. Valvano, "Embedded Microcomputer Systems: Real-Time Interfacing", 3rd Edition, Cengage Learning, 2012.
4. Tammy Noergaard, "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", 2nd Edition, Newnes / Elsevier, 2013.

MAPPING OF COs WITH POs AND PSOs

Course Outcomes	Program Outcomes											Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	1	2	-
CO2	3	3	2	2	2	-	-	-	-	-	1	2	-
CO3	3	3	3	2	3	1	-	-	-	-	-	2	-
CO4	3	2	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	3	2	3	1	-	-	-	-	1	2	-


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BoS (ECE)

OBJECTIVES:

The student should be made to:

- Explain the working principles of meteorological and irrigation instruments
- Describe methods for measuring infiltration, flow in open channels, and irrigation performance.
- Design drip and sprinkler irrigation systems based on field data
- Use measurements to evaluate pressurized irrigation performance.
- Analyze uniformity and efficiency parameters to improve irrigation system design and operation

LIST OF EXPERIMENTS

1. To study various instruments in the Meteorological Laboratory.
2. Determination of wind velocity using Digital anemometer.
3. Determination of evaporation rate using Open pan evaporimeter.
4. Determination of soil moisture wetting pattern for irrigation scheduling.
5. Determination of infiltration rate using double ring and digital infiltrometer.
6. Design of Drip irrigation system.
7. Design of sprinkler irrigation system.
8. Measurement of flow properties in open irrigated channels (flumes, notches).
9. Evaluation of surface irrigation.
10. Determination of uniformity coefficient for drip irrigation system.
11. Determination of uniformity coefficient for sprinkler system (catch can method).

TOTAL: 30 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Explain the working principles and applications of meteorological and irrigation instruments.
- Describe methods for measuring wind velocity, infiltration rate, evaporation, and flow in open channels
- Design drip and sprinkler irrigation systems using field measurements.
- Estimate surface and pressurized irrigation performance using measured data.
- Analyze uniformity coefficients and efficiency parameters to enhance irrigation system design and operation

REFERENCES:

1. Michael A M "Irrigation Theory and Practice", S Chand Publication, New Delhi, 2nd Edition, 2008.
2. Michael AM, "Irrigation Engineering", Vikas Publishers, New Delhi, 2nd Edition 2008.



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BoS (AGE) 17/4/26

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	2	-	-	2	-	-	1	3	1
CO2	3	2	1	2	2	-	-	2	-	-	1	3	3
CO3	3	2	1	2	2	-	-	2	-	-	1	3	3
CO4	3	2	1	2	2	-	-	2	-	-	1	3	2
CO5	3	2	1	2	2	-	-	2	-	-	1	3	2

V. Gopal Rao

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BoS (AGE)

List of Equipment's

Sl.No	Description of Equipment
1.	Meteorological lab with Cup counter anemometer, Sunshine recorder, Open pan evaporimeter, Stevenson's screen –Dry bulb, wet bulb thermometers, recording and non-recording type rain gauge etc. – Each 1 No.
2.	Double ring infiltrometer – 1 No.
3.	Digital infiltrometer – 1 No.
4.	Parshall flume, cut throat flume – Each 1 No
5.	V notch, Rectangular notch and trapezoidal notch – Each 1 No
6.	Drip irrigation system with all accessories – 1 No
7.	Sprinkler irrigation system with all accessories – 1 No
8.	Stop watches – 1 No
9.	Weighing balance – 1 No.
10.	Measuring jars – 1No.

V. Cp R E

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24EC509L

EMBEDDED SYSTEMS LABORATORY

L T P C

0 0 2 1

OBJECTIVES:**The Student should be made to:**

- Understand 8051 and ARM architectures for embedded applications.
- Develop basic programs using arithmetic, logical, and data transfer instructions.
- Interface I/O devices (LEDs, LCDs, keypads, sensors, motors) with 8051 and ARM.
- Design real-time embedded systems for agriculture and environmental monitoring.
- Integrate sensors and peripherals with ARM using I/O and PWM techniques.

List of Experiments**Experiments using 8051.**

1. General Purpose Programming in 8051 (Arithmetic and Logical Instructions, Data Transfer Instructions, Boolean Variable Instructions)
2. Interfacing an LED with 8051/89S52
3. Interfacing a 7-segment display with 8051/89S52
4. Interfacing an LCD with 8051/89S52
5. Interfacing input devices (Matrix Keypad) with 8051/89S52
6. Interfacing a DC motor with 8051/89S52
7. Fire and Smoke Detection in Crop Storage Area
8. Weather Monitoring System
9. Smart Water Level Controller for Irrigation Tank
10. Animal Intrusion Detection System

Experiments using ARM

11. Blinking LEDs with LPC2148
12. Interfacing a Buzzer with LPC2148
13. Interfacing a Relay with LPC2148

TOTAL: 45 PERIODS**OUTCOMES:****On successful completion of this course, the students will be able to:**

- Explain the architecture and instruction set of 8051 and ARM controllers.
- Develop programs using assembly and embedded C.
- Interface I/O devices like LEDs, LCDs, keypads, and sensors with 8051 and ARM.
- Implement real-time applications such as fire and weather monitoring systems.
- Design ARM-based embedded systems using timers, interrupts, and PWM.


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BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

Course Outcomes	Program Outcomes											Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	–	2	–	–	–	–	1	1	2	-
CO2	3	3	2	1	3	–	–	–	1	–	1	2	-
CO3	3	2	3	2	3	1	–	–	2	1	2	2	-
CO4	3	3	3	3	3	2	2	1	2	1	2	2	-
CO5	3	3	3	2	3	1	2	–	2	1	3	2	-


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 BoS (ECE)

REQUIREMENTS FOR A BATCH OF 30 STUDENTS:

1	8051 Trainer Kit	10 Nos
2	ARM LPC 2148 kit-	10 Nos
3	89s52-trainer Kit-10	10 Nos
4	Interfacing cards (LED,7 Segment Display,LCD,Kaypad)	Each 2
5	Flame sensor / IR flame module	Each 5
6	Smoke/gas sensor	Each 5
7	Temperature & humidity sensor	Each 5
8	Ultrasonic range sensor	Each 5
9	PIR motion sensor	Each 5
10	DC Motor	Each 5
10	Bread Boards	12


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24EEC501L PROFESSIONAL SKILLS AND CAREER DEVELOPMENT
(Common to All Branches)

L T P C
0 0 2 1

OBJECTIVES:

The student should be made to:

- Analyze problems effectively using critical thinking skills.
- Use language effectively with commitment and cooperation.
- Enrich creative thinking and presentation skills to meet industry requirements.
- Develop and enhance soft skills through individual and group activities.
- Acquire the right attitude and behavioral traits for personal and professional development.

UNIT I INTRODUCTION TO BASIC ARITHMETIC AND PERSONALITY TRAITS

6

Aptitude - Numbers, Average, Percentage, Profit and loss, Picture pattern.

Soft skills - Personality development, Professional ethics, Perception insights, attitude and behavioral changes.

UNIT II CONCEPT OF PROPORTIONALITY & INTERPERSONAL SKILLS

6

Aptitude - Time and work, Pipes and cisterns, Series completion, Critical reasoning.

Soft skills - Developing self - esteem, Significance of interpersonal behaviour and interpersonal relationships.

UNIT III AN APPROACH TO COGNITIVE APTITUDE AND LEADERSHIP SKILLS

6

Aptitude - Time, speed and distance, Boats and streams, Races and games, Syllogism.

Soft skills - Leadership skills - Characteristics and importance of leadership, Roles and responsibilities of a good Leader

UNIT IV CONTEMPORARY APTITUDE AND SITUATIONAL RESPONSES

6

Aptitude - Crypt arithmetic, Ranking, Logarithms, Cubes, Analogy.

Soft skills - Decision making - Processes and challenges, Creative and Critical thinking.

UNIT V NON-VERBAL REASONING AND INFLUENCING OTHERS

6

Aptitude - Clocks, Non - verbal reasoning, Permutation, Classifications.

Soft skills - Presentation skills - Make use of visual aids with modern tools, Insights on persistence and perseverance.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Ability to solve both analytical and logical problems in an effective manner
- Practice to organize and convey the information in such an optimistic way.
- Deliver a professional and constructive presentation
- Recognize explicit assumptions and their consequences
- Access the needed information effectively and efficiently.


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BoS (S&H) 18/03/26

TEXT BOOKS:

1. Aggarwal R S, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand Publishing New Delhi, Revised Edition Oct 2024.
2. Agna Fernandez, "Generic Skills for Employability", Cambridge Publisher, Revised Edition, 2023.

REFERENCES:

1. Dr. Soma Mahesh Kumar, Soft Skills: "Enhancing Personal and Professional Success", McGraw Hill Education; First Edition, 2023
2. Aashish Arora, "Quanta Quantitative Aptitude" Kiran Institute of Career Excellence Pvt. Ltd, April 2022.

Useful Weblinks:

1. <https://www.bbc.co.uk/learningenglish/>
2. <https://www.cambridgeenglish.org/test-your-english/>

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	3	2	3	1	1	1	3	2	1	2
CO2	2	1	1	1	1	2	2	2	2	1	2
CO3	2	3	2	2	2	3	2	3	3	1	2
CO4	2	3	2	3	3	2	1	3	2	3	2
CO5	1	1	2	2	3	1	2	3	3	1	2


CHAIRMAN
BoS (S&H)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamental concepts of post-harvest operations using engineering knowledge to address agricultural engineering problems
- Identify psychrometric principles for solving engineering problems in crop drying processes
- Apply the engineering principles for cleaning and grading machinery for improving post-harvest system efficiency
- Analyze the design and performance parameters of shelling and handling equipment using modern engineering tools
- Assess appropriate processing methods in post-harvest management considering technical feasibility

TEXTBOOKS:

1. Chakraverty A, "Post harvest technology for Cereals, Pulses and oil seeds", Oxford & IBH publication Pvt Ltd, New Delhi, 3rd Edition, 2019.
2. Sahay K M and Singh K K, "Unit operations of Agricultural Processing", Vikas publishing house Pvt. Ltd., New Delhi, 2nd Revised and Enlarged edition, 2004.

REFERENCES:

1. Pandey P H, "Principles of Agriculture Processing", Kalyani Publishers, 2019.
2. Mangaraj S, Dash S K, Swain S, and Ali Nawab, "Agricultural Process Engineering Volume II", Kalyani Publishers, 2017.
3. Rathore N S, Mathur G K and Chasta S S, "Post-Harvest Management and Processing of Fruits and Vegetables", ICAR, The Energy and Resources Institute, India, 2018.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	-	-	1	2	2
CO2	3	3	3	3	2	-	-	-	-	-	1	3	2
CO3	3	2	2	2	1	-	-	-	-	-	1	2	2
CO4	3	3	3	2	1	-	-	-	-	-	1	2	2
CO5	3	2	2	2	2	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand the engineering principles involved in milk composition, processing equipment
- Compare the manufacturing processes, equipment and standards used for various dairy products and sanitation practices
- Apply thermal processing methods and reaction kinetics of food materials in processing systems
- Utilize membrane and extrusion technologies in practical food processing applications
- Analyze the food processing and preservation methods to enhance food quality and shelf life

UNIT I	PROPERTIES AND PROCESSING OF MILK	9
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Dairy Industry – importance and status – Milk Types – Composition and properties of milk – Production of high quality milk – Method of raw milk procurement and preservation – Processing – Staining – Filtering and Clarification – cream separation – Pasteurization – Homogenization – sterilization, UHT processing and aseptic packaging – emulsification – Fortification.

UNIT II DAIRY PRODUCTS 9

Manufacture of Milk Powder – Processing of Milk Products – Condensed Milk – Skim milk – Butter milk – Flavoured Milk, whey, casein, yoghurt and paneer – Manufacture of Butter – Cheese Ghee, ice creams and frozen desserts – standards for milk and milk products – Packaging of Milk and Milk Products – CIP Process - Cleaning and Sanitation – Dairy effluent treatment and disposal.

UNIT III FOOD AND ITS PROPERTIES, REACTION AND KINETICS 9

Engineering properties of food materials - Rheology of food - Constituents of food – thermal processing of foods – cooking, blanching, sterilization, pasteurization, canning – Interaction of heat energy on food components, reaction kinetics, Arrhenius equation, TDT curves – water activity, sorption behaviour of foods – isotherm models – monolayer value, BET isotherms, Raoult's law, Norrish, Ross, Salwin - Slawson equations.

UNIT IV **FOOD PROCESSING OPERATIONS** 8

Membrane processes Ultra filtration, Reverse osmosis, Electrodialysis, per-evaporation and micro filtration – principles - application in food industry, Extrusion - Extrusion cookers - cold extrusion, single and twin-screw extrusion - Low pressure and high-pressure extrusion

V. Gupta

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UNIT V PRESERVATION OF FOODS**10**

Coffee, Tea processing – Concentration of foods, freeze concentration – osmotic and reverse osmotic concentration – drying and dehydration of food – Tray, tunnel, belt, vacuum and freeze dryers – rehydration of dehydrated foods – Fat and oil processing, sources, extraction, methods and equipment, refining of oils, hydrogenation, manufacture of margarine – Food preservation methods – preservation by irradiation, microwave and dielectric heating of food.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Explain the composition and properties of milk to process and preserve milk using fundamental engineering knowledge
- Illustrate the manufacturing processes, packaging and cleaning practices of dairy products using engineering principles
- Apply the engineering properties of food materials, thermal processing and reaction kinetics to provide solution for complex problem
- Use membrane processes, extrusion techniques for efficient food product development and equipment design.
- Examine various processing and food preserving techniques to extend the shelf life of food using fundamental principles

TEXTBOOKS:

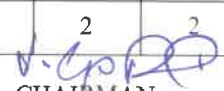
1. Chandra Gopala Rao, “Essentials of Food Process Engineering”, B.S. Publications, Hyderabad, 2006.
2. Walstra P, Jan T M Wouters and Tom J Geurts, “Dairy Science and Technology”, CRC press, 2nd Edition, 2005.

REFERENCES:

1. Subbulakshmi G and Shobha A Udipi, “Food Processing and Preservation”, New Age International Publications, New Delhi, 2nd Edition, 2022.
2. Toledo R T, “Fundamentals of Food Process Engineering”, Springer International Publishing AG, 4th edition, 2018.
3. Tufail Ahmed, “Dairy Plant Engineering and Management”, Kitab Mahal Publishers, Allahabad, 2010.

Mapping of COs with POs and PSOs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C311.1	3	2	2	-	2	-	-	-	-	-	2	2	2
C311.2	3	2	2	-	1	-	-	-	-	-	2	2	2
C311.3	3	2	2	-	1	-	-	-	-	-	2	2	2
C311.4	3	2	2	-	1	-	-	-	-	-	2	3	2
C311.5	3	2	2	-	1	-	-	-	-	-	2	2	2


CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand the physical and engineering properties of grains relevant to post-harvest operations
- Demonstrate experimental methods for determining moisture content, porosity, coefficient of friction, and angle of repose of grains
- Evaluate the performance characteristics of threshing, winnowing, decorticating, and shelling operations
- Analyze the drying behavior and performance of thin layer and LSU dryers
- Examine the efficiency of material handling equipment and oil extraction processes used in post-harvest management

LIST OF EXPERIMENTS

1. Determination of moisture content of grains by oven method and moisture meter
2. Determination of porosity of grains
3. Determination of coefficient of friction and angle of repose of grains
4. Testing of paddy thresher & paddy winnower
5. Testing of groundnut decorticator & maize sheller
6. Study of thin layer dryer
7. Study of L.S.U. dryer
8. Determining the efficiency of bucket elevator and screw conveyor
9. Evaluation of shelling efficiency of rubber roll sheller
10. Determining the oil content of oil seeds

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Determine engineering properties of grains for post-harvest problem analysis
- Evaluate the performance of threshing and shelling machinery for engineering solution development
- Analyze drying characteristics of dryers using modern engineering tools
- Assess the efficiency of material handling equipment for system performance improvement
- Examine oil content of oilseeds for post-harvest process development



CHAIRMAN
BoS (AGE) 17/4/26

REFERENCES:

1. Chakraverty A, "Post harvest technology for Cereals, Pulses and oil seeds", Oxford & IBH publication Pvt Ltd, New Delhi, 3rd Edition, 2019.
2. Rathore N S, Mathur G K and Chasta S S, "Post-Harvest Management and Processing of Fruits and Vegetables", ICAR, The Energy and Resources Institute, India, 2018.
3. Sahay K M and Singh K K, "Unit operations of Agricultural Processing", Vikas publishing house Pvt. Ltd., New Delhi, 2nd Revised and Enlarged edition, 2004.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	-	-	1	2	2
CO2	3	3	3	3	2	-	-	-	-	-	1	3	2
CO3	3	2	2	2	1	-	-	-	-	-	1	2	2
CO4	3	3	3	2	1	-	-	-	-	-	1	2	2
CO5	3	2	2	2	2	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

List of Equipment's

Sl.No	Description of Equipment
1.	Hot air oven
2.	Moisture meter
3.	Grain Porosity apparatus
4.	Coefficient of friction apparatus
5.	Angle of Repose L and Round type
6.	Paddy thresher winnower
7.	Hand operated groundnut decorticator
8.	Mini maize sheller motorized
9.	Screw conveyor
10.	Mini oil expeller
11.	LSU dryer
12.	Thin layer dryer
13.	Bucket Elevator
14.	Rubber Roll Sheller



CHAIRMAN
BoS (AGE) 17/4/26

OBJECTIVES:

The student should be made to,

- Acquire knowledge of current technologies and recent developments relevant to the selected project domain.
- Identify real-time engineering problems and apply appropriate concepts to define project objectives and scope.
- Utilize modern tools, techniques and methodologies required for designing project solutions.
- Identify real-time engineering problems and analyze concepts to define project objectives and scope.
- Evaluate team performance, project outcomes and presentation effectiveness through critical review and reflective assessment.

GUIDELINES FOR REVIEW AND EVALUATION

The students in convenient groups of not more than 3 members on a topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction. Every project work shall have a guide who is the faculty member of the institution. The progress of the project is evaluated based on a project reviews. The review committee may be constituted by the head of the department. A mini project report may be prepared and submitted to the head of the department at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain real-time engineering problems and summarize requirements identified through effective literature survey.
- Implement technical ideas, strategies and methodologies for developing project solutions.
- Apply modern tools, algorithms and techniques to obtain solutions for the selected project problem.
- Analyze, test and validate the developed prototype through performance verification and conformance testing.
- Evaluate project outcomes, communication effectiveness and continuous learning gained during project execution.



CHAIRMAN
BoS (AGE) 17/4/26

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	1	-	-	-	3	2	-	2	3	2
CO2	3	3	2	2	2	2	-	3	1	2	2	3	2
CO3	3	3	3	3	2	-	-	3	1	2	2	3	2
CO4	3	3	3	3	2	2	-	3	1	2	2	3	2
CO5	3	3	3	3	-	1	-	3	3	2	2	3	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:**The students should be made to:**

- Learn the application of mathematical and project management to different contexts.
- Focus on quantitative ability and employment skills through modern practices.
- Enhance job skills and analytical ability of students
- Improve reasoning skills and employability skills
- Practice the skills on logical reasoning and interview techniques

UNIT I INTRODUCTION TO NUMERIC ABILITY AND PROJECT MANAGEMENT**6**

Aptitude - Ratio and proportion, Partnership, Allegation or Mixtures, Coding - Decoding, Number sequence.

Soft Skills - Managerial skills - Project Cost, risk and Task management, Conflict Management and Resolution.

UNIT II QUANTITATIVE ANALYSIS AND EMPLOYERS EXPECTATIONS**6**

Aptitude - Number system, Data Interpretation, Chain rule, Surds and Indices, Direction Sense.

Soft Skills - Employers Needs and Expectations, Mind Mapping, Situation Reaction Test (SRT).

UNIT III ANALAYTICAL SKILLS AND JOB READINESS**6**

Aptitude - Combination, Probability, Problems on Ages, Seating Arrangements.

Soft Skills - Job Application - Resume Building - Exploring and Identifying Career Options.

UNIT IV REASONING ABILITY AND INSIGHT ON INTERVIEWS**6**

Aptitude - Menstruations, SI and CI, Cause and Effect, Statement, Assumptions and Conclusions

Soft Skills - Interview Techniques, Job Description, Roles and Responsibilities - Work Etiquettes

UNIT V LOGICAL REASONING AND READY RECKNOERS FOR INTERVIEWS**6**

Aptitude - Input-Output Tracing – Trains – Calendar - Blood Relations.

Soft Skills - Types of Interviews, Interview Process, Analyzing the Interviewer, HR Questions & Mock Interviews.

TOTAL: 30 PERIODS**OUTCOMES:****On successful completion of this course, the students will be able to,**

- Develop numerical ability and project management skills
- Achieve quantitative skills and employability skills.
- Understand both analytical and job readiness in a productive manner
- Acquire reasoning ability and interview techniques
- Obtain logical skills and interviewers' expectations


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BoS (S&H) 18/03/26

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition, 2024.
2. Rajat Gupta, "Soft Skills: Tools for Success", Yking Books, Second Edition, 2022.

REFERENCE BOOKS:

1. Oswaal Editorial Board, "Objective Quantitative Aptitude for All Competitive Examinations" Oswaal Books and Learning Private Limited, New Edition, 2025.
2. M. S. Rao, "Soft Skills: Enhancing Employability" I.K. International Publishing House, Revised Edition, 2025.

USEFUL WEBLINKS:

1. <https://learnenglish.britishcouncil.org/>
2. <https://www.engvid.com/>

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	3	2	3	1	1	1	3	2	1	2
CO2	2	1	1	1	1	2	2	2	2	1	2
CO3	2	3	2	2	2	3	2	3	3	1	2
CO4	2	3	2	3	3	2	1	3	2	3	2
CO5	1	1	2	2	3	1	2	3	3	1	2


CHAIRMAN
BoS (S&H)

OBJECTIVES:

The student should be made to,

- Explain the fundamental principles and historical development of remote sensing using core Engineering Knowledge
- Use visual interpretation elements and interpretation keys for analyzing satellite images, contributing to Problem Analysis
- Utilize the concepts and components of GIS including hardware and software for spatial data management, aligning with Modern Tool Usage
- Analyze the role of expert systems in GIS-based decision-making for sustainable resource management, promoting Environment and Sustainability
- Assess UAV mission planning including airframe, payload, environment, budget and time constraints, aligning with Modern Tool Usage

UNIT I CONCEPTS OF REMOTE SENSING**9**

Definition – Historical background – Components of remote sensing – EMR, Energy source, electromagnetic spectrum, radiation principle, platforms and sensors – Active and passive remote sensing interference – Atmospheric effects on remote sensing – Energy interaction with earth surface feature – Data acquisition – Reflectance, spectral signatures for water, soil and vegetation. Satellites – Types – Sun synchronous – Geo synchronous remote sensing satellites LANDSAT, SPOT & IRS – Resolution – Spectral, spatial, radiometric and Temporal resolution Recent satellites with its applications.

UNIT II DATA PRODUCTS AND IMAGE ANALYSIS**9**

Data products –based on level of processing- o/p – scale – area/coverage – data availability – data ordering- data price - Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices

UNIT III CONCEPTS OF GIS**9**

Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.

UNIT IV DATA INPUT AND ANALYSIS**9**

Data – Spatial, Non-Spatial – Database models – Hierarchical network, Relational and Object Oriented Data Models – Raster and Vector – Methods of Data input – Data Editing – Files and formats – Data structure – Data compression. Introduction to analysis – Measurements – Queries – Reclassification – Simple spatial analysis – Buffering – Neigh boring functions – Map overlay – Vector and raster – Spatial interpolation – Modelling in GIS – Digital Elevation Modelling – Expert systems.



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BoS (AGE) 17/4/26

UNIT V UNMANNED AERIAL VEHICLE**9**

History of unmanned aerial vehicle (UAV) development. Classifications and components of UAVs – Design standards and Regulatory aspects – Environment, Budget & Time, Airframe Payload, Flight planning, Mosaicing, Ground control, Feature detection and mapping, Point cloud, 3D Models, DEM generation, Orthophoto generation, UAV Applications

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Understand the electromagnetic radiation principles, atmospheric effects and energy interactions with earth surface features to support the problem analysis
- Identify suitable visual image interpretation elements to improving decision-making skills
- Apply GIS components including hardware and software for spatial data management using modern tools
- Analyze spatial and non-spatial data with different database models to enhance geospatial analysis skills.
- Analyze the standards and regulatory aspects to focus compliance and operational feasibility for improving problem analysis skills

TEXTBOOKS:

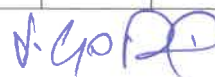
1. Anji Reddy M, "Textbook of Remote Sensing and Geographical Information System", Atlantic Publishers and Distributors Pvt Ltd, 5th Edition, 2024.
2. Floyd F.Sabins, "Remote Sensing: Principles and Interpretation", Waveland Pr Inc, New York, 4th Edition, 2020.

REFERENCES:

1. Lillesand T M and Kiefer R W, "Remote Sensing and Image Interpretation", John Wiley and Sons, New York, 8th Edition, 2019.
2. Ian Heywood, "An Introduction to GIS", Pearson Education, New Delhi, 4th Edition, 2012.
3. Paul Gerin F & Thomas James Gleason, "Introduction to UAV Systems", Wiley Publications, 5th Edition, 2022.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	2	-	-	-	-	1	2	2
CO2	3	3	3	2	2	2	-	-	-	-	1	2	2
CO3	3	3	3	2	2	2	-	-	-	-	1	2	2
CO4	3	3	3	3	3	2	-	-	-	-	1	2	2
CO5	3	3	3	3	3	2	-	-	-	-	1	2	2


CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the construction, operation and maintenance of different types of biogas plants.
- Apply the principles of thermochemical conversion processes including combustion, pyrolysis and gasification.
- Identify the concepts and observation methods to know the potential of solar energy at a given location
- Examine suitable locations and assess wind potential by interpreting wind characteristics and turbine features for power generation
- Analyze the technical and economic feasibility of biomass briquetting and cogeneration systems for energy applications.

UNIT I BIO RESOURCE**9**

Bio resource – origin – biomass types and characteristics – biomass conversion technology – biodegradation – steps in biogas production – parameters affecting gas production – types of biogas plants – construction details – operation and maintenance.

UNIT II BIO MASS CONVERSION TECHNIQUES**9**

Alcohol ethanol production – Acid hydrolysis – Enzyme hydrolysis – Methanol synthesis – Antibiotics – Enzymes – Principles of thermochemical conversion – Combustion – Pyrolysis – Gasification – Types of gasifiers.

UNIT III SOLAR ENERGY**9**

Solar radiation – Measurements of solar radiation and sunshine – Solar spectrum - Solar thermal collectors – Flat plate and concentrating collectors – Solar thermal applications – Solar thermal energy storage – Fundamentals of solar photo voltaic conversion – Solar cells – Solar PV Systems – Solar PV applications.

UNIT IV WIND ENERGY**9**

Wind data and energy estimation – Betz limit - Site selection for windfarms – characteristics - Wind resource assessment - Horizontal axis wind turbine – components - Vertical axis wind turbine – Wind turbine generators and its performance – Hybrid systems – Environmental issues - Applications.

UNIT V ENERGY AND ENVIRONMENT**9**

Principles of operation- chemical reaction- cleaning and cooling - Utilization- Improved wood burning stove - Energy plantations- Biomass briquetting - co generation- Impact on Environment – – Bioenergy policy

TOTAL: 45 PERIODSV. G. O. P.
CHAIRMAN
BoS (AGE)

17/4/26

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the biomass conversion technologies using engineering knowledge including thermochemical and biochemical processes
- Identify suitable methods of ethanol production through acid hydrolysis and enzymatic hydrolysis in the development of sustainable biofuel solutions
- Apply the principles of solar radiation, solar spectrum and measurement techniques for systematic data collection and investigation
- Examine wind energy systems using engineering knowledge by considering site selection criteria, wind resource assessment techniques and system characteristics.
- Analyze the environmental impacts of bioenergy systems and existing bioenergy policies in the context of sustainable development.

TEXTBOOKS:

1. Rai.G.D, “Non-Conventional Energy Sources”, Khanna Publishers, New Delhi, 6th Edition, 2023.
2. D.P. Kothari, K.C. Singal, Rakesh Ranjan, “Renewable Energy Sources and Emerging Technologies” Prentice Hall India Learning Private Limited, 3rd edition, 2022.

REFERENCES:

1. Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, Oxford University Press, 3rd Edition, 2012.
2. Sukhatme.S.P, “Solar Energy: Principles of Thermal Collection and Storage”, Tata McGraw, Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2009.
3. John Twidell and Tony Weir, “Renewable Energy Resources”, Taylor & Francis 2nd Edition, 2006.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	2	3	-	-	-	2	3	2
CO2	3	2	-	-	-	3	3	-	-	-	2	2	2
CO3	3	3	2	2	2	2	2	-	-	-	1	3	2
CO4	3	3	2	2	2	2	2	-	-	-	1	3	2
CO5	3	2	2	-	2	2	3	-	-	-	3	3	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Acquire knowledge about the stereoscopic vision and parallax bar
- Apply visual interpretation to satellite images for land use
- Use supervised and unsupervised classification techniques to interpret spatial data
- Analyze spatial data input and editing through digitizing to ensure accurate GIS datasets
- Examine DEM and watershed data using GIS to support terrain and hydrological assessments

LIST OF EXPERIMENTS:

1. Measurement of relief displacement using parallax bar
2. Stereoscopic vision test
3. Aerial photo interpretation - visual
4. Satellite images interpretation – visual
5. Supervised and Unsupervised classification practice
6. Database Management Systems
7. Spatial data input and editing - Digitising
8. Raster analysis problems – Database query
9. GIS application in DEM and watershed analysis
10. GIS application in rainfall-runoff modelling
11. GIS application in soil erosion modeling

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principles of relief displacement and stereoscopic vision to enhance photogrammetric interpretation skills
- Apply visual interpretation techniques to satellite images for land use, land cover and environmental assessment for developing decision-making skills
- Identify the GIS technique for supervised and unsupervised classification from spatial data
- Analyze the data inputs, structures and spatial interpolation to optimize GIS and reinforce engineering knowledge
- Analyze raster datasets using database queries to extract meaningful spatial information to support modern tool usage

REFERENCES:

1. Lillesand T M and Kiefer R W, “Remote Sensing and Image Interpretation”, John Wiley and Sons, New York, 7th Edition, 2015.
2. Ian Heywood, “An Introduction to GIS”, Pearson Education, New Delhi, 4th Edition, 2012.



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BoS (AGE) 17/4/26

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	-	1	1	1
CO2	3	3	2	2	2	-	-	-	-	-	1	1	1
CO3	3	3	3	2	2	-	-	-	-	-	1	1	1
CO4	3	3	2	2	2	-	-	-	-	-	1	1	1
CO5	3	3	2	2	2	-	-	-	-	-	1	1	1



CHAIRMAN
BoS (AGE)

List of Equipment's

Sl.No	Description of Equipment
1.	Aerial Photos – 10 Nos
2.	Satellite Images – 10 Nos
3.	Topo Maps – 10 Nos
4.	Packet Stereoscopic – 5Nos
5.	Parallax bar – 5 Nos
6.	Mirror Stereoscope – 5Nos
7.	Lighting table – 3 Nos
8.	QGIS software (Open Source)
9.	Computer – 36 Nos


CHAIRMAN
BoS (AGE) 17/4/26

OBJECTIVES:

The student should be made to:

- Apply the methods for testing biomass materials and developing biogas plants for efficient renewable energy production and utilization
- Identify the process of biomass briquette production and their use as solid biofuels for energy generation
- Apply the process of pyrolysis to produce tar from biomass under appropriate operating conditions
- Analyze wind speed and direction data from an automatic weather station and use it to predict wind energy potential
- Evaluate and compare the performance of solar thermal and solar photovoltaic systems

LIST OF EXPERIMENTS

1. Determination of Moisture, Volatile Matter, Ash and Fixed Carbon in Biomass
2. Study Domestic Biogas Plants (KVIC/Deenbandhu Models)
3. Study of Briquette Production from Biomass
4. Production of Tar using Pyrolysis Process
5. Study and Data Collection of Weather and Wind Data using Automatic Weather Station
6. Simulation study on Wind Energy Generator
7. Testing and Performance Analysis of Solar Water Heating System
8. Testing and Performance of Solar Drying System
9. Performance Testing of Solar Photovoltaic Water Pumping System
10. Simulation study on Solar PV Energy System

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply engineering knowledge of biomass characterization methods and biogas plant design principles for effective renewable energy production and utilization.
- Identify the principles, process steps and operational parameters involved in biomass briquetting through problem analysis for effective solid biofuel production.
- Apply the principles of pyrolysis for the development of solutions to produce tar from biomass by considering the operational steps
- Analyze wind speed and wind direction data obtained from an automatic weather station through investigation using appropriate methods for wind energy prediction
- Examine the performance characteristics of solar thermal and solar photovoltaic systems through problem analysis under varying solar radiation.



CHAIRMAN
BoS (AGE) 17/4/26

REFERENCES:

1. Khandelwal K C and Mahdi S S “Biogas Technology: a practical handbook” Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1989
2. Solanki CH “Solar Photovoltaics – Fundamentals, Technologies and Applications”, PHI Learning Pvt Ltd, New Delhi, 3rd Edition, 2015.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	2	2	3	-	1	-	-	3	2
CO2	3	3	2	2	3	-	2	2	1	-	-	3	3
CO3	3	3	2	2	2	2	3	-	1	-	2	3	3
CO4	2	2	2	-	2	2	3	2	3	2	2	2	3
CO5	2	2	2	2	2	-	2	-	2	-	3	2	2


CHAIRMAN
BoS (AGE)

List of Equipment's

Sl.No	Description of Equipment
1.	Hot air oven – 1 No
2.	Muffle furnace – 1 No
3.	Model of Biogas plant – 1 No
4.	Pyrolysis unit – 1 No
5.	Briquetting Machine (Lab Scale) – 1 No
6.	Automatic weather station – 1 No
7.	Solar water heater – 1 No
8.	Solar dryer – 1 No
9.	Solar PV module trainer kit – 1 No
10.	Solar PV water pumping system – 1 No



CHAIRMAN
BoS (AGE) 17/4/26

OBJECTIVES:

The students should be made to:

- Understand the process of identifying needs and converting them into well-defined engineering problems.
- Apply basic engineering fundamentals to attempt feasible solutions for the identified problem.
- Demonstrate standard practices for project report preparation and product development.
- Analyze problem-solving processes while working individually or as a team.
- Evaluate self-learning and research practices for continuous improvement and innovation.

GUIDELINES FOR REVIEW AND EVALUATION

The students in convenient groups of not more than 3 members have to design and fabricate an engineering system /component. Every project work shall have a guide who is the member of the faculty of the institution.

The students are required to design and fabricate the chosen system / components in the college and demonstrate its working apart from submitting the project report which will be reviewed and evaluated for internal assessment by a committee constituted by the Head of the Department.

At the end of the semester examination, the mini project work is evaluated based on oral presentation and the mini project report.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the problem specifications and methodology developed for the selected engineering problem.
- Demonstrate teamwork and responsibilities during project planning and execution.
- Implement ideas to develop a model that meets societal needs and industrial requirements.
- Analyze engineering problems by integrating professional skills, technical knowledge, and ethical values.
- Evaluate and present the project work effectively through technical reports, oral presentation and demonstration.



CHAIRMAN
BoS (AGE) 20/04/26

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	1	-	-	-	3	2	-	2	3	2
CO2	3	3	2	2	2	2	-	3	1	3	2	3	2
CO3	3	3	3	3	2	-	-	3	1	3	2	3	2
CO4	3	3	3	3	2	2	-	3	1	3	2	3	2
CO5	3	3	3	3	-	1	-	3	3	3	2	3	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand problems identified from the literature review and the fundamentals of research methodologies.
- Apply research methodologies to promote research findings and address identified problems.
- Implement engineering knowledge to identify real-time problems and propose suitable solutions.
- Analyze engineering problems to design an appropriate model for solving them.
- Evaluate and develop a new device or working model to effectively address the identified problem.

GUIDELINES FOR REVIEW AND EVALUATION

Students in a group of 3 shall work on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on three reviews by the review committee constituted by the Head of the Department. The project work is evaluated based on oral presentation and the final project report jointly by a team of examiners including one external examiner.

TOTAL: 300 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the specific problem and the conceptual solution developed for the identified engineering problem.
- Develop new ideas to build a physical model addressing the identified problem.
- Propose and implement suitable solutions for the problem based on industry needs.
- Analyze and demonstrate the performance of a working model or machine element.
- Evaluate challenging practical problems and formulate an appropriate methodology to obtain effective solutions.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	-	2	2	3	2	3	2	3	1
CO2	3	3	3	3	2	2	-	3	2	3	2	3	1
CO3	3	3	3	3	-	2	-	3	2	3	2	3	1
CO4	3	3	3	3	2	-	2	3	2	3	2	3	1
CO5	3	3	3	3	-	1	2	3	3	3	2	3	1



CHAIRMAN
BoS (AGE) 17/4/26

OBJECTIVES:

The students should be made to:

- Understand fundamental concepts of rheological properties and viscoelastic models of foods to measure texture and rheology
- Infer kinetics of microbial destruction and heat transfer mechanisms in various thermal processing
- Examine water activity and its impact on drying and freezing technology
- Apply the concepts of size reduction and mechanical separation in food process
- Analyze the leaching and extraction principles of foods and importance of non-thermal processing in foods

UNIT I FOOD RHEOLOGY**9**

Rheological properties of foods – Rheology of processed foods – Rheological methods – Measurements of rheological parameters – Rheological properties of fluid foods – granular and powder foods – solid foods. Viscoelastic foods – Viscoelastic models – Measurements of food texture – Instruments for rheological measurement.

UNIT II THERMAL PROCESSING OF FOODS**9**

Thermal destruction of microbial cells and bacteria spores – Kinetics of microbial death. Mechanisms of heat transfer in foods – blanching, pasteurization and sterilization. Thermal processing equipment and technology. Evaporation and concentration – heat exchangers.

UNIT III DRYING AND FREEZING TECHNOLOGY**9**

Water activity – drying rate curve – drying time prediction. Driers – tray, tunnel, puff, fluidized bed, spray, rotary drier – Freeze drying. Freezing – effects of freezing in foods. Principles of freezing – methods of freezing and equipments. Storage of frozen and dried products.

UNIT IV SIZE REDUCTION AND MECHANICAL SEPARATION**9**

Size reduction of solids – principle and laws of size reduction. Equipments used for size reduction. Mechanical separation – filtration, sedimentation – equipments used for filtration. Mixing and Agitation.

UNIT V LEACHING, EXTRACTION AND NON-THERMAL PROCESSING**9**

Leaching – principles of leaching – methods of leaching – equipments used for leaching process. Extraction – principles of extraction – methods of extraction – equipments used for extraction. Non-thermal processing of foods – types – applications.

TOTAL: 45 PERIODSCHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the properties of foods and their significance in food processing using engineering knowledge
- Apply thermal death kinetics D-value, Z-value and heat transfer principles to get solution for complex engineering problems using pasteurization and sterilization processes
- Determine drying rate curves and freezing kinetics to develop preservation techniques for food quality
- Examine mechanical separation methods and size reduction laws for efficient food processing
- Analyze non-thermal processing HPP, PEF and extraction systems to meet public needs for enhance nutrient retention and sustainability

TEXTBOOKS:

1. Toledo T R, Singh K R and Kong F. "Fundamentals of Food Process Engineering". Springer Pvt. Ltd, 4th Edition, 2018
2. Akash P and Mandhyan B L. "Food Process Engineering and Technology". New India Publication, 2020

REFERENCES:

1. McCable W L, Smith J C and Harriott P, "Unit Operations in Chemical Engineering", McGraw Hill Education India Pvt. Ltd., 7th Edition, 2017
2. Ashim K D, Jasim A, Rao M A and Rizvi S H, "Engineering Properties of Food". CRC Press Pvt. Ltd., 4th Edition, 2014

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	2	2	-	-	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Identify direct or indirect damages in perishable and durable commodities measures to control losses
- Understand on improved modern storage methods and structures
- Categorize packaging materials by function and correlate packaging strategies with environmental conditions
- Identify material properties of glass, plastics, metals and perform standard tests for quality control
- Explore special packing techniques for shelf-life extension for various food products

UNIT I SPOILAGE AND STORAGE 9

Direct damages, indirect damages of perishable and durable commodities – control measures – factors affecting storage – types of storage – Losses in storage and estimation of losses.

UNIT II STORAGE METHODS 9

Improved storage methods for grain – modern storage structures-infestation – temperature and moisture changes in storage structures – CAP storage – CA storage of grains and perishables construction operation and maintenance of CA storage facilities.

UNIT III FUNCTIONS OF PACKAGING MATERIALS 9

Introduction – packaging strategies for various environment – functions of package – packaging materials – cushioning materials – bio degradable packaging materials – shrink and stretch packaging materials.

UNIT IV	FOOD PACKAGING MATERIALS AND TESTING	9
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Introduction – paper and paper boards – flexible – plastics – glass containers – cans – aluminium foils – package material testing – tensile, bursting and tear strength.

UNIT V SPECIAL PACKAGING TECHNIQUES 9

Packaging equipment and machinery - Vacuum and gas packaging – aseptic packaging – retort pouching – edible film packaging – tetras packaging – antimicrobial packaging – stretch packaging. seal and shrink-packaging machine. form & fill sealing machine. aseptic packaging systems. Carton making machines.

TOTAL: 45 PERIODS

V. GORDON

CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify the causes of spoilage and quantify storage losses by the impact of humidity, temperature and pests on different commodities using engineering knowledge
- Determine the role of temperature and moisture in storage facilities to develop suitable solutions for engineering problems
- Apply the correct packaging strategies for various environment conditions to provide solution for real world problems
- Infer the suitability of glass and cans for acidic foods and other foods and test them to provide better solutions
- Categorize various packaging technologies available in market for packaging food products using modern tools

TEXTBOOKS:

1. Matteo Alessandro Del Nobile and Amalia Conte. "Packaging for Food Preservation", Springer, Edition 2013
2. Paine F A and Paine H Y, "Handbook of Food Packaging", Springer: 2nd Edition, 1992

REFERENCES:

1. Himangshu Barman, "Post Harvest Food grain storage", Agrobios (India). Jodhpur, 2008
2. Chakaraverty A, "Post harvest technology of cereals, pulses and oilseeds", Oxford & IBH publishing, New Delhi, 3rd Edition, 2018

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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CO2	3	3	1	1	1	-	2	-	-	-	2	2	2
CO3	3	2	1	1	-	2	2	2	-	-	2	2	2
CO4	3	2	2	2	1	2	2	2	-	-	2	2	2
CO5	3	2	1	1	1	2	2	2	-	-	2	2	2

V. Gope

CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Identify fruits and vegetables based on maturity indices and identify the storage method
- Understand the concepts of preservation and value addition of fruits and vegetables
- Analyze various preservation techniques to prevent nutrient loss during dehydration and drying
- Apply the concepts and utilization of minimal processing of foods
- Explore the applications of canning and bottling techniques in food industry

UNIT I HARVESTING, HANDLING AND STORAGE OF FRUITS AND VEGETABLES 9

Fruits and Vegetables: classification. nutritional profile – Harvesting of fruits and vegetables – Maturity indices – Post harvest physiology – Handling – Pre-cooling and storage – Storage under ambient condition. low temperature storage. Modified atmosphere storage – concepts and methods – gas composition – Changes during storage. Production and Utilization Scenario of fruits and vegetables in India.

UNIT II PRESERVATION OF FRUITS AND VEGETABLE BY VALUE ADDITION 9

Methods of fruit and vegetable preservation – Processing using sugar – Preparation of jam. jelly. marmalade. squash. RTS. crush. nectar. cordial. fruit bar. preserves. candies and carbonated. fruit beverages. Processing using salt – Brining – Preparation of pickles. chutney and sauces. ketchup. Machinery involved in processing of fruits and vegetables products.

UNIT III PRESERVATION BY DRYING AND DEHYDRATION 9

Drying and dehydration – Types of driers – Solar. cabinet. fluidized bed drier, spouted bed drier. heat pump drier and freeze drier – Applications – Preparation of product. Changes during drying and dehydration. Problems related to storage of dried and dehydrated products.

UNIT IV CANNING AND BOTTLING 9

Canning – principles. types of cans – preparation of canned products – packing of canned products – spoilage of canned foods. Bottling of fruit and vegetable. Precautions in canning operations. General considerations in establishing a commercial fruit and vegetable cannery. machineries involved in canning and bottling unit.

UNIT V ADVANCED TECHNIQUES IN FRUITS AND VEGETABLES 9

Thermal treatment effects in fruit and vegetable juices. effect of fruit and vegetable processing on product aroma. sensory evaluation in fruit and vegetable product development. ohmic heating. microwave dielectric heating recent trends in drying.

TOTAL: 45 PERIODS



CHAIRMAN

BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Relate the physiological properties of fruits and vegetables to provide a proper storage conditions using engineering knowledge
- Determine suitable value additive preservation techniques to obtain better-quality fruit and vegetable products
- Apply the different drying and dehydration techniques to extend the shelf-life of the product and provide a solution for nutrient deficient in real world
- Analyze canning principles to select appropriate can types and packaging methods for fruits and vegetables
- Examine the impact of thermal and non-thermal processing on juice quality to investigate sensory attributes

TEXTBOOKS:

1. Norman W D. "The Technology of Food Preservation". Medtech Publishers. 3rd Edition. 2017
2. Srivastava R P and Sanjeev kumar. "Fruit and Vegetable Preservation: Principles and Practices". CBS Publishers. 2017

REFERENCES:

1. Tandon G L. Siddappa G S and Gridhari Lal. "Preservation of Fruits and Vegetables". Bombay Popular Prakashan Publishers. 2009
2. NPCS Board. "Handbook of Fruits, Vegetables and Food processing with Canning and Preservation". Asia Pacific Business Press Inc.. 3rd Edition. 2012

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	-	-	-	-	2	2	2
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CO3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	-	-	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

24AG104PE	THERMAL OPERATIONS IN FOOD PROCESS	L	T	P	C
	ENGINEERING: THEORY AND APPLICATIONS	3	0	0	3

OBJECTIVES:

The student should be made to,

- Understand fundamental knowledge on food processing and preservation techniques
- Impart a thorough understanding of heat transfer mechanisms used in food processes
- Apply the engineering principles involved in drying, evaporation and distillation
- Designing thermal processing operations for safe and quality food
- Analyze process time calculations and understand equipment used in thermal processing

UNIT I FOOD PROCESSING AND HEAT TRANSFER INTRODUCTION 9

Fundamentals of food processing and preservation - Principles of food spoilage and preservation methods - Modes of heat transfer - Conduction, Convection and Radiation. One-dimensional conduction heat transfer - Cartesian coordinate systems - One-dimensional conduction in cylindrical coordinates

UNIT II TRANSIENT HEAT TRANSFER AND DRYING TECHNOLOGY 9

Transient heat conduction – Lumped system analysis, Semi-infinite solid and finite slab analysis - Application of Heisler charts - Basics of drying - Mechanism of drying - Types of dryers used in food industries - S Factors affecting drying rate and efficiency

UNIT III THERMAL PROCESSING AND EVAPORATION 9

Preservation by high temperature processing – Pasteurization, Sterilization - Design of thermal processes for food safety - Working principles of multiple-effect evaporators - Energy balance and economy of evaporators - Types of evaporators used in food industries

UNIT IV THERMAL PROCESS CALCULATIONS AND PHASE CHANGE HEAT TRANSFER 9

Process time calculations for thermal processing Cold point determination and heat penetration data – Boiling - Pool and nucleate boiling – Condensation - Filmwise and dropwise condensation - Heat transfer coefficients - boiling and condensation

UNIT V HEAT EXCHANGERS AND DISTILLATION 9

Classification and design of heat exchangers - Shell and tube, Plate heat exchangers - Forced and natural convection heat transfer in food systems - Introduction to distillation - Types of distillation used in food processing - Application of distillation in alcohol recovery, aroma concentration.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 14/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand and explain the fundamental principles of food processing and heat transfer using engineering knowledge
- Apply knowledge of conduction and transient heat transfer to real-world food processing scenarios
- Applying design principles of drying and thermal processing systems for different food materials
- Analyze process time and thermal load calculations essential for safe food processing to provide valid conclusions
- Examine the principles and operations of evaporators, heat exchangers and distillation units in the food industry to develop the systems using modern tools

TEXTBOOKS:

1. Heldman, D. R., & Lund, D. B. "Handbook of Food Engineering", CRC Press, 3rd edition 2018
2. Toledo, R. T. "Fundamentals of Food Process Engineering, Springer", 3rd Edition, 2012

REFERENCES:

1. Geankoplis, C. J. "Transport Processes and Separation Process Principles" Pearson Education India, 4th Edition, 2015
2. Susanta Kumar Das, Madhusweta Das, "Heat Transfer in Food Processing" CRC Press, 2019
3. Sahay, K. M., & Singh, K. K. "Unit Operations of Agricultural Processing" Vikas Publishing House Pvt. Ltd., 2nd Edition, 2004

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	2	3	3
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CO3	3	3	3	3	2	-	-	-	-	-	2	3	3
CO4	3	3	3	3	2	-	-	-	-	-	2	3	3
CO5	3	3	3	3	2	-	-	-	-	-	2	3	3



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Explain refrigeration principles, COP and components
- Apply cycle analysis of vapour compression and absorption systems using T-S and p-h charts
- Use psychrometric charts for cooling and heating load calculations
- Analyze air conditioning systems and their applications
- Design and evaluate cold storage and cold chain systems for food preservation

UNIT I REFRIGERATION PRINCIPLES AND COMPONENTS 9

Refrigeration principles - refrigeration effect coefficient of performance -units of refrigeration - Refrigeration components -compressor-classification-principle and working- condensers-types construction, principle and working. Evaporators - types-principle and working. Expansion device types construction, principle and working. Refrigerants properties classification comparison and advantages chloroflouro carbon (CFC) refrigerants - effect on environmental pollution - alternate refrigerants. Cascade refrigeration system.

UNIT II VAPOUR COMPRESSION AND VAPOUR ABSORPTION CYCLE 9

Simple vapour compression cycle - T-S diagram - p-h chart- vapour compression system-different types-vapour absorption cycle simple and practical vapour absorption system-advantages- ideal vapour absorption system- Electrolux refrigerator Lithium bromide refrigeration-construction and principles

UNIT III APPLIED PSYCHROMETRY 9

Principle and properties of psychrometry. Representation of various psychrometric processes on psychrometric chart and their analysis, by-pass factor, sensible heat factor, room sensible heat factor, equipment sensible heat factor, grand sensible heat factor, apparatus dew point, ventilation and infiltration, energy efficiency ratio. Use of psychrometric charts. Cooling and heating load calculations

UNIT IV AIR CONDITIONING SYSTEM 9

Air conditioning systems-equipment used-classification-comfort and Industrial air conditioning system- winter, summer and year- round air conditioning system- unitary and central air conditioning system- application of refrigeration and air conditioning-domestic refrigerator and freezer- ice manufacture.

UNIT V APPLICATIONS OF REFRIGERATION IN FOOD PROCESSING AND PRESERVATION 9

Cooling and heating load estimation, cold storage design, types of cooling plants for cold storage. Insulation properties and types of insulation material. Cold storage for milk, meat, fruits, vegetables, poultry and marine products. Refrigerated Transport. Handling and Distribution. Cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display. Sensors for cold storage management.

TOTAL: 45 PERIODS

V. Gopal
CHAIRMAN
BoS (AGE) 16/5/24

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain refrigeration principles, components and environmental impacts of refrigerants using engineering knowledge
- Describe vapor compression and absorption cycles using T-S & p-h charts and psychrometric processes
- Apply psychrometry properties of various factors on air conditioning systems to determine cooling and heating load calculations
- Analyze the principles of refrigeration and air conditioning in preserving foods using domestic and industrial refrigeration systems to meet the society need
- Examine appropriate cold storage system for ensuring the product quality and provide valid conclusions

TEXT BOOKS:

1. C. P. Arora, Refrigeration and Air Conditioning. Tata McGraw Hill Publishing Company Private Limited. New Delhi, 2017
2. Rajput R K. "Refrigeration and Air-Conditioning", S K Kataria Sons, 3rd Edition, 2015

REFERENCES:

1. J. B Hains, Automatic Control of Heating & Air conditioning. Tata McGraw Hill Publishing Company Private Limited, 2014
2. Langley and C. Billy, Refrigeration and Air conditioning, Ed. 3, Engle wood Cliffs (NJ), Prentice Hall of India, New Delhi, 2009

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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CO3	3	3	2	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	1	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	-	-	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the principles and practices involved in the design and selection of food processing equipment
- Develop knowledge on design parameters, material specifications and codes used in equipment fabrication
- Explain the design of various heat exchangers and perform related calculations
- Illustrate the design aspects of conveying systems, dryers and milling equipment used in the food industry
- Examine the design of cold storage systems and different types of dryers for perishable food products

UNIT I PROCESS EQUIPMENT DESIGN 9

Introduction on process equipment design, principles and selection of food processing equipment. Application of design engineering for processing equipment.

UNIT II DESIGN PROCEDURE 9

Design parameters and general design procedures. Material specification, Types of material for process equipment. Design codes. Pressure vessel design, Design of cleaners.

UNIT III HEAT EXCHANGER 9

Design of tubular heat exchanger, shell and tube exchanger and plate heat exchanger- Sterilizer and Retort - Problems on tubular heat exchanger, shell and tube type heat exchanger and plate heat exchanger.

UNIT IV CONVEYING SYSTEM 9

Design of belt conveyer, screw conveyor and bucket elevator, Design of dryers, Design of milling equipment.

UNIT V DESIGN OF DRYER AND FREEZER 9

Design of freezing equipment - Design of ice cream freezers - Refrigerated display system - Design of dryers - Design of tray dryer - tunnel dryer, fluidized dryer - spray dryer, vacuum dryer - freeze dryer and microwave dryer.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principles of process equipment design and selection in food processing industries using engineering knowledge
- Apply design parameters, material specifications and codes for pressure vessels and cleaners
- Construct appropriate solutions for real-world food processing problems through the application of different types of heat exchangers
- Examine the design of various agricultural material handling equipment to provide a suitable solution
- Analyze drying and freezing equipment used in various stages of food processing to develop engineering components

TEXTBOOKS:

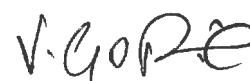
1. George S and Athanasios E K. "Hand book of Food Processing Equipment". Springer Nature Publications. 2nd Edition. 2016
2. Rajput R K. "Heat and Mass Transfer". S Chand Publications. 7th Edition. 2019
3. R. T. Toledo. "Fundamentals of Food Process Engineering". 3rd edition. Springer. 2012

REFERENCES:

1. Akash P and Mandhyan B L. "Food Process Engineering and Technology". New India Publication. 2020
2. McCabe W L. Smith J C and Harriott P. "Unit Operations in Chemical Engineering". McGraw Hill Education India Pvt. Ltd.. 7th Edition. 2017
3. C. W. Hall and D. C. Davis. "Processing Equipment for Agricultural Products". 2nd Edition. AVI Publisher. 2017

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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CO3	3	3	3	2	1	-	-	-	-	-	2	2	2
CO4	3	3	3	2	1	-	-	-	-	-	2	2	2
CO5	3	3	3	2	1	-	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

**24AG107PE NOVEL TECHNOLOGIES FOR FOOD PROCESSING
AND SHELF LIFE EXTENSION**

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the fundamental principles and processes involved in food processing and preservation
- Use the modern food processing technology to process various food products
- Apply advanced storage and packaging technologies to ensure food safety and quality
- Examine methods of oil extraction, processing and shelf-life extension
- Explore on novel food products, nutraceuticals and functional foods

UNIT I BASIC PRINCIPLES OF FOOD PROCESSING 9

Introduction to food processing – Basic principles and methods, water activity and food stability – Preservation and quality – Structure and function relationship – Chemical changes in food during processing – Browning reactions – Protein interactions – Carbohydrate interactions.

UNIT II MODERN FOOD PROCESSING TECHNOLOGIES 9

High pressure processing and Membrane technologies – Food irradiation – RF and Microwave heating – Super critical fluid extraction – Food extrusion technology – RTE snack foods – Textured vegetable protein – Rice and dal analogues – Hurdle technology concept – Natural antimicrobials and bacteriocin – Freeze drying.

UNIT III STORAGE AND PACKAGING TECHNOLOGY 9

Controlled atmosphere storage of food grains – Ozone microwave treatment for disinfestations of grains – Modified atmosphere packaging – Active packaging – Edible coating of fruits and vegetables.

UNIT IV OIL EXTRACTION AND SHELF LIFE EXTENSION 9

Extraction and processing of oil – Mechanical expellers – Solvent extraction – Refining – Hydrogenation – Winterization – Shelf life extension of oils using natural antioxidants – Concepts and Measurement of rancidity.

UNIT V NOVEL FOOD PRODUCTS 9

Microencapsulation of bioactive – Technology of oil powder – Functional foods and Nutraceuticals – Ready-to-eat therapeutic food – Micronutrient fortified high energy bar – Gluten free bread – Carbonated cereal beverage.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to.

- Understand the basic principles and chemical changes involved in food processing to preserve the food products using engineering knowledge
- Apply various modern food processing technologies like HPP, irradiation and extrusion to improve shelf life of food
- Construct suitable packaging techniques to extend the shelf life of the products
- Analyze perfect oil extraction and shelf-life extension method in processing of food products to meet the specific needs of society
- Examine the development of novel food products such as functional and therapeutic foods using modern tools.

TEXTBOOKS:

1. Avantina Sharma, "Textbook of Food Science and Technology". 3rd Edition, CBS Publications, 2019
2. Vikas Nanda and Savita Sharma, "Novel Food Processing Technologies". New India Publishing Agency, 2017

REFERENCES:

1. Bhatia S C, "Handbook of Food Processing Technology: Vol-2". Atlantic Publisher, 2008
2. Srilakshmi B, "Food Science". New Age International Publishers, 2018

Mapping of COs with POs and PSOs

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CO4	3	3	2	2	1	-	-	-	-	-	2	2	2
CO5	3	3	3	2	1	-	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand the principles of QC, QA and food safety management systems
- Apply HACCP principles in evaluating biological hazards in dairy foods
- Examine microbiological risks in dairy products through various factors
- Assess the microbial quality of water, air and environment in dairy plants
- Formulate hygiene and food safety plans integrating global standards and innovative detection techniques

UNIT I INTRODUCTION**9**

Consumer Awareness about Microbiological Quality and Safety of Dairy Foods: Changing scenario: Concepts of quality control, quality assurance and food safety. Global quality and food safety standards, integrated food law, its main features and functions.

UNIT II FOOD SAFETY MANAGEMENT SYSTEM IN DAIRY INDUSTRY**9**

Introduction to Food Safety Management System: Concepts of Quality Management System (QMS)–ISO: 9000:2000: Principles of QMS: Standard requirements for QMS: HACCP concept and principle with special reference to biological hazards in dairy foods. TQM tools and techniques.

UNIT III MICROBIOLOGICAL RISK ANALYSIS**9**

Risk assessment, risk management and risk communication: risk profiling of dairy products: Microbiological criteria and two and three class sampling plan / guidelines: Bio-safety concepts in handling of dairy pathogens and setting up of a microbiological/ pathogen lab in a dairy plant. Rapid Enumeration Techniques: Enumeration principles and procedure for rapid detection of predominant hygiene indicator organisms and pathogens like E. coli (E. coli 0157:H7), Salmonella, Shigella, Staphylococcus aureus, Bacillus cereus and Listeria monocytogenes.

UNIT IV BIOSENSORS IN DAIRY QUALITY ANALYSIS**9**

Role of Biosensors for monitoring hygiene and safety of dairy foods: Detection of antibiotic residues in milk – Delvo SP, MDR test, penzyme test, charm assay, lateral flow assay (ROSA test) etc. Detection of aflatoxins, pesticides other inhibitors etc. and their public health importance in dairy foods.

UNIT V PLANT AND EQUIPMENT HYGIENE**9**

Concepts of hygiene and sanitation, microbial quality of water and environmental hygiene in dairy plant, chlorination of dairy water supply, quality of air, personnel hygiene, treatment and disposal of waste water and effluents.

TOTAL: 45 PERIODS


 CHAIRMAN
 BoS (AGE) 16/02/25

OUTCOMES:

On successful completion of this course, the students will be able to.

- Explain concepts of microbiological quality, food safety and global food safety standards in dairy foods by applying engineering principles
- Apply HACCP principles and risk assessment techniques to identify and control biological hazards in dairy foods using engineering knowledge
- Demonstrate the application of sampling plans, biosafety concepts and pathogen profiling to address microbiological risks in dairy products
- Investigate the effectiveness of sanitation, hygiene practices, water and air quality control and effluent treatment in dairy plants
- Analyze requirements for a microbiological and pathogen laboratory in a dairy plant and propose a layout with appropriate biosafety measures

TEXTBOOKS:

1. Manoranjan Kalia. "Food analysis and Quality control". Kalyani Publishers. Ludhiana. 2002
2. Mehta, Rajesh and J. George. "Food Safety Regulation Concerns and Trade: The Developing Country Perspective". Macmillan. 2005
3. P.A. Luning, F. Devlieghere and R. Verhe. "Safety in the agri - food chain". Wageningen Academic Publishers. Netherland. 2006

REFERENCES:

1. Leo and M.L. Nollet. "Handbook of food analysis - Methods and Instruments in applied food analysis". CRC Press.. 2015
2. J. Andres Vasconcellos. "Quality Assurance for the Food Industry: A Practical Approach". 1st Edition. CRC Press. New York. 2003

Mapping of COs with POs and PSOs

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CO4	2	2	2	2	1	-	3	-	-	-	2	2	2
CO5	2	2	2	2	1	-	2	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the stages of the ergonomic design process
- Identify principles of workstation and equipment design
- Determine human information processing and mental workload
- Describe ergonomic considerations for manual handling
- Analyze case studies and recent trends in ergonomics

UNIT I FUNDAMENTALS OF ERGONOMICS 9

Introduction and scope of ergonomics - Principles of human-centred design - Historical development and applications in various industries - Ergonomic design process and its stages - Benefits and challenges of ergonomic implementation.

UNIT II ANTHROPOMETRY AND PHYSICAL ERGONOMICS 9

Anthropometric data - types and applications - Principles of workstation and equipment design - Physical Ergonomics – concepts and applications - Musculoskeletal considerations in task design - Tools and techniques for physical ergonomic assessment.

UNIT III COGNITIVE ERGONOMICS 9

Principles and scope of cognitive ergonomics - Human information processing and mental workload - Decision making, memory and attention in work design - Human-machine interaction and interface design - Error prevention and cognitive task analysis.

UNIT IV ENVIRONMENTAL AND BIOMECHANICAL ASPECTS 9

Physical environment factors - lighting, noise, temperature, vibration - Impact of environment on human performance - Fundamentals of biomechanics - Posture, force, and movement analysis - Ergonomic considerations for manual handling and repetitive tasks.

UNIT V OCCUPATIONAL ERGONOMICS AND APPLICATIONS 9

Occupational ergonomics - scope and significance - Ergonomics in industrial workplaces - Application in agriculture, healthcare and IT sectors - Ergonomic interventions for safety and productivity - Case studies and recent trends in ergonomics.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the engineering concepts of ergonomics, human factors, and design principles to know the stages of the ergonomic design process
- Apply the principles of workstation and equipment design to solve complex ergonomic challenges with consideration for sustainable development
- Develop ergonomic solutions for manual handling tasks, integrating public health, safety, and environmental considerations
- Examine human information processing and mental workload using research-based methods, data modelling, and interpretation to draw valid conclusions
- Analyze ergonomic case studies and recent trends to propose improvements in equipment design and workplace systems

TEXTBOOKS:

1. Johl S S and Kapur T R. "Fundamentals of Farm Business Management", Kalyani publishers, Ludhiana, 2019
2. Subba Reddy S, Raghu Ram P, Neelakanta Sastry T V and Bhavani Devi I. "Agricultural Economics", Oxford and IBH Publishing Co Pvt Ltd, 02nd Edition, New Delhi, 2019

REFERENCES:

1. Raju V T. "Economics of Farm Production & Management", Oxford and IBH Publishing Co Pvt Ltd, New Delhi, 2017
2. Subba Reddy S and Raghu Ram P, "Agricultural Finance and Management", Oxford and IBH Publishing Co Pvt Ltd., New Delhi, 2018

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	2	-	-	-	-	2	2	2
CO2	3	3	2	2	1	2	-	-	-	-	2	2	2
CO3	3	3	2	2	1	2	-	-	-	-	2	2	2
CO4	3	3	2	2	1	2	-	-	-	-	2	2	2
CO5	3	3	2	2	1	2	-	-	-	-	2	2	2


CHAIRMAN
BoS (AGE)

24AG202PE	FARM POWER AND MACHINERY MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand modern trends, principles, and procedures in farm power systems
- Determine inventory control techniques and spare parts management
- Implement dynamic programming methods for mechanization planning problems
- Analyze case studies of mechanization planning in India
- Examine overall economic feasibility and optimization of mechanization systems

UNIT I INTRODUCTION TO FARM POWER AND DESIGN CRITERIA 9

Modern trends – principles – procedures – fundamentals and economic considerations for design and development of farm power and machinery systems – Reliability criteria in design and its application. Traditional Mechanization – indigenous farm tools, animal power system and role in sustainable farming practices.

UNIT II MACHINERY MANAGEMENT 9

Maintenance and scheduling of operations – Replacement of old machines – repair and maintenance of agricultural machinery – inventory control of spare parts – work study – productivity study. First order Markov chains – applications – forecasting – problems of inventory control – modelling of workshop processes – quality control.

UNIT III SYSTEMS APPROACH 9

System approach in farm machinery management – application of programming techniques to the problems of farm power and machinery selection. Network Analysis – Transportation, CPM – PERT – dynamic programming.

UNIT IV PLANNING OF MACHINERY 9

Time and motion study. Man-machine task system in farm operations – planning of work system in agriculture. Computer application in selection of power units – optimize mechanization system. Mechanization Planning – case studies of agricultural mechanization in India.

UNIT V ECONOMIC ANALYSIS 9

Energy conservation – performance and power analysis – cost analysis of machinery – fixed cost and variable costs – effect of inflation on cost – selection of optimum machinery – replacement criteria – Break-even analysis – reliability – cash flow problems and mechanization planning.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AGE) 16/12/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand farm power and machinery systems using engineering knowledge of modern trends, principles, and procedures
- Identify inventory control techniques and spare parts management to optimize machinery operations
- Develop solutions using dynamic programming for efficient mechanization planning.
- Examine mechanization case studies in India using research-based methods, modelling and data interpretation
- Analyze the economic feasibility and overall performance of mechanization systems considering sustainability and efficiency

TEXT BOOKS

1. Bainer R, Kepner R A and Barger E L. "Principles of Farm Machinery", John Wiley and Sons, New York, 3rd Edition, 2005
2. Smith H P, "Farm Machinery and Equipment", Read Book Publishers, New Delhi, 6th Edition, 2011

REFERENCES:

1. Donnell Hunt and David Wilson. "Farm Power and Machinery Management". Waveland Pr. Inc., 11th Edition, 2015
2. Sharma D N and Mukesh S. "Farm Power and Machinery Management". Jain Brothers, 2nd Edition, 2021
3. Michael and Ojha, "Principles of Agricultural Engineering". Volume -1, Jain Brothers publications, 16th Edition, New Delhi, 2025

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	1	-	-	-	-	-	2	2	2
CO2	3	3	3	2	1	-	-	-	-	-	2	2	2
CO3	3	3	3	2	1	-	-	-	-	-	2	2	2
CO4	3	3	3	2	1	1	-	-	-	-	2	2	2
CO5	3	3	3	2	1	1	-	-	-	-	2	2	2


CHAIRMAN
BoS (AGE)

24AG203PE

MECHANICS OF TILLAGE AND TRACTION

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the principles of soil cutting for different tillage tools
- Apply force analysis for soil-engaging tools
- Examine traction models for predicting performance
- Demonstrate tyre testing methods and procedures
- Analyze geostatistical methods for soil property mapping

UNIT I MECHANICS OF TILLAGE 9

Introduction to mechanics of tillage tools – engineering properties of soil – principles and concepts – stress strain relationship.

UNIT II DYNAMICS OF TILLAGE 9

Design of tillage tools principles of soil cutting – design equation – force analysis – application of dimensional analysis in soil dynamics – performance of tillage tools.

UNIT III TRACTION 9

Introduction to traction and mechanics – off road traction – mobility – traction model – traction improvement – traction prediction.

UNIT IV TYRES 9

Tyre size – tyre lug geometry – their effects – tyre testing.

UNIT V APPLICATIONS 9

Soil compaction and plant growth – variability and geo statistics – application of GIS in soil dynamics.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Recognize knowledge of mathematics, natural science, and agricultural engineering fundamentals to explain soil cutting principles for different tillage tools
- Interpret engineering problems through force analysis of soil-engaging tools with focus on sustainability
- Identify solutions for predicting traction performance using suitable traction models with attention to public health, safety, and environmental factors
- Demonstrate tyre testing using research-based methods and data analysis
- Analyze modern engineering tools like geostatistical modelling to map soil properties, ensuring valid conclusions and sustainability



CHAIRMAN
BoS (AGE) 16/01/25

TEXTBOOKS:

1. J B Liljedahl, P K Turnquist, D W Smith, & M Hoki. "Tractors and their Power Units". 4th Edition. American Society of Agricultural Engineers, ASAE, 2004
2. Bainer R, Kepner R A and Barger E L. "Principles of Farm Machinery". John Wiley and Sons, New York, 3rd Edition, 2005

REFERENCES:

1. 1. Donnell Hunt and David Wilson. "Farm Power and Machinery Management". Waveland Pr. Inc., 11th Edition, 2015
2. Sharma D N and Mukesh S, "Farm Power and Machinery Management". Jain Brothers, 2nd Edition, 2021

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	1	1	-	-	-	-	2	2	2
CO2	3	3	3	2	2	1	-	-	-	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	2	2	2
CO4	3	3	3	2	1	-	-	-	-	-	2	2	2
CO5	3	3	3	2	2	1	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand knowledge on land development and sowing machinery
- Apply weeder and boom sprayer while adhering to safety guidelines and standard procedures
- Identify threshing operation and different types of harvester to minimize crop loss
- Assess performance difference types of horticultural equipments
- Analyze residue management for different types of crops

UNIT I LAND DEVELOPMENT AND SOWING MACHINERY 9

Machinery for land development. Tractor operated and self-propelled machines for laying drainage system – sub surface drip laying machines – subsoiler – trenchers – laser levelers. Spading machine – Coir pith applicator. Pneumatic planters – air seeders – direct paddy seeders – direct paddy cum daincha – tractor operated rhizome planter.

UNIT II INTERCULTURE AND PLANT PROTECTION MACHINERY 9

Weeder - Inter and Intra row – Laser weeder. Machines for plant protection – pneumatic, thermal type sprayers – aero/drone spraying – other methods of spraying – electrostatic charging – air sleeve boom sprayer – disinfection of seed beds by micro waves and other methods. Safety aids for operator – advances in plant protection method.

UNIT III THRESHERS AND HARVESTERS 9

Field plot machinery threshing operation – Principles and construction – sugar cane harvester – Cotton stripper. Combine harvesting and its importance. Principles and construction – Starw combine – Groundnut combine – Maize combine – pulse combine.

UNIT IV HORTICULTURAL EQUIPMENT 9

Vegetable cultivation – nursery machinery – tray seeders – grafting machines – vegetable transplanters. Machinery for planting crops on raised beds – mulch laying – planting machines. Harvesting of vegetable and fruit crops

UNIT V RESIDUE MANAGEMENT MACHINERY 9

Machines for residue management – cereals – millets – horticultural – sugarcane crop. Silage and hay making machines for special crops.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course the students will be able to,

- Recognize knowledge of engineering fundamentals and natural sciences to know land development and sowing machinery
- Apply potential operational hazards in weeder and boom sprayer use by reviewing safety guidelines and standard procedures to ensure sustainable application practices
- Select suitable threshing operation and different types of harvester to minimize crop loss
- Assess efficiency performance of difference types of horticultural equipments providing valid conclusions
- Compare residue management for different types of crops using data analysis and performance modelling

TEXTBOOKS:

1. Jagdishwar Sahay, "Elements of Agricultural Engineering". Standard Publishers Distributors, Delhi, 2022
2. Michael and Ojha, "Principles of Agricultural Engineering". Volume - 1. Jain Brothers publications, 16th Edition, New Delhi, 2025
3. T Senthilkumar, B Suthakar and G Manikandan "Text book of Farm Machinery and Equipment – Principles and Practice". Brillion Publishing, 2024

REFERENCES:

1. Kepner R A, "Principles of farm machinery", CBS Publishers and Distributers, Delhi, 3rd Edition, 2005
2. Smith H P, "Farm Machinery and Equipment", Read Book Publishers, New Delhi, 2011

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	-	-	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Study the working of Gasoline fuel injection systems and SI combustion
- Know the working of Diesel fuel injection systems and CI combustion.
- Understand the sources, formation mechanisms, and control methods for engine emissions.
- Discuss the various alternative fuel resources and their utilization techniques in IC engines.
- Acquire knowledge of advanced combustion modes and future powertrain systems

UNIT I SPARK IGNITION ENGINES**9**

Air-fuel Mixtures –Automotive Engine Air-fuel Mixture Requirements – Stages of combustion – Normal and Abnormal combustion, Factors affecting knock, Effects of compression ratio – Combustion chambers – Fuel injection systems – Mono-point, Multipoint & Direct injection.

UNIT II COMPRESSION IGNITION ENGINES**9**

Stages of combustion – Factors affecting the delay Period – Phenomenon of Knock – Fuel Spray behaviour – Spray structure and spray penetration – Air motion - Swirl Measurement – Direct and Indirect Combustion Chambers – Turbo charging –Variable Geometry turbochargers.

UNIT III EMISSION FORMATION AND CONTROL**9**

Formation of Carbon Monoxide, Unburnt hydrocarbon, Oxides of Nitrogen, Smoke and Particulate matter – Methods of controlling emissions – In-cylinder treatments – After treatment systems – Three Way Catalytic converter, Selective Catalytic Reduction, De-NOx Catalyst, Diesel Oxidation Catalyst and Particulate Traps – Methods of emission measurement – Emission norms and Driving cycles National and International Emission Standards.

UNIT IV ALTERNATIVE FUELS**9**

Need for alternate fuels – Alcohol, Vegetable Oils, Bio -Gas, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits – Utilisation Methods - Engine Modifications and Emissions – Performance Characteristics of SI and CI engines.

UNIT V ALTERNATE COMBUSTION AND POWERTRAIN SYSTEM**9**

Homogeneous Charge Compression Ignition (HCCI) – Low Temperature Combustion - Reactivity Controlled Compression Ignition (RCCI) – Gasoline Compression Ignition – Lean Burn Engine – Stratified Charge Engine – Surface Ignition Engine — Spark Assisted HCCI - Hybrid Electric Vehicles– Fuel Cells.

TOTAL: 45 PERIODS


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(BoS/ MECH) 28/10/28

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the working of injection systems and SI combustion.
- Explain the working of Combustion chamber and CI combustion.
- Identify the source and the mechanism of emission formation and control methods.
- Select the various alternative fuels and their adaptability in internal combustion (IC) engine applications.
- Apply advanced combustion modes and assess future powertrain systems.

TEXT BOOKS:

1. V. Ganesan, "Internal Combustion Engines", Vth Edition, Tata McGraw Hill, 2012.
2. John B. Heywood, "Internal Combustion Engines Fundamentals", McGraw-Hill, 2nd Edition 2018.

REFERENCES:

1. B.P. Pundir, "IC Engines Combustion & Emission", Narosa Publishing House, 2nd Edition, 2014.
2. Richard Stone, "Introduction to Internal Combustion Engines", Palgrave Macmillan Limited, 4th Edition, 2012.
3. Eran Sher, Handbook of Air Pollution from Internal Combustion Engines: Pollutant Formation and Control, Academic Press, 1998.
4. K.K. Ramalingam, "Internal Combustion Engine Fundamentals", SciTech Publications, 2011.
5. R.B. Mathur and R.P. Sharma, "Internal Combustion Engines", Dhanpat Rai & Sons, 2007

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	-	-	-	-	-	-	2
CO2	2	2	2	2	-	-	-	-	-	-	2
CO3	2	2	1	1	-	-	-	-	-	-	2
CO4	2	2	1	1	-	2	-	-	-	-	1
CO5	2	2	-	-	-	2	-	-	-	-	-


CHAIRMAN
(BoS / MECH)

24AG205PE	ADVANCES IN FARM MACHINERY AND POWER	L	T	P	C
	ENGINEERING	3	0	0	3

OBJECTIVES:

The student should be made to:

- Interpret constraints in adopting advanced mechanization technologies
- Demonstrate strategies to design machinery that minimizes field compaction
- Analyse the cost economics and selection farm machinery
- Examine different algorithmic approaches for robot-based precision farming
- Application of the robots in agriculture

UNIT I AGRICULTURAL MECHANIZATION 9

Advances in mechanization as applicable to Indian context – outlook for improving agricultural productivity – reducing cost. Mechanization – applications of advanced mechanization technologies and constraints in adaptability.

UNIT II SUSTAINABLE MECHANIZATION 9

Sustainable mechanization management – Management of compaction of agricultural fields. Strategies – develop machinery – systems. Concept of Controlled Traffic Farming (CTF) systems.

UNIT III FARM MACHINERY MANAGEMENT 9

Management and performance of power – operator – labour. Economic performance of machinery – field capacity – field efficiency – factors affecting field efficiency. Selection of optimum machinery – replacement criteria. Break-even analysis. Reliability and cash flow problems.

UNIT IV AGRICULTURAL ROBOTICS 9

Introduction to Robotics-classification with respect to geometrical configuration (anatomy). selection based on the agriculture application. Board sensors – computing hardware – algorithms and software. Manipulator type ag-robots.

UNIT V APPLICATIONS OF ROBOTS IN AGRICULTURE 9

Application of site-specific management - nutrient management. agrochemicals and fertilizer management. weeds management – Application of drone – pesticides/ nutrient spraying. environmental monitoring – Yield monitoring and mapping – soil sampling and analysis.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/20

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the constraints affecting the adoption of advanced mechanization technologies using engineering knowledge
- Formulate field compaction problems by reviewing research literature for sustainable mechanization practices
- Interpret machinery and systems with cost analysis that minimize field compaction, meeting identified agricultural needs while considering public health, safety and environmental sustainability
- Demonstrate renewable energy systems in agriculture by performing modelling to determine the EROEI and provide valid conclusions
- Analyze application of robots in agriculture for improved agricultural productivity

TEXTBOOKS:

1. Dr. B. Rajyalakshmi. "Transforming Farms: Role and Impact of Agricultural Mechanization". Book Publications, New Delhi. 1st Edition, 2024
2. José Pérez-Alonso. "Agricultural Structures and Mechanization". MDPI, Basel, Switzerland. 1st Edition, 2022
3. Donnell Hunt and David Wilson. "Farm Power and Machinery Management". Waveland Pr. Inc., 11th Edition, 2015

REFERENCES:

1. Sharma D N and Mukesh S. "Farm Power and Machinery Management". Jain Brothers, 2nd Edition, 2021
2. Nikku, S. B. 2020. Introduction to Robotics – Analysis, Control, Applications, 3rd edition, John Wiley & Sons Ltd., 2020

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	2	2	2
CO5	3	3	3	2	1	1	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Study the forces acting on different tillage implements
- Identify power requirements for efficient and sustainable operation
- Build seed drills, drum seeders and unmanned seeders
- Assess performance in lab and field for sustainable farming
- Develop harvesting and threshing machinery for different crops

UNIT I – DESIGN AND ANALYSIS OF TILLAGE IMPLEMENTS**9**

Components and working principles of tillage implements – active, passive, and combination types – Forces acting on passive tillage implements – Design of passive tillage implements – Components and forces in active tillage implements – Design of active tillage implements – Concept – classification – power requirement of combination tillage implements – Design of combination tillage implements (offset disk harrow, rota-cultivator).

UNIT II – PERFORMANCE EVALUATION OF TILLAGE IMPLEMENTS**9**

Measurement of performance parameters – passive, active and combination tillage implements – Problem solving related to performance evaluation of tillage implements – Power requirement calculations for different tillage implements.

UNIT III – DESIGN AND DEVELOPMENT OF SOWING EQUIPMENT**9**

Types of sowing equipment and their components – Working principles of different metering mechanisms – BIS standards for sowing equipment design – Design of tractor-drawn seed drill and multi-crop drum seeder – Design of unmanned paddy seeder for wetlands – Concepts for precision seed dropping.

UNIT IV – LIQUID CHEMICAL APPLICATORS: DESIGN AND TESTING**9**

Performance evaluation parameters of sowing equipment – Need, classification and components of liquid chemical applicators – Working principles of knapsack sprayer and tractor-drawn boom type sprayer – Design of tractor-drawn boom type sprayer (tank, agitator, pump, atomizer selection) – Droplet size determination – factors affecting distribution – Testing of liquid chemical applicators in laboratory and field – Design of solar-operated unmanned boom type sprayer.

UNIT V – DESIGN OF HARVESTING AND THRESHING MACHINERY**9**

Machinery for harvesting forage and cereal crops – components and cutting mechanisms – Design of tractor-drawn rota-slasher – Electric vertical conveyor reaper – onion and cabbage harvesters – Basic mechanisms and classification of threshing equipment – Power requirement – factors affecting thresher performance – Design of spike tooth type thresher – solar-operated wire-loop paddy thresher.

TOTAL: 45 PERIODS

V. G. P.
CHAIRMAN
BoS (AGE)

16/10/25

OUTCOMES:

On successful completion of this course the students will be able to,

- Understand engineering knowledge to know the parts, functions, and uses of tillage implements
- Interpret the power requirements of various tillage implements by applying principles of farm power, mechanics and sustainable machinery selection
- Apply BIS standards, ergonomic principles, and environmental sustainability concepts to develop sowing equipment for diverse crop types
- Assess optimal design parameters and material selection for tractor-drawn boom sprayers using modelling, experimental testing, and data interpretation
- Examine thresher performance by assessing operational factors using data, with emphasis on efficiency, safety, and environmental impact

TEXTBOOKS:

1. Smith H P, "Farm Machinery and Equipment", Read Book Publishers, New Delhi, 2011
2. Bainer R, Kepner R A and Barger E L, "Principles of Farm Machinery", John Wiley and Sons, New York, 3rd Edition, 2005

REFERENCES:

1. Srivastava A K, Goering C E, Rohrbach R P, and Buckmaster D R, "Engineering Principles of Agricultural Machines", ASABE Publication, 2012
2. Michael A M, and Ojha, T P, "Principles of Agricultural Engineering", Vol. 1, Jain Brothers 16th Edition, 2025

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	1	-	-	-	-	2	2	3
CO2	3	3	3	2	3	1	-	-	-	-	2	2	3
CO3	3	3	3	2	3	1	-	-	-	-	2	2	3
CO4	3	3	3	2	3	1	-	-	-	-	2	2	3
CO5	3	3	3	2	3	1	-	-	-	-	2	2	3


CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand tractor mechanization policies, standards, and future developments
- Apply test codes for tillage and sowing equipment to ensure standard compliance
- Identify laboratory and field testing methods for various intercultural implements
- Demonstrate test reports to assess efficiency and suitability of harvesting machinery
- Analyzes safety precautions during machinery operation and maintenance

UNIT I TESTING AND EVALUATION OF AGRICULTURAL TRACTORS 9

Testing and evaluation system in India – Agricultural machinery situation – Mechanization policy – future prospects – standardization efforts – type of testing systems – General regulations – terminology – basic measurements, speed, fuel consumption, smoke density and power measurement – test items, specifications checking – PTO performance test – engine test, drawbar performance test – field test procedures – interpretation of results - Power tillers testing, Test code for tractor.

**UNIT II TESTING AND EVALUATION OF TILLAGE AND SOWING
EQUIPMENT 9**

Testing of tillage machinery – laboratory test (hardness testing, chemical analysis) – field test (rate of work, quality of work, draft measurement, fuel consumption) – seed drill – laboratory test (seed drill calibration) – field checking and field tests, Test code for tillage and sowing equipment.

UNIT III TESTING AND EVALUATION OF INTERCULTURAL EQUIPMENT 9

Testing and evaluation of weeders – types of tests for weeder – types of pesticide application equipment – terminology – types of tests for sprayers – testing methods – types of tests for duster – testing methods – Test code for intercultural equipment.

UNIT IV TESTING AND EVALUATION OF THRESHERS AND HARVESTERS 9

Laboratory and field testing of reaper - thresher and chaff cutter, Laboratory and field testing – straw combine – combine harvester, Review and interpretation of test reports, Importance and need of standardization of components of agricultural equipment – Test code for harvesting equipments.



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UNIT V SAFETY TESTING OF AGRICULTURAL MACHINERY**9**

Types of agricultural machinery accidents – causes of agricultural machinery accidents – technical measurements for ensuring safety – methods of safety testing – ROPS and FOPS – safety precautions.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Understand engineering knowledge of mechanization policy, standardization processes, and future trends in tractor development to develop solutions
- Apply compliance using test codes for tillage and sowing equipment
- Formulate field testing for intercultural implements
- Examine harvesting machinery through test report interpretation
- Apply safety principles for machinery operation and maintenance

TEXTBOOKS:

1. Metha M L, Verma S R, Mishra S K and Sharma V K, "Testing and Evaluation of Agricultural Machinery", Daya Publishing House, India, 2016
2. Indian Standards Test Codes related to tractors, power tillers and agricultural implements

REFERENCES:

1. Anonymous, 1983, "RNAM Test Codes & Procedures for Farm Machinery", Technical Series 12
2. Nebraska Tractor Test Codes for Testing Tractors, Nebraska, USA

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	1	1	-	-	-	-	2	2	2
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CO3	3	3	3	2	1	1	-	-	-	-	2	2	2
CO4	3	3	3	2	1	1	-	-	-	-	2	2	2
CO5	3	3	3	2	1	1	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand hydrological cycle and various forms of precipitation, abstraction losses, and their measurements.
- Learn methods to estimate runoff and hydrograph analysis.
- Infer the causes, classification, and estimation of floods and droughts.
- Gain knowledge about reservoir design, sedimentation, and erosion.
- Outline groundwater flow mechanisms and artificial recharge methods.

UNIT I PRECIPITATION AND ABSTRACTIONS**9**

Hydrological cycle - Types of precipitation - Forms of precipitation -Measurement of Rainfall - Probable maximum precipitation - Spatial analysis of rainfall data using Thiessen and Isohyetal methods - Interception - Evaporation measurements and evaporation suppression - Infiltration-Horton"s equation - double ring infiltrometer.

UNIT II RUNOFF**9**

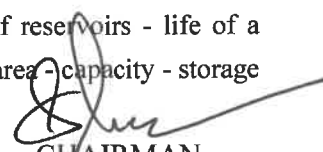
Introduction, necessity, runoff- different methods, factors affecting runoff- Runoff estimation - Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation - Infiltration indices - Stage discharge relationships flow measurements - Hydrograph - Unit Hydrograph - Synthetic Unit Hydrograph.

UNIT III FLOOD AND DROUGHT**9**

Flood frequency studies - Natural Disasters - Flood Estimation - Frequency analysis - Flood control - Flood routing - Reservoir flood routing-Definitions of droughts - Meteorological - hydrological and agricultural droughts - IMD method - NDVI analysis - Drought Prone Area Programme (DPAP).

UNIT IV RESERVOIRS**9**

Classification of reservoirs - storage zones of a reservoir - fixing capacity of reservoirs - life of a reservoir - General principles of design - site selection - spillways - elevation - area - capacity - storage


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BoS (CIVIL) 28/10/25

estimation - sedimentation - life of reservoirs - rule curve - Estimation of Erosion/sediment yield using SWAT Model.

UNIT V GROUNDWATER AND MANAGEMENT

9

Source of groundwater - Classification and types - Types of aquifers and properties of aquifers-governing equations - Flow through layered soil - steady and unsteady flow - artificial recharge - RWH in rural and urban areas - GEC norms - Environmental Protection Law - Environmental Constraints on water Resources Development.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Demonstrate precipitation, observations and hydrological process
- Summarize catchment and runoff characteristics
- Interpret flood and drought frequency studies in natural disaster
- Develop the reservoir characteristics and its general principles of design
- Examine groundwater management

TEXTBOOKS:

1. Subramanya K., "Engineering Hydrology", McGraw Hill Education (India) Private Limited, 4th Edition, 2013.
2. Jaya Rami Reddy P., "Hydrology", Laxmi Publications, 3rd Edition, 2016.

REFERENCES:

1. David K. Todd and Larry W. Mays "Groundwater Hydrology", Wiley India Pvt Ltd, 3rd Edition, 2011.
2. VenTe Chow, Maidment, David R. Maidment and Lorry W. Mays, L.W. "Applied Hydrology", McGraw Hill Education, 1st Edition, 2017.
3. Raghunath H.M., "Hydrology: Principles, Analysis, Design, New Age International Private Limited, 4th Edition, 2022.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	-	-	-	-	-	-	-
CO2	3	2	3	3	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-
CO4	3	3	3	3	1	-	-	-	-	-	-
CO5	2	3	3	2	1	-	-	-	-	-	-


CHAIRMAN
BoS (CIVIL)

OBJECTIVES:

The student should be made to:

- Explain hydrological processes and precipitation measurement methods
- Identify the runoff, infiltration indices and hydrograph parameters
- Apply the watershed characteristics and geomorphological parameters for watershed analysis
- Implement hydrological models for water resources assessment
- Evaluate flood and drought causes, impacts and management strategies

UNIT I RAINFALL AND HYDROLOGIC PROCESSES 9

Hydrological cycle – Precipitation and its forms – Rainfall measurement and estimation of mean rainfall – Rainfall frequency analysis – Mass curve – Hyetograph – Depth-Area-Duration curve – Intensity-Frequency-Duration curve – Interception – Infiltration: factors influencing, measurement and indices – Evaporation: estimation and measurement.

UNIT II RUNOFF AND HYDROGRAPH ANALYSIS 9

Runoff: factors affecting, measurement – Stage-discharge rating curve – Estimation of peak runoff rate and volume – Rational method – Cook's method – Hydrograph: components, base flow separation, unit hydrograph theory, S-curve, synthetic hydrograph, applications and limitations – Exercises on runoff hydrograph, unit hydrograph and synthetic hydrograph – Computation of infiltration indices, peak runoff and runoff volume by various methods.

UNIT III WATERSHED CHARACTERISTICS AND GEOMORPHOLOGY 9

Drainage basin characteristics – Geomorphology of watersheds: linear, aerial and relief aspects – Stream order – Drainage density – Stream frequency – Exercises on computation of geomorphic parameters of watersheds.

UNIT IV HYDROLOGICAL MODELING 9

Concept, protocol and classification of hydrological models – Model calibration – Validation – Sensitivity analysis – Applications in water resources assessment.

UNIT V FLOODS AND DROUGHT MANAGEMENT 9

Floods: terms and definitions – Headwater flood control methods – Flood peak, design flood, computation of probable flood – Flood routing: channel and reservoir routing – Drought: classification, causes, impacts – Drought management strategies.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/20

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the hydrological processes including precipitation, infiltration and evaporation using engineering knowledge
- Apply empirical methods like Rational Method and Cook's Method to estimate peak runoff and volume.
- Utilize the runoff estimation and hydrograph analysis methods in design and development of solutions
- Examine the hydrological models for water resource assessment to conduct investigation on complex problems
- Analyze flood and drought management strategies through problem analysis

TEXTBOOK:

1. Raghunath H M, "Hydrology: Principles, Analysis and Design", New Age International Publishers, 4th Edition, 2022
2. Subramanya K, "Engineering Hydrology", McGraw Hill Education, 6th Edition, 2024
3. Shaw E M, "Hydrology in Practice", CRC Press, 4th Edition, 2011

REFERENCES:

1. Subramanya K, "Flow in Open Channels", McGraw Hill Education, 4th Edition, 2015
2. Viessman W Jr and Lewis G L, "Introduction to Hydrology", Pearson Education, 5th Edition, 2003

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	1	2	2
CO2	3	3	2	2	-	-	-	-	-	-	1	2	2
CO3	3	3	2	2	-	-	-	-	-	-	1	2	2
CO4	3	3	2	2	-	-	-	-	-	-	1	2	2
CO5	3	3	2	2	-	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand the occurrence, variability and exploration methods of groundwater along with aquifer characteristics and potential assessment
- Utilize groundwater well design, construction and monitoring methods for effective development.
- Implement techniques for pollution control, rehabilitation and saltwater management in aquifers.
- Examine groundwater management strategies including recharge, pumping and conjunctive use for irrigation.
- Differentiate legal, policy and diagnostic aspects of groundwater development for sustainable practices.

UNIT I GROUND WATER OCCURRENCE 9

Occurrence of groundwater, temporal and spatial variability of groundwater, methods for groundwater exploration – determination of aquifer parameters, pumping tests, assessment of groundwater potential.

UNIT II WELL CONSTRUCTION 9

Groundwater structures, groundwater development and utilization, types of water wells – design and construction of water wells, drilling methods, well development – well maintenance and rehabilitation – groundwater monitoring, monitoring wells, design and construction of monitoring wells.

UNIT III GROUNDWATER POLLUTION 9

Groundwater development and quality considerations, groundwater contamination, sources and causes of groundwater pollution, contaminated systems and their rehabilitation – groundwater bioremediation – management of salt water ingress in inland and coastal aquifers.

UNIT IV GROUNDWATER MANAGEMENT 9

Management of declining and rising water table, Natural and artificial groundwater recharge – Groundwater recharge basins and injection wells – Groundwater management in irrigation command, conjunctive water use, water lifting – Different types of pumps, selection of pumps, cost of groundwater pumping, comparative economics of surface and groundwater use for irrigation.

UNIT V GROUNDWATER DEVELOPMENT POLICIES 9

Major issues related to groundwater development and management in India – Legal aspects of groundwater exploitation - Diagnostic survey of sick wells/tube wells and their rehabilitation.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the temporal and spatial variability of groundwater resources through effective problem analysis.
- Apply engineering knowledge to utilize well design, drilling, development and monitoring methods for efficient groundwater structures.
- Implement appropriate techniques to apply problem analysis in controlling groundwater pollution, bioremediation and saltwater intrusion.
- Examine groundwater management strategies such as recharge methods, pump selection and conjunctive use to support the design and development of solutions for irrigation.
- Differentiate legal, policy and diagnostic measures in groundwater development to analyze sustainable water management practices using engineering knowledge.

TEXTBOOKS:

1. Walton W C, "Groundwater Resource Evaluation", Mc Graw Hill, New York 1976
2. Karanth K R, "Groundwater Assessment, Development and Management", Tata-Mc Graw Hill, New Delhi 1987
3. Michael A M and Khepar S D, "Water Well and Pump Engineering", Tata- Mc Graw Hill, New Delhi 1989

REFERENCES:

1. Giordano M and Villholth K G, "The Agricultural Groundwater Revolution" CABI Head Office Volume 3, 2007
2. Madan Kumar Jha and Stefan Peiffer, "Applications of Remote Sensing and GIS Technologies in Groundwater Hydrology: Past, Present and Future". Bay CEER Bayreuther Forum Ökologie, Volume 112, 2006

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	2	2
CO2	3	3	3	2	2	-	-	-	-	-	1	2	2
CO3	3	3	3	2	2	-	-	-	-	-	1	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	2
CO5	3	3	3	2	2	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand types of water pollutants, regulatory standards and key water quality parameters
- Identify the principles and operations of physico-chemical treatment processes
- Apply aerobic and anaerobic biological treatment methods for wastewater management
- Examine the operational guidelines and troubleshooting practices for treatment systems
- Analyze case studies to identify treatment issues and recommend effective solutions

UNIT I INTRODUCTION TO WATER POLLUTION AND MANAGEMENT SYSTEMS

10

Classification of pollutants – Regulatory standards – Necessity and essential requirements for water management systems – Fundamentals of reactor engineering – Self-purification of natural waters – Quantity estimation of major pollutants: TSS, VSS, TDS, Alkalinity, DO, pH, BOD, COD, TOC, nitrogen, phosphorous and microbial numbers – Modelling and relationships among BOD, COD, TOC and nutrients.

UNIT II PHYSICO-CHEMICAL OPERATIONS AND PROCESSES

9

Screens – Grit chambers – Skimming tanks – Theory of sedimentation – Primary sedimentation – Equalization – Neutralization – Dissolved air flotation – Coagulation – Flocculation – Flocculation–sedimentation combined processes.

UNIT III BIOLOGICAL WASTEWATER TREATMENT: FUNDAMENTALS AND AEROBIC SYSTEMS

9

Fundamentals and principles of biological wastewater treatment – Aerobic wastewater treatment systems: Suspended growth processes – Attached growth processes – Hybrid aerobic treatment systems.

UNIT IV ANAEROBIC AND ADVANCED BIOLOGICAL TREATMENT SYSTEMS

8

Advanced anaerobic wastewater treatment systems – Emerging biological processes for nutrient removal – Tertiary treatment systems.

UNIT V OPERATION, TROUBLESHOOTING AND CASE STUDIES

9

Guidelines for operation of wastewater treatment plants – Common troubleshooting strategies – Case studies of water and wastewater treatment systems.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

After successful completion of this course students are expected to be able to:

- Explain pollutants, standards and water management using engineering knowledge
- Select the physico-chemical treatment processes with engineering knowledge
- Apply biological treatment in design and development of solutions
- Utilize the operational and troubleshooting methods to conduct investigation on complex problems
- Analyze advanced processes and case studies through problem analysis

TEXTBOOKS:

1. Metcalf and Eddy, "Wastewater Engineering: Treatment and Resource Recovery", McGraw Hill Education, 5th Edition, 2014
2. Hammer M J and Hammer M J, "Water and Wastewater Technology", Pearson, 8th Edition, 2015

REFERENCES:

1. Droste R L and Gehr R, "Theory and Practice of Water and Wastewater Treatment", Wiley, 2nd Edition, 2018
2. Grady C P L, Daigger G T, Love N G and Filipe C D M, "Biological Wastewater Treatment", CRC Press, 3rd Edition, 2011

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	-	-	-	-	1	2	2
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CO3	3	3	3	2	-	-	-	-	-	-	1	2	2
CO4	3	3	3	2	-	-	-	-	-	-	1	2	2
CO5	3	3	3	2	-	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Interpret natural resources, carrying capacity and sustainability
- Plan the integrated resource and watershed management approaches
- Implement EIA methods and laws for environmental impact studies
- Classify the RS and GIS for agriculture and water monitoring
- Examine EMS, ICT and modeling tools for effective natural resource management

UNIT I NATURAL RESOURCES AND SUSTAINABILITY 9

Concept of resource, carrying capacity, ecological foot print and sustainability: sustainable portfolios, building sustainable business, natural resources of different geographical regions.

UNIT II INTEGRATED NATURAL RESOURCES MANAGEMENT 9

Integrated natural resources management such as land, water, forest – need to sustain agriculture productivity. Participatory Rural Appraisal – ranking technique – water shed management – National Water Policy.

UNIT III ENVIRONMENT IMPACT ASSESSMENT 9

The need for EIA – Indian policies – EIA method – EIA process and project cycle - environmental laws and protection acts.

UNIT IV REMOTE SENSING AND GIS FOR AGRICULTURE 9

Agriculture land monitoring – land use land cover mapping – crop condition monitoring – crop pest/ disease detection – crop system analysis – soil moisture status monitoring – water resources command area management.

UNIT V TECHNOLOGIES AND TOOLS FOR NRM 9

Technologies for sustainable natural resource management – Environmental Management Systems (EMS) – ICT tools for resource monitoring and decision-making – Modeling tools for resource assessment and management.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/24

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain concepts of natural resources, carrying capacity and sustainability by applying engineering knowledge
- Plan the land, water and forest management through engineering knowledge for sustainable productivity
- Implement EIA processes and environmental laws for project evaluation in design and development of solutions
- Examine the remote sensing and GIS tools to conduct investigation on complex problems in agricultural resource monitoring
- Evaluate sustainable technologies, EMS and ICT tools through problem analysis for effective NRM solutions

TEXTBOOKS:

1. Brantely Kelley, "Natural resources management for a sustainable future", Larsen and Keller education June 2019
2. Jaswant Singh and Girish Pandey, "Natural Resources Management and Conservation", Kalyani Publishers, 2015

REFERENCES:

1. Lenka S, Lenka N K, Kundu S and Subba Rao A. "Climate Change and Natural Resources Management", Nipa Publishers, 2013
2. Mukesh K S and Pant R M. "Natural Resource Management: Policy, Environment and Technological options", Lakshmi Publishers and Distributors, 2021

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	1	2	2
CO2	3	3	2	2	2	-	-	-	-	-	1	2	2
CO3	3	3	2	2	2	-	-	-	-	-	1	2	2
CO4	3	3	2	2	2	-	-	-	-	-	1	2	2
CO5	3	3	3	3	3	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Explain the principles of irrigation channel design and land levelling methods
- Apply the command area concepts, water duty and rotational irrigation systems
- Compute water requirements using rainfall, canal and groundwater data
- Evaluate water balance and performance indicators to optimize conjunctive water use
- Evaluate the farm drainage systems using appropriate methods and materials

UNIT I	DESIGN OF IRRIGATION CHANNELS	9
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Design of Erodible and Non-Erodible, Alluvial channels – Kennedy's and Lacey's Theories–
Materials for Lining watercourses and field channel – Water control and Diversion structure –
Design – Land grading–Land Leveling methods.

UNIT II COMMAND AREA 9

Command area – Concept – CADA Programmes in Tamil Nadu – Duty of water – expression –relationship between duty and delta – Warabandhi – water distribution and Rotational Irrigation System – case studies.

UNIT III CONJUNCTIVE USE OF SURFACE AND GROUNDWATER 9

Availability of water – Rainfall, canal supply and groundwater – Irrigation demand – water requirement and utilization – Prediction of over and underutilization of water – Dependable rainfall – Rainfall analysis by Markov chain method – Probability matrix.

UNIT IV WATER BALANCE 9

Groundwater balance model – Weekly water balance – Performance indicators – Adequacy, Dependability, Equity and efficiency – conjunctive use plan by optimization – Agricultural productivity indicators – Water use efficiency.

UNIT V	DESIGN OF FARM DRAINAGE SYSTEM	9
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Agricultural drainage – types and Concept - Issues; Principles of flow through soils - Darcy's law - drainage coefficient -Infiltration theory; Surface drainage - methods - design - Random drainage - Herringbone - Grid iron types -Design of Open Drains. Steady State flow - Dupit's Forchimer assumptions -Hooghoudt's equation: Methods and Design - Mole drains - Drainage wells – Pipe materials - Problem soils - Leaching Requirements; Land reclamation – methods of Reclamation.

TOTAL: 45 PERIODS

V. G. P. D.
CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the design principles of irrigation channels, command area concepts and water distribution systems using engineering knowledge
- Identify the conjunctive use of surface and groundwater and water balance through engineering knowledge
- Apply design procedures for farm drainage systems in design and development of solutions
- Analyze the rainfall, groundwater models and performance indicators to conduct investigation on complex problems
- Examine the water use efficiency and reclamation strategies through problem analysis

TEXTBOOKS:

1. Michael A M. "Irrigation Theory and practice". Vikas publishing house, New Delhi, 2008
2. Garg S K, "Irrigation Engineering and Hydraulic Structures". Khanna Publishers, New Delhi, 2015

REFERENCES:

1. Asawa G L, "Irrigation and Water Resources Engineering", New Age International Publishers, New Delhi, 2013
2. Israelson, "Irrigation principles and practices". John Wiley and Sons, New York, 2002
3. Modi P N, "Irrigation Water Resources and Water Power Engineering". Standard Book House, New Delhi, 11th Edition, 2019

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	-	-	-	-	-	-	1	2	2
CO3	3	3	3	2	-	-	-	-	-	-	1	2	2
CO4	3	3	3	2	-	-	-	-	-	-	1	2	2
CO5	3	3	3	2	-	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand the need for efficient irrigation and various irrigation methods
- Identify the components and design parameters of micro irrigation systems
- Apply design concepts to develop layout plans and calculate flow requirements
- Infer the operation and maintenance practices for effective MI system performance
- Analyze system performance and propose improvements based on case studies

UNIT I INTRODUCTION TO MICRO IRRIGATION 9

Need for efficient irrigation – Water scarcity and agricultural challenges – Classification of irrigation methods: surface, sprinkler, micro irrigation – Types of micro irrigation: drip, micro-sprinklers, bubblers – Advantages and limitations – Global and Indian adoption trends.

UNIT II COMPONENTS AND DESIGN PRINCIPLES 9

Water sources and pumping units – Filtration systems: screen, disk, sand media, hydrocyclone – Pipes and fittings: mainlines, sub-mains, laterals – Emitters: types, discharge rates, spacing – Valves and control devices: pressure regulators, air release valves, solenoid valves – Design parameters: crop water requirement, flow calculations, hydraulic principles, uniformity – Layout planning and preparation of design maps.

UNIT III INSTALLATION, OPERATION AND MAINTENANCE 9

Installation procedures, testing and commissioning – Operation protocols: irrigation scheduling, seasonal adjustments – Maintenance practices: flushing, filter cleaning, emitter care – Troubleshooting: common problems and remedies – Economic considerations: cost-benefit analysis, payback period – Government subsidy schemes: PMKSY and state-level programs.

UNIT IV ADVANCEMENTS AND AUTOMATION 9

Automation: timers, controllers, solenoid valves – Sensor-based irrigation: soil moisture, weather sensors – PLC and IoT applications – Fertigation: principles, equipment, scheduling, compatibility – Renewable energy integration: solar-powered irrigation – GIS and remote sensing applications in irrigation planning.

UNIT V SUSTAINABILITY, FUTURE TRENDS AND CASE STUDIES 9

Water use efficiency and climate resilience – Recycled water use: quality standards, treatment – Environmental impacts and resource sustainability – Precision agriculture integration – Emerging technologies: AI applications, self-flushing emitters, biodegradable pipes – Case studies of operational micro irrigation systems.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 11/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the need, types, advantages and limitations of micro irrigation using engineering knowledge
- Develop the components and design principles of micro irrigation systems through engineering knowledge
- Apply installation, operation and maintenance practices in design and development of solutions
- Examine the fertigation and sensor-based technologies to conduct investigation on complex problems in irrigation management
- Analyze sustainability aspects, future trends and case studies through problem analysis for improved water use efficiency

TEXT BOOKS:

1. Michael A M, "Irrigation: Theory and Practice", Vikas Publishing House Pvt. Ltd., New Delhi, 2016.
2. Keller J and Bliesner R D, "Sprinkler and Trickle Irrigation", CBS Publishers and Distributors, New Delhi, 2000.

REFERENCES:

1. Nakayama F S and Bucks D A, "Trickle Irrigation for Crop Production: Design, Operation and Management", Elsevier, 2013.
2. Narayanamoorthy A, "Drip Irrigation in India: Developments and Challenges", Academic Foundation, New Delhi, 2012.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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CO3	3	3	3	2	2	2	-	-	-	-	1	2	2
CO4	3	3	3	2	2	2	-	-	-	-	1	2	2
CO5	3	3	3	2	2	2	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Interpret the principles, hydrological aspects and classification of reservoirs, dams and farm ponds
- Identify the design features, seepage behavior and failure mechanisms in embankment structures
- Utilize stability analysis methods and slope protection measures to enhance embankment safety
- Implement construction, operation and maintenance practices for sustainable water harvesting systems
- Assess the economic viability, seepage/evaporation control techniques and alternative water harvesting structures for project optimization

UNIT I FUNDAMENTALS OF RESERVOIR AND FARM PONDS 9

Introduction to rainwater harvesting – Hydrological aspects of water harvesting – Identification of areas suitable for water harvesting – Reservoirs, dams and farm ponds – Earthen embankments and their classification.

UNIT II DESIGN ASPECTS OF RESERVOIR AND FARM POND STRUCTURES 9

Components of embankments – Basic design concepts – Design of dam components – Seepage through dams – Estimation of seepage flow – Determination of seepage line location – Flow nets – Seepage analysis methods – Failures and damages in embankment structures – Control of seepage using drainage systems.

UNIT III STABILITY ANALYSIS AND SLOPE PROTECTION 9

Stability analysis methods for reservoir and farm pond embankments – Stability analysis I to IV – Slope protection techniques – Failure modes and preventive measures.

UNIT IV CONSTRUCTION, OPERATION AND MAINTENANCE 9

Construction methods for reservoirs and farm ponds – Operation and maintenance of water harvesting systems – Water quality considerations for harvested water – Environmental aspects related to water harvesting structures.

UNIT V ECONOMIC AND MISCELLANEOUS CONSIDERATIONS 9

Economic analysis of reservoirs and farm ponds – Economic indicators for evaluating water harvesting projects – Methods to reduce seepage and evaporation losses – Runoff inducement techniques – Other types of water harvesting structures.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

After successful completion of this course students are expected to be able to:

- Explain the hydrological principles, site selection criteria and classifications of reservoirs, dams and farm ponds
- Solve the design considerations, seepage control measures and failure modes of embankment structures
- Apply stability analysis methods and slope protection techniques to ensure the safety of embankments
- Implement construction, operation and maintenance practices for effective water harvesting and quality management
- Evaluate economic feasibility, seepage/evaporation loss reduction methods and alternative water harvesting structures for optimal project planning

TEXTBOOKS:

1. Panda S N, Sahoo B C and Sudheer K P. "Reservoir and Farm Pond Design". ICAR Book 2020
2. Garg S K, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 30th Edition, 2020
3. Michael A M, "Irrigation: Theory and Practice", Vikas Publishing House, 2nd Edition, 2008

REFERENCES:

1. Punmia B C and Lal P B B, "Irrigation and Water Power Engineering", Laxmi Publications, 2016
2. Bhagat R M and Ambast S K, "Water Harvesting and Management: A Training Manual", ICAR – Indian Agricultural Research Institute, 2015

Mapping of COs with POs and PSOs

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CO4	3	3	3	2	-	-	-	-	-	-	1	2	2
CO5	3	3	3	2	-	-	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the types of biomass, fuel forms and key characterization parameters involved in biomass energy systems
- Apply appropriate methods for operating and maintaining biogas systems, utilizing biogas efficiently and managing slurry enrichment and usage in practical applications
- Identify key combustion parameters such as air requirement, temperature zones and pollutant formation to evaluate the efficiency of biomass thermal systems
- Examine various gasifier types, pyrolysis techniques and product recovery methods to select or optimize appropriate thermochemical systems for biomass
- Analyze cogeneration configurations and waste heat recovery systems to assess energy efficiency, suitability and integration with biomass energy systems

UNIT I BIOMASS CHARACTERIZATION**9**

Biomass – types – fuels from biomass. Terms and units used in biomass production. Biomass fuel characterization – physical, chemical and thermal – energy release. Supply chain – harvesting / collection – transportation and processing. Briquetting – types – pelletizing.

UNIT II BIOCHEMICAL CONVERSION**9**

Biochemical degradation – factors affecting biogas production – types of biogas plants – construction details – operation and maintenance – utilization of biogas – slurry handling, utilization and enrichment – high rate biomethanation process – landfills – bioethanol production from edible sources and non-edible sources, process description, distillation, combined biogas and bioethanol production.

UNIT III THERMO CHEMICAL CONVERSION BY COMBUSTION**9**

Thermochemical degradation. Stoichiometric air requirement – Combustion process – chemistry of combustion – combustion zones – emissions. Cofiring of biomass. Incinerators – layout. Combustion of wastes and MSW. Wood burning stoves – types – operation.

**UNIT IV THERMOCHEMICAL CONVERSION BY GASIFICATION AND
PYROLYSIS****9**

Biomass gasification – chemistry of gasification – types of gasifier – Gas cleaning and conditioning - utilization of producer gas - emissions – commercial gasifies plants Pyrolysis – product recovery – types - biochar – bio oil – operation – recovery.


CHAIRMAN
BoS (AGE) 16/10/25

UNIT V COGENERATION AND WASTE HEAT RECOVERY**9**

Cogeneration technologies – cycles – topping – bottoming – problems – applications – selection. Waste heat recovery – plate heat exchangers - shell and tube heat exchangers – waste heat boilers – heat pumps – thermic fluid heaters – selection of waste heat recovery.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Understand the fundamentals of biomass resources, fuel types, characterization methods and supply chain involved in biomass fuel production
- Utilize biochemical conversion methods to develop and operate biogas production systems, plan for effective biogas utilization
- Identify thermochemical conversion techniques, including combustion principles, air requirements, emission control methods and the practical use of incinerators
- Categorize gasification and pyrolysis processes by evaluating gasifier types, chemical reactions, product recovery methods and system selection criteria
- Examine cogeneration and waste heat recovery systems to assess their efficiency, application suitability and integration into biomass energy systems

TEXTBOOKS:

1. Jhon Twidell, "Renewable Energy Resources". Taylor & Francis Ltd. 4th Edition. 2021
2. Mathur, A N and Rathore N S. "Biogas production Management and Utilisation". Himanshu Publication. New Delhi. 1993

REFERENCES:

1. Srivastava, P K, Shukla, B D and Ojha, T P. "Technology and application of biogas", Jain Brothers, New Delhi, 1993
2. Rao S and B B Parulekar, "Energy Technology – Non conventional, Renewable and Conventional", Khanna Publishers, New Delhi, 1994

Mapping of COs with POs and PSOs

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CO3	3	3	3	2	-	2	2	-	-	-	2	2	1
CO4	3	3	3	2	-	1	2	-	-	-	2	2	1
CO5	3	3	3	2	-	2	3	-	-	-	2	2	1

V. Gope
CHAIRMAN
BoS (AGE)

24EE606PE

**SOLAR ENERGY ENGINEERING AND
TECHNOLOGY**
(Common to AGE, EEE and Mech)

L T P C

3 0 0 3

COURSE OBJECTIVES:

The students should be made to:

- Understand the principles of solar energy conversion and methods for measuring and estimating solar radiation under various climatic conditions.
- Design standalone and grid-connected photovoltaic systems.
- Analyze the components and semiconductor physics of grid-connected PV systems,
- Evaluate the fundamentals, performance, testing and applications of solar air heaters and concentrating solar collectors
- Describe different thermal energy storage techniques and solar energy applications

UNIT I INTRODUCTION 9

Energy scenarios – Overview of solar energy conversion devices and applications – Physics of propagation of solar radiation from the sun to the earth – Sun earth geometry, Extra-terrestrial and terrestrial radiation – Solar energy measuring instruments – Geometry, angles and measurement – Estimation of radiation under different climatic conditions – Estimation of total radiation.

UNIT II PHOTOVOLTAIC SYSTEMS 9

Semiconductor physics – Fundamentals of solar PV cells – Performance characterization of PV cells – Photovoltaic modules and arrays – Components of standalone PV system – Design of standalone PV system – Functioning and components of PV system – Design of a grid connected PV system – Performance analysis of a grid connected PV system.

UNIT III GRID CONNECTED PV SYSTEMS 9

Schematics semiconductor physics – Component semiconductor physics – Charge conditioners semiconductor physics – Interface components – Balance of system components – PV system in buildings.

UNIT IV SOLAR AIR HEATERS AND CONCENTRATIC COLLECTOR 9

Basics and performance analysis of solar air heaters – Testing and application of solar air heaters – Fundamentals of concentrating collectors – Concentrating collector technologies and working principle – Concentrating collector.

UNIT V THERMAL ENERGY STORAGE AND APPLICATIONS 9

Sensible heat, latent heat and thermo-chemical energy storage – Solar pond – Solar pond power plant design – Emerging technologies – Solar energy applications in cooking, desalination, refrigeration and electricity generation – Tutorial: COP of VARS and performance analysis of PVT collector.

TOTAL: 45 PERIODS

P. S. Prasad
CHAIRMAN

BoS (EEE) 16/10/25

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain solar radiation fundamentals, sun–earth geometry and measurement techniques
- Construct standalone and grid-connected photovoltaic systems based on design principles and application requirements
- Examine the semiconductor physics and components of grid-connected PV systems
- Assess the operation, performance, testing procedures and applications of solar air heaters and concentrating solar collectors
- Design basic layouts of solar pond power plant considering thermal energy extraction and conversion

TEXT BOOK:

1. Tiwari G N, “Solar Energy, Fundamentals, Design, Modeling and Applications”, Narosa, 2013.

REFERENCES:

1. Sukhatme S P and Nayak J K, “Solar Energy: Principles of Thermal Collection and Storage”, Tata McGraw Hill, 2006.
2. Duffie J A and Beckman W A, “Solar Engineering of Thermal Processes”, John Wiley, 2006.
3. Yogi Goswami D, Kreith Frank and Jan F Kreider, “Principles of Solar Engineering”, Taylor and Francis, 2000.
4. Green M A, “Third Generation Photovoltaics: Advanced Solar Energy Conversion”, Springer, 2003.
5. Goetzberger A and Hoffmann V U, “Photovoltaic Solar Energy Generation”, Springer Verlag, 2010.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	–	–	–	–	–	–	2
CO2	3	3	3	2	–	2	–	–	–	–	2
CO3	3	3	3	2	–	2	–	–	–	–	2
CO4	3	3	3	3	–	–	–	–	–	–	2
CO5	3	3	3	3	–	2	–	–	–	–	2


CHAIRMAN
BoS (EEE)

OBJECTIVES:

The student should be made to,

- Explain the fundamentals of wind energy, including wind characteristics and measurement techniques
- Describe the aerodynamic principles and various wind turbine types and control strategies
- Demonstrate the working of wind turbine components like generators, yaw/pitch systems, and control units
- Apply SCADA and monitoring tools to analyze turbine performance and fault codes
- Analyze the performance of wind turbines under varying wind and grid conditions to ensure efficiency and compliance

UNIT I WIND ENERGY FUNDAMENTALS AND WIND MEASUREMENTS 9

Wind Energy Basics, Climate change and need, Advantages of wind energy, Potential of Wind Energy worldwide, Estimating wind speed and power, Wind resource estimation, Wind Properties, Wind Mechanics, Class of wind turbines, Atmospheric Boundary Layers, Turbulence, Instrumentation for wind measurements, Wind data analysis, tabulation, Betz's Limit, Turbulence Analysis.

UNIT II AERODYNAMICS THEORY AND WIND TURBINE TYPES 9

Airfoil terminology, Blade design, Rotor performance and dynamics, Balancing technique (Rotor and Blade), Types of loads: Sources of loads Vertical Axis Type, Horizontal Axis, Constant Speed Constant Frequency, Variable speed Variable Frequency, Up Wind, Down Wind, Stall Control, Pitch Control, Gear Coupled Generator type, Direct Generator Drive /PMG/Rotor Excited Sync Generator.

UNIT III GEAR COUPLED GENERATOR WIND TURBINE COMPONENTS AND THEIR CONSTRUCTION 9

Electronics Sensors /Encoder /Resolvers, Wind Measurement : Anemometer & Wind Vane, Grid Synchronisation System, Soft Starter, Switchgear [ACB/VCB], Transformer, Cables and assembly, Compensation Panel, Programmable Logic Control, UPS, Yaw and Pitch System : AC Drives, Safety Chain Circuits, Generator Rotor Resistor controller (Flexi Slip), Differential Protection Relay for Generator, Battery/Super Capacitor Charger and Batteries/ Super Capacitor for Pitch System, Transient Suppressor / Lightning Arrestors, Oscillation and Vibration sensing.

UNIT IV DIRECT ROTOR COUPLED GENERATOR 9

Excited Rotor Synch. Generator / PMG Generator, Control Rectifier, Capacitor Banks, Step Up /Boost Converter (DC-DC Step Up), Grid Tied Inverter, Power Management, Grid Monitoring Unit (Voltage and Current), Transformer, Safety Chain Circuits



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UNIT V MODERN WIND TURBINE CONTROL AND MONITORING SYSTEM

9

Details of Pitch System and Control Algorithms. Protections used & Safety Consideration in Wind turbines. Wind Turbine Monitoring with Error codes. SCADA and Databases: Remote Monitoring and Generation Reports. Operation and Maintenance for Product Life Cycle. FACTS control, LVRT and New trends for new Grid Codes.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principles of wind energy generation, including wind resource assessment and turbine classifications
- Demonstrate the aerodynamic behavior of blades and the influence of rotor dynamics on wind turbine performance
- Operate various wind turbine subsystems such as pitch, yaw, and generator systems using real-time data
- Utilize control systems like SCADA to monitor, troubleshoot, and optimize wind turbine functionality
- Analyze grid integration technologies and assess their impact on power quality and turbine performance under dynamic conditions

TEXTBOOKS:

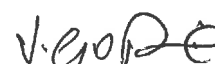
1. C-WET: Wind Energy Resources Survey in India, 2003
2. John D Sorensen and Jens N Sorensen. "Wind Energy Systems", Wood head Publishing Ltd, 2011

REFERENCES:

1. Kaldellis J K. "Stand – alone and Hybrid Wind Energy Systems". CRC Press, 2010
2. Mario Garcia – Sanz, Constantine H. Houpis. "Wind Energy Systems". CRC Press 2012
3. Spera D A. "Wind Turbine Technology: Fundamental concepts of Wind Turbine Engineering". ASME Press, 1994

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	2	1	-	-	-	2	2	1
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CO3	3	3	3	2	-	2	1	-	-	-	2	2	1
CO4	3	3	3	2	-	2	1	-	-	-	2	2	1
CO5	3	3	3	2	-	2	1	-	-	-	2	2	1


CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Explain the sources, characteristics and environmental impact of wastewater from food processing industries
- Discuss the chemical and biological properties of wastewater, including BOD, COD and toxic residues
- Apply suitable pre-treatment and secondary treatment methods for various types of industrial wastewater
- Demonstrate the utilization of by-products for energy recovery and waste reduction techniques like biogas and vermicomposting
- Analyze advanced wastewater treatment technologies (SBR, MBR, MBBR) and recommend appropriate recycling or disposal methods

UNIT I INTRODUCTION TO WASTEWATER TREATMENT 9

Types and formation of by-products and waste; the magnitude of Waste generation in different food processing industries; concept scope and maintenance of waste management and effluent treatment.

UNIT II CHEMICAL PROPERTIES 9

Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in wastewater, the microbiology of waste and other ingredients like insecticide, pesticides and fungicides residues.

UNIT III BY-PRODUCTS UTILIZATION 9

Waste utilization in various industries, furnaces and boilers run on agricultural wastes and by-products, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and utilization, waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, the concept of vermicomposting.

UNIT IV PROCESSING TECHNIQUES 9

Pre-treatment of waste: sedimentation, coagulation, flocculation, and floatation. Secondary treatments: Biological and chemical oxygen demand for different food plant waste- trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, Tertiary treatments.



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UNIT V ADVANCED WASTEWATER TREATMENT PROCESSES**9**

Sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal. Assessment, treatment and disposal of solid waste; and biogas generation. Conventional systems: integrated treatment systems: SBR, MBR and MBBR. Wastewater Recycling

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Understand the origin and types of waste generated in food processing industries
- Demonstrate key chemical and biological characteristics of wastewater, including contaminants
- Implement appropriate treatment methods for different stages of wastewater processing
- Utilize agricultural waste for energy generation through biogas, briquetting and composting
- Evaluate the effectiveness of advanced treatment systems (SBR, MBR, MBBR) for wastewater recycling and solid waste disposal

TEXTBOOKS:

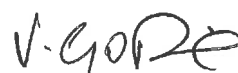
1. Deepak Sharma, Neelam Rathore and Kapil Kumar Samar, "Waste and By-product Utilization", Apex Publishers, Udaipur, 2020
2. Sanju Bala Dhull, Ajay Singh and Pradynman Kumar, "Food Processing Waste and Utilization", CRC press Publishers, Boca Raton, 1st Edition, 2022

REFERENCES:

1. Vasso Oreapoulou and Winfried Russ, "Utilization of By-Products and Treatment of Waste in the Food Industry", Springer Publishers, India, 2nd edition, 2007
2. Joshi Viral, "Agricultural Waste and By-Product Utilization", LAP Lambert Academic Publishers, USA, 2019

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	1	1	-	-	-	2	2	1
CO2	3	3	3	2	-	1	1	-	-	-	2	2	1
CO3	3	3	3	2	-	1	1	-	-	-	2	2	1
CO4	3	3	3	2	-	1	1	-	-	-	2	2	1
CO5	3	3	3	2	-	1	1	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the principles of green building design and climate-responsive construction practices
- Explain landscape and envelope strategies to enhance thermal comfort and energy efficiency
- Apply passive heating and cooling techniques to improve building thermal performance
- Examine various methods to evaluate heat gain, building loads and thermal performance of materials
- Analyze the integration of renewable energy technologies in building systems for sustainability

UNIT I INTRODUCTION**9**

Climate and Building, Historical perspective, Aspects of green building design – Sustainable Site, Water, Energy, Materials and IAQ, ECBC Standards

UNIT II LAND SCAPE AND BUILDING ENVELOPES**9**

Energy efficient Landscape design – Microclimate, Shading, Arbors, Windbreaks, Xeriscaping, Building envelope – Thermal comfort, Psychrometry, Comfort indices, Thermal Properties of Building Materials – Thermal Resistance, Thermal Time Constant (TTC), Diurnal Heat Capacity (DHC), Thermal Lag, Decrement Factor, Effect of Solar Radiation –Sol-air Temperature, Processes of heat exchange of building with environment, Insulation.

UNIT III PASSIVE HEATING AND COOLING**9**

HVAC introduction, Passive Heating – Solar radiation basics, Sun Path Diagram, Direct Heating, Indirect Heating and Isolated heating, Concept of Day lighting, Passive Cooling– Natural Ventilation (Stack and Wind), Evaporative Cooling and Radiative Cooling.

UNIT IV THERMAL PERFORMANCE OF BUILDINGS**9**

Heat transfer due to fenestration / infiltration, Calculation of Overall Thermal Transmittance, Estimation of building loads: Steady state method, network method, numerical method, correlations, Thermal Storage integration in buildings

UNIT V RENEWABLE ENERGY IN BUILDINGS**9**

Introduction of renewable sources in buildings, BIPV, Solar water heating, small wind turbines, stand- alone PV systems, Hybrid system–Economics.

TOTAL: 45 PERIODS


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OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the fundamentals of green buildings, sustainability aspects and ECBC standards
- Describe energy-efficient landscape techniques, building envelope properties and thermal behaviour
- Apply passive heating, cooling and ventilation strategies in climate-responsive building design
- Examine thermal performance and energy loads in buildings using standard methods and tools
- Categorize the feasibility and application of renewable energy systems in buildings

TEXTBOOKS:

1. Jan F. Kreider, Peter S.Curtiss, Ari Rabl, Heating and cooling of buildings: Design for Efficiency, Revised Second Edition, CRC Press, 2009
2. Baruch Givoni: Passive Low Energy Cooling of Buildings by, John Wiley & Sons, 1994

REFERENCES:

1. ASHRAE Hand book Fundamentals, 2009
2. JA Duffie and WA Beckman: Solar Engineering of Thermal Processes, Third Edition, John Wiley& Sons, 2006

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	1	1	1	-	-	-	2	2	2
CO2	3	3	3	2	1	1	1	-	-	-	2	2	2
CO3	3	3	3	2	1	1	1	-	-	-	2	2	2
CO4	3	3	3	2	1	1	1	-	-	-	2	2	2
CO5	3	3	3	2	1	1	1	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the fundamentals of thermodynamics, waste heat recovery and efficiency concepts
- Explain the working principles of various heat recovery and energy storage systems
- Apply thermodynamic principles to assess performance of power plant and cogeneration cycles
- Apply LMTD and NTU methods in heat exchangers used in waste heat recovery
- Analyze different thermal energy and electrical systems for improving overall energy efficiency

UNIT I INTRODUCTION TO THERMODYNAMICS 9

Introduction to Waste Heat, Importance of Waste Heat Recovery, Introduction to First and Second Laws – Review of Thermodynamics – Entropy, Entropy Generation, First and Second Law efficiency, VCRS – performance assessment – energy savings opportunities – VAM: working, types, benefits, comparison with vapor compression system.

UNIT II HEAT RECOVERY GENERATIONS 9

Power Plant Cycles – Energy Cascading, Rankine Cycle, modification of Rankine cycle, examples, Gas Turbine Cycle, Combined Cycle, Combined Gas Turbine– Steam Turbine Power Plant, Heat Recovery Steam Generators.

UNIT III ENERGY AND COGENERATION 9

Thermodynamic cycles for low-temperature application, Cogenerations, Introduction to Heat Exchangers, Analysis – LMTD and –NTU method – Analysis of Heat Exchanger – continued, Problem-solving, Special Heat Exchangers for Waste Heat Recovery, Synthesis of Heat Exchanger network.

UNIT IV THERMAL ENERGY TECHNOLOGIES AND ELECTRICAL SYSTEMS 9

Heat pipes & Vapor Chambers, Direct conversion technologies – Thermoelectric Generators – Direct conversion technologies – Thermoelectric Generators, Thermoionic conversion, Thermo–PV, MHD, Electricity billing – Demand side management – Power factor improvement transformer losses – Harmonics induction Motors



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UNIT V ENERGY STORAGE TECHNIQUES**9**

Heat Pump: Heat Recovery from Incinerators. Energy Storage – Introduction. Energy Storage Techniques – Pumped hydro. Compressed Air. Flywheel. Superconducting Magnetic storage – Energy Storage Techniques – Thermal storage (Sensible & Latent). Battery. Chemical Energy Storage. Fuel cells – Energy Economics.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Understand the principles of thermodynamics and the importance of waste heat recovery systems
- Interpret the working of vapor absorption and vapor compression refrigeration systems
- Demonstrate the application of thermodynamic cycles in power generation and cogeneration
- Utilize LMTD and NTU methods for the design and evaluation of heat exchangers
- Analyze the various thermal energy storage and electrical systems to assess energy performance

TEXT BOOKS:

1. Taimoor Pervez, Sohaib Ejaz Randhawa, Nauman Sadiq, "Waste heat Recovery and Energy Conservation", Lambert Academic Publishing, 2011
2. David Borge – Diez, Enrique Rosales – Asensio, "Heat Energy Recovery for Industrial Processes and wastes", Springer Publishing, 2023

REFERENCES:

1. Tangellapalli Srinivas, "Thermal cycles of Heat Recovery Power Plants", Bentham Books Publishers, 2021
2. Thipse, "Energy conservation and Management", Alpha Science Publishers, 2014

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	1	-	1	-	-	-	2	2	1
CO2	3	3	3	2	1	-	1	-	-	-	2	2	1
CO3	3	3	3	2	1	-	1	-	-	-	2	2	1
CO4	3	3	3	2	1	-	1	-	-	-	2	2	1
CO5	3	3	3	2	1	-	1	-	-	-	2	2	1



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Explain key concepts of electricity billing, load management, power factor and distribution losses
- Describe energy audit methodology and energy conservation opportunities in electrical utilities
- Apply techniques to improve energy efficiency in motors, transformers and compressed air systems
- Implement energy auditing and reporting procedures for various electrical systems in industries
- Analyze HVAC, lighting and pumping systems for potential integration of renewable energy and improved efficiency

UNIT I ENERGY CONSERVATION CONCEPTS 9

Energy – classification – scenario – energy pricing – energy and environment – energy conservation and its importance – energy strategy for the future – energy conservation act and its features.

UNIT II ENERGY AUDITING AND ECONOMICS 9

Scope of energy audit— principles – energy audit strategy - types – detailed energy audit steps. Role of energy managers in industries: Energy performance - bench marking – fuel substitutions – energy audit instruments – material and energy balance – energy conversion – energy index – cost index – financial management – financing options.

UNIT III THERMAL ENERGY AUDIT 9

Energy efficiency in thermal utilities – methodology – stoichiometric analysis of combustion in a boiler – performance evaluation – boiler losses - analysis – feed water treatment – energy conservation opportunities in boilers and steam system – furnaces – insulation and refractories – cogeneration – principles of operation - waste heat recovery systems – case study – analysis.

UNIT IV ELECTRICAL ENERGY AUDIT – I 9

Electrical systems – introduction – electricity billing – load management – power factor – improvements and benefits – transformers – distribution losses – analysis – energy audit in electrical utilities methodology – energy conservation opportunities in motors – efficiency – energy efficient motors – motor losses – analysis – energy efficiency in compressed air system.



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UNIT V ELECTRICAL ENERGY AUDIT – II**9**

HVAC and refrigeration system – fans and blowers – fan performance – pumps - lighting system - energy auditing and reporting in industries – replacement of renewable energy technology option – case study in agro-industries

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Explain the fundamentals of electricity billing, load management and power factor improvement
- Describe energy audit procedures and conservation opportunities in electrical utilities
- Apply energy-saving techniques to improve the efficiency of motors, transformers and compressed air systems
- Implement energy auditing methods in industrial setups including fans, blowers and lighting systems
- Analyze HVAC and refrigeration systems to identify energy efficiency improvements and renewable energy options

TEXTBOOKS:

1. Guide books for National Certification Examination for Energy Managers and 176 Energy Auditors. Book 1, 2, 3 & 4. Bureau Energy Efficiency, New Delhi, 2005
2. Murphy W R and McKay G, "Energy Management", Butterworth & Co., Publishers Ltd., London, 1982
3. Craig B. Smith, "Energy Management Principles, Applications, benefits & savings", Pergamon Press Inc, 1981

REFERENCES:

1. Victor B Ottaviano, "Energy Management", an OTIS Publication, Ottaviano Technical Service Inc, 150, Broad Hollow Road, Melville, New York, 1747
2. Richard Porter and Tim Roberts, "Energy saving by Waste recycling", Elsevier applied science publishers, 1985

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	1	-	-	-	-	1	2	2
CO2	3	3	2	2	2	1	-	-	-	-	1	2	2
CO3	3	3	2	2	2	1	-	-	-	-	1	2	2
CO4	3	3	2	2	2	1	-	-	-	-	1	2	2
CO5	3	3	2	2	2	1	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the global and national energy scenario and the importance of energy conservation and policies
- Describe energy audit methodologies, demand-side management and energy monitoring techniques
- Apply project management tools and techniques in the planning and execution of energy projects
- Utilize financial analysis methods to evaluate the feasibility of energy conservation projects
- Analyze the environmental impacts of energy use and assess mechanisms for sustainable energy development

UNIT I ENERGY SCENARIO 9

Comparison of energy scenario – India and World (energy sources, generation mix, consumption pattern, T and D losses, energy demand, per capita energy consumption) – energy pricing – energy security-energy conservation and its importance – EnergyConservationAct2001

UNIT II ENERGY MANAGEMENT 9

Energy audit - need – types – methodology – barriers - analysis on energy costing and sharing - bench marking - fuel and energy substitution – billing parameters in TANGEDCO – demand side management - instruments for energy audit – energy monitoring and targeting – CUSUM – energy labelling

UNIT III PROJECT MANAGEMENT 9

Four Basic Elements of Project Management - Project Management Life Cycle - Steps in Project Management Project Definition and Scope, Technical Design, Financing, Contracting, Implementation Techniques (Gantt Chart, CPM and PERT) and Performance Monitoring - EnMS5001

UNIT IV FINANCIAL MANAGEMENT 9

Investment appraisal for energy conservation projects - Financial analysis techniques - Simple payback period, Return on investment, Net present value, Internal rate of return - Cash flows - Risk and sensitivity analysis: micro and macro factors- Financing options- energy performance contracts-ESCOs.



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UNIT V ENERGY AND ENVIRONMENT

9

Greenhouse effect and the carbon cycle - current evidence and future effects of climate change - Global Environmental Concerns-United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, Conference of Parties (COP), Emissions trading (ET), Joint implementation (JI), Clean Development Mechanism (CDM), Prototype Carbon Fund (PCF), Sustainable Development.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the global and Indian energy scenario along with energy conservation laws and practices
- Describe energy audit types, methodologies and demand-side management strategies
- Apply project management techniques in planning and executing energy-related projects
- Develop financial appraisal methods to assess the viability of energy conservation investments
- Analyze environmental impacts of energy systems and assess global sustainability mechanisms

TEXTBOOKS:

1. L C Witte, P S Schmidt, D R Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988
2. Eastop T D and Croft D R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, 1990

REFERENCES:

1. Energy Manager Training Manual (4 Volumes) by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004
2. W C Turner, "Energy Management Handbook" Wiley, New York, 1982

Mapping of COs with POs and PSOs

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CO3	3	3	3	2	-	1	-	-	-	-	1	2	1
CO4	3	3	3	2	-	1	-	-	-	-	1	2	1
CO5	3	3	3	2	-	1	-	-	-	-	1	2	1



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the precision farming with various sensors
- Extend intensive knowledge of environmental control systems
- Apply knowledge on modern tillage practices, conservation agriculture and sustainable farming systems.
- Build the importance of seasonal climate forecasting
- Discover the knowledge on E-Commerce systems in agriculture

UNITI PRECISION FARMING 9

Precision agriculture and agricultural management – Ground based sensors. Remote sensing. GPS. GIS and mapping software. Yield mapping systems. Crop production modeling.

UNITII ENVIRONMENT CONTROL SYSTEMS 9

Artificial light systems, management of crop growth in greenhouses, simulation of CO₂ consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.

UNITIII AGRICULTURAL SYSTEMS MANAGEMENT 9

Modern concepts of tillage and conservation agriculture. Land capability classification. Alternate land use and Agro forestry systems-objectives and components of agroforestry. Shifting cultivation: Concept of sustainable agriculture. Concept of secondary agriculture. Natural /zero budget farming.

UNITIV WEATHER PREDICTION MODELS 9

Importance of climate variability and seasonal forecasting. Understanding and predicting world's climate system. Global climatic models and their potential for seasonal climate forecasting. General systems approach to applying seasonal climate forecasts.

UNITV E-GOVERNANCE IN AGRICULTURAL SYSTEMS 9

Expert systems, decision support systems, Agricultural and biological databases, e-commerce, e-business systems & applications, Technology enhanced learning systems and solutions, e-learning, Rural development and information society.

TOTAL: 45 PERIODS

V. GORDON

CHAIRMAN
BoS (AGE) 16/12/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concepts of precision farming, environment control systems, agricultural systems management and weather prediction models
- Demonstrate modern tools such as GPS, GIS, remote sensing, yield mapping and expert systems to enhance crop production and farm management efficiency
- Construct suitable tillage practices, land capability classes, alternate land use options and agro forestry components for different agro-climatic conditions
- Apply the role of climate variability, seasonal forecasting models, and simulation techniques in sustainable agricultural decision-making
- Examine the impact of digital tools, decision support systems and e-governance applications on rural development and agricultural productivity

TEXTBOOKS:

1. National Research Council and Board on Agriculture, "Precision Agriculture in the 21st Century: Geospatial and Information Technologies in Crop Management", National Academies Press, Canada, 1997
2. Krug H and Liebig H P. "International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation", ISHS Acta Horticulturae 248, 1989

REFERENCES:

1. Peart R M and Shoup W D. "Agricultural Systems Management", Marcel Dekker, New York, 2004
2. Hammer G L, Nicholls N and Mitchell C. "Applications of Seasonal Climate", Springer, Germany, 2000

Mapping of COs with POs and PSOs

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CO3	3	3	3	2	1	-	-	-	-	1	1	1	-
CO4	3	3	3	2	1	-	-	-	-	1	1	1	-
CO5	3	3	3	2	1	-	-	-	-	1	1	1	-



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand the basics of electronic devices, microprocessors and their role in automation systems
- Compare the concepts of precision farming, robotics and IoT in agricultural applications
- Determine the application of sensors, microcontrollers and automation tools for smart farming practices
- Apply IoT-based solutions such as smart irrigation, greenhouse automation and drone-based monitoring in agriculture
- Analyze the case studies of automation in agriculture to analyze the effectiveness and challenges of integrating modern technologies in farming operations

UNIT I BASICS OF ELECTRONICS AND MICROPROCESSOR SYSTEMS 9

Fundamental of electronics Passive devices -semiconductor devices - transistors - diode circuits - amplifier circuits - Integrated circuits and operational amplifier - logic gates - flip flop - counters digital to analog - analog to digital converters- microprocessor.

UNIT II PRECISION FARMING 9

Precision farming - Ground based sensors - Remote sensing, GPS, GIS and mapping software - Yield mapping systems-Crop production modelling.

UNIT III ROBOTICS IN AGRICULTURE 9

Fundamental of Robotics - types – application. Agricultural robots - types- function – application - Future trends in automation in agriculture.

UNIT IV AUTOMATION USING IoT 9

Use of different sensors - Temperature and humidity sensor - Soil Moisture Sensor - Water Level Depth Detector, Raspberry Pi Arduino UNO.

UNIT V AUTOMATION OF AGRICULTURE OPERATION 9

Automation of agricultural operations using IoT based systems - Smart Irrigation System- Automation in Greenhouse – Drones. Case Study - Automation of greenhouse/farm operations.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the working principles of basic electronic components, microprocessors and their applications in automation
- Classify the concepts of precision farming, robotics and IoT for improving agricultural productivity
- Apply the use of different sensors, microcontrollers (Arduino, Raspberry Pi) and IoT systems for smart farming solutions
- Build simple automation models such as smart irrigation, greenhouse control and drone-based monitoring
- Analyze the integration of robotics, IoT and precision farming technologies to assess their impact on efficiency and sustainability in agriculture

TEXTBOOKS:

1. Zhang Q, Pierce and F J Eds, Agricultural automation: fundamentals and practices, CRC Press, 2013
2. Choudhury A Biswas, A Singh, T P and Ghosh and S K Eds, Smart Agriculture Automation Using Advanced Technologies: Data Analytics and Machine Learning, Cloud Architecture, Automation and IoT, 2022

REFERENCES:

1. Young S L and Pierce F J Eds, Automation: The future of weed control in cropping systems, Springer Science & Business Media, 2013
2. Billingsley J, Robotics and automation for improving agriculture, Burleigh Dodds Science Publishing Limited, 2019

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	1	1	-	-	-	-	2	2
CO2	3	3	3	2	2	1	1	-	-	-	-	2	2
CO3	3	3	3	2	2	1	1	-	-	-	-	2	2
CO4	3	3	3	2	2	1	1	-	-	-	-	2	2
CO5	3	3	3	2	2	1	1	-	-	-	-	2	2


CHAIRMAN
BoS (AGE)

**24AG503PE INSTRUMENTATION AND CONTROL ENGINEERING
IN AGRICULTURE**

**L T P C
3 0 0 3**

OBJECTIVES:

The students should be made to:

- Understand the measurement system concepts and performance characteristics
- Apply working principles and uses of various measuring instruments
- Determine modelling techniques for dynamic and static process behaviour
- Examine P, PI and PID control for agricultural and industrial processes
- Analyze stability and frequency response of control systems for specific applications

UNIT I BASICS OF MEASUREMENT SYSTEM 9

Basic concepts of measurement system configuration. Concept of accuracy- precision error - resolution repeatability bias - calibration – range - Performance characteristics of Instruments - Zero, first and second order instrument systems and their response to different input signals - Specification and testing of dynamic response.

UNIT II INSTRUMENT FOR VARIOUS USES 9

Different types of measuring instruments, their working principles, construction features, measurement of level, flow, temperature, pressure, vacuum, force, torque, power, displacement, vibration, acceleration, pH, colour, viscosity, surface tension and composition. Indicating and recording type instruments, digital displays, transmitting and telemetering devices.

UNIT III INTRODUCTION TO CONTROL SYSTEM 9

Control system characteristics, purpose disturbances and stability feedback and feed forward control strategies - Modelling the Dynamic and Static Behaviour of Process - Mathematical modelling for physical process control, state variables and state equations, modelling difficulties and considerations. Input-output models block diagram - degree of freedom, process controller action, P, PI, PID controllers - final control system.

UNIT IV ANALYSIS OF DYNAMIC BEHAVIOUR 9

Linearization of systems - Deviation variables, Application of Laplace transform in mathematical modelling of process control - Transfer function; Transfer function matrix for processes having multiple outputs - Poles and zeros of transfer function.

UNIT V APPLICATION OF ROBOTS IN AGRICULTURE 9

Design of Feed Back System Block diagram- stability analysis, frequency response root locus analysis - Routh's criteria, Nyquist plots and Bode diagrams - Control Systems for Various Uses Electronic pneumatic - hydraulic control system and their application in Farm machinery - food processing industry aquaculture - milk processing.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concepts of measurement system, accuracy, precision, error, calibration and dynamic response of instruments
- Apply the working principles of various measuring instruments for physical variables such as flow, temperature, pressure and composition
- Determine mathematical modelling techniques and PID controllers for analyzing process control systems
- Categorize process dynamics using Laplace transforms, transfer functions, poles and zeros for multi-output systems
- Analyze stability and frequency response of control systems for applications in farm machinery, food processing and related industries

TEXTBOOKS:

1. W Bolton, Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 7th Ed, Pearson, 2023
2. Manoj Karkee & Qin Zhang, Fundamentals of Agricultural and Field Robotics, Springer, 2021

REFERENCES:

1. Clarence W de Silva, Mechatronics: A Foundation Course, 2nd Edition, CRC Press, 2022
2. Robert H Bishop, Mechatronic Systems: Fundamentals, 2nd Edition, Cengage, 2022

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	1	1	-	-	-	1	2	1
CO2	3	3	3	2	2	1	1	-	-	-	1	2	1
CO3	3	3	3	2	2	1	1	-	-	-	1	2	1
CO4	3	3	3	2	2	1	1	-	-	-	1	2	1
CO5	3	3	3	2	2	1	1	-	-	-	1	2	1


CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand the basic concepts of mechatronics, sensors, and transducers
- Apply microprocessor-based controllers and PLCs in mechatronic systems
- Determine sensors/actuators with microprocessor control systems
- Build the robot subsystems and drives for agricultural tasks
- Analyze suitable robotic technologies for specific agricultural applications

UNIT I BASICS OF MECHATRONICS 9

Definition of mechatronics, measurement system, control systems - microprocessor-based controllers, mechatronics approach - Sensors and transducers - performance terminology - Displacement, Position & Proximity Sensors, photo-electric transducers, flow transducers, optical sensors and transducers.

UNIT II MICROPROCESSOR CONTROL 9

System interfacing, instrumentation, and control systems - Input/output signals of a mechatronic system - signal conditioning, microprocessor control, microprocessor numerical control, microprocessor input/output control.

UNIT III MICROPROCESSOR BASED CONTROLLERS AND MICROELECTRONICS 9

Introduction to microelectronics - digital logic - overview of control computers - microprocessors and microcontrollers - programmable logic controllers - digital communications.

UNIT IV TECHNOLOGIES OF ROBOT 9

Sub systems, transmission system (Mechanics), power generation and storage system, sensors, electronics, algorithms and software - Servo motor drives types and applications. Stepper motor and its concept - Industrial robots: Classification and sub systems - Defining work space area.

UNIT V APPLICATION OF ROBOTS IN AGRICULTURE 9

Harvesting and picking - weed control - autonomous mowing – pruning – seeding - spraying and thinning – phenotyping - sorting and packing - Utility platforms - Use of different agrobots in agriculture.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 11/11/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamentals of mechatronics, sensors, transducers and measurement systems relevant to engineering applications
- Explain the architecture of microprocessor-based controllers, microelectronics and programmable logic controllers used in automation
- Apply the principles of signal conditioning, interfacing, and microprocessor control to analyze and solve basic instrumentation and control problems
- Apply robotic subsystem concepts, actuators and algorithms to identify and analyze suitable robotic solutions for agricultural operations
- Analyze agricultural tasks such as harvesting, spraying and phenotyping and design effective robotic solutions to enhance efficiency and productivity

TEXTBOOKS:

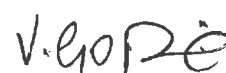
1. Karl J Astrom and Richard M Murray, Feedback Systems: An Introduction for Scientists and Engineers, 2nd Edition, 2021
2. D G Alciatore and M B Hystand, Introduction to Mechatronics and Measurement Systems, 5th Edition, 2018

REFERENCES:

1. D G Alciatore and M B Hystand, Introduction to Mechatronics and Measurement Systems, 5th Edition, 2018
2. Ajay Kumar, Parveen Kumar, Sarita Rathee and Brijesh Kumar, Mechatronics: Concepts, Tools, Applications and New Trends, 1st Edition, 2023

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	1	-	1	-	-	-	-	2	1	1
CO2	3	3	3	1	-	1	-	-	-	-	2	1	1
CO3	3	3	3	1	-	1	-	-	-	-	2	1	1
CO4	3	3	3	1	-	1	-	-	-	-	2	1	1
CO5	3	3	2	1	-	1	-	-	-	-	2	1	1



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the concepts, types, aerodynamics and safety of drones
- Classify drone components, programming and flight operations
- Construct the assembly and programming techniques for stable flight
- Determine about the drone technology in agriculture, logistics and inspection
- Analyze the safety, regulations and future trends of drones

UNIT I INTRODUCTION TO DRONE TECHNOLOGY 9

Drone Concept – Vocabulary Terminology– History of drone – Types of current generation of drones based on their method of propulsion– Drone technology impact on the businesses– Drone business through entrepreneurship– Opportunities/applications for entrepreneurship and employability.

UNIT II DRONE DESIGN, FABRICATION AND PROGRAMMING 9

Classifications of the UAV –Overview of the main drone parts– Technical characteristics of the parts –Function of the component parts –Assembling a drone– The energy sources– Level of autonomy– Drones configurations –The methods of programming drone– Download program –Install program on computer– Running Programs– Multi rotor stabilization– Flight modes –Wi-Fi connection.

UNIT III DRONE FLYING AND OPERATION 9

Concept of operation for drone – Control system: Transient response, Frequency response, Stability - Classical auto-pilot design : auto-takeoff and landing, auto-stabilization, attitude hold and position hold - point-to-point navigation – Linked mobile devices and applications.

UNIT IV APPLICATIONS OF DRONE IN AGRICULTURE 9

Choosing a drone based on the application –Drones in the insurance sector– Drones in delivering mail, parcels and other cargo– Drones in agriculture– Drones in inspection of transmission lines and power distribution –Drones in filming and panoramic picturing.

UNIT V FUTURE DRONES AND SAFETY 9

The safety risks– Guidelines to fly safely –Specific aviation regulation and standardization– Drone license– Miniaturization of drones– Increasing autonomy of drones – The use of drones in swarms.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/20

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concepts, classifications and applications of drones with reference to engineering and entrepreneurial perspectives
- Demonstrate drone parts, propulsion systems, autonomy levels and flight modes using fundamental engineering principles
- Apply assembling, programming and stabilizing drones to meet specific operational requirements
- Build drone technology in agriculture, inspection, logistics and other domains to develop practical solutions
- Categorize safety, regulatory aspects and future advancements to assess challenges and solutions in drone-based systems

TEXTBOOKS:

1. Agriculture 4.0: Precision & Automated Ag Technologies – Eds M G Shinde, S D Gorantiwar, Prabhat Kumar & Others, Satish Serial Publishing, 2022
2. Daniel Tal and John Altschuld, “Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation”, John Wiley & Sons, Inc, 2021

REFERENCES:

1. Drones in Digital Agriculture – K S Subramanian, S Pazhanivelan & R Santhi, Daya Publishing, 1st Edition, 2022
2. Završnik, “Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance”. Springer, 2018

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	2	2	2
CO5	3	3	3	2	2	-	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand the need for intelligent control techniques
- Relate architectures and approaches for intelligent control
- Build pre processing techniques for data analysis in control applications
- Apply the fundamentals and structures of Neural Networks
- Discover the optimization methods such as Genetic Algorithms and other heuristic search techniques for control system design

UNIT I SYSTEM CONCEPTS 9

Definition, classification, and characteristics of systems– Scope and steps in systems engineering– Need for systems approach to water resources and irrigation.

UNIT II LINEAR PROGRAMMING 9

Introduction to operations research – Linear programming, problem formulation, graphical solution, solution by simplex method – Sensitivity analysis, application to design and operation of reservoir, single and multipurpose development plans – Irrigation water allocation- Cropping pattern optimization.

UNIT III SIMULATION 9

Basic principles and concepts – Random variate and random process – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic and stochastic simulation – Irrigation Scheduling.

UNIT IV DYNAMIC PROGRAMMING 9

Bellman's optimality criteria, problem formulation and solutions – Application to design and operation of reservoirs. Single and multipurpose reservoir development plans – Applications in Irrigation management.

UNIT V OPTIMIZATION TECHNIQUES 9

Integer and parametric linear programming – Applications to Irrigation water management- Goal programming models with applications.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the knowledge of engineering fundamentals to understand the architecture and key concepts of intelligent control systems
- Classify complex engineering problems using artificial neural networks to develop intelligent control
- Construct research-based knowledge to evaluate and optimize control system performance
- Apply neural networks and controllers for engineering systems
- Contrast advanced intelligent control strategies

TEXTBOOKS:

3. Ross T J. "Fuzzy Logic with Engineering Applications". McGraw-Hill, 4th Edition, 2020
4. Simon Haykin. "Neural Networks: A Comprehensive Foundation". Pearson Education, 3rd Edition, 2008

REFERENCES:

3. Ogata K. "Modern Control Engineering". Prentice Hall, 5th Edition, 2010
4. Rajasekaran S and Vijayalakshmi Pai G A. "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications". PHI Learning, 2003

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	1	1	1	-	-	-	1	2	-
CO2	3	2	3	2	1	1	1	-	-	-	1	2	-
CO3	3	3	3	2	1	1	1	-	-	-	1	2	-
CO4	3	3	3	2	1	1	1	-	-	-	1	2	-
CO5	3	3	3	2	1	1	1	-	-	-	1	2	-



CHAIRMAN
BoS (AGE)

**24AG507PE MACHINE LEARNING FOR SOIL AND CROP
MANAGEMENT**

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made to,

- Understand about the fundamentals of machine learning and deep learning
- Demonstrate the concepts of components analysis and regression
- Apply deep knowledge on soil and crop characterization analysis sensors
- Determine the applications of ML and DL for processing soil and crop images
- Inspect the importance of digital image processing for soil in decision making

**UNIT I MACHINE LEARNING AND DEEP LEARNING APPLICATIONS IN
AGRICULTURE 9**

Dig data – machine learning. Artificial intelligence and deep learning – traditional uses of machine learning – supervised, unsupervised, semi supervised and reinforcement learning – applications of machine learning – precision agriculture – machine learning for crop management – machine learning for soil management – basics of multivariate data analysis.

UNIT II PRINCIPLE COMPONENT ANALYSIS AND REGRESSION 9

Principle component analysis – dimensionality reduction – feature elimination – feature extraction – eigen value – screenplot – applications of Principal components analysis – principal component regression – partial least square regression. Agricultural data visualization. Regression Techniques – Linear, polynomial, and nonlinear regression – Applications in yield prediction and soil nutrients.

UNIT III SOIL AND CROP SENSORS 9

Historical and modern soil survey – proximal sensors – portable X-ray fluorescence spectrometry – PXRf applications for soil and crop – sensor fusion – nix sensor – nix for plant characterization – nutrient sensor for assessing soil and crop nutrient status.

UNIT IV ML AND DL FOR SOIL AND CROP IMAGE PROCESSING 9

Machine learning for soil moisture prediction – ANN features and basic mathematical representation – convolutional neural network – digital image processing – crop image processing – image based soil property predictions.

UNIT V DIGITAL SOIL MAPPING 9

Digital soil mapping for decision making and policy management – covariates of digital soil mapping – digital elevation model – geographic information system – geographic coordinate system – universal transverse meridianer – datum – geostatistics overview – kriging – inverse distance interpolation – variogram.

TOTAL: 45 PERIODS

V. Gope

CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Relate the knowledge of engineering to explain ML/DL applications in precision agriculture and soil/crop management
- Identify the agricultural datasets using dimensionality reduction and regression techniques, reaching substantiated conclusions
- Build knowledge of engineering fundamentals to find the application of advanced sensors like PXRF in agriculture
- Organize the machine and deep learning-based systems for image processing in agriculture
- Categorize the research-based knowledge, geostatistics and GIS tools to conduct spatial investigations

TEXTBOOKS:

1. Somsubhra Chakraborty, "Machine Learning for Soil and Crop Management", NPTEL Course, IIT Kharagpur, SWAYAM, 2023
2. Brendan P Malone, Budiman Minasny, Alex B McBratney, Using R for Digital Soil Mapping, Springer, 2011

REFERENCES:

1. Bo Liu, Longchang Wang, "Artificial Intelligence in Precision Agriculture", Academic Press, 2020
2. Kurt Varmuza, Peter Filzmoser, "Introduction to Multivariate Statistical Analysis in Chemometrics", CRC Press, 2009

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	1	1	1	-	-	-	1	2	1
CO2	3	2	3	2	1	1	1	-	-	-	1	2	1
CO3	3	3	3	2	1	1	1	-	-	-	1	2	1
CO4	3	3	3	2	1	1	1	-	-	-	1	2	1
CO5	3	3	3	2	1	1	1	-	-	-	1	2	1



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to,

- Understand AI concepts, evolution and applications in agriculture
- Infer classical AI methods like expert systems and fuzzy logic
- Apply AI search techniques and knowledge representation methods
- Build ethical and philosophical issues in AI
- Analyze modern AI techniques for solving agricultural problems

UNIT I FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE 9

Definitions of intelligence and artificial intelligence – Disciplines important to AI – History of development of AI – Different types of AI – Acting humanly, Turing test – AI systems in everyday life – Applications of AI.

UNIT II CLASSICAL AI AND EXPERT SYSTEM 9

Classical AI – concept of expert system, conflict resolution, multiple rules, forward chaining, backward chaining – Advantages and disadvantages of expert system – Fuzzy logic and fuzzy rules – Fuzzy expert systems.

UNIT III AI PROBLEM SOLVING AND KNOWLEDGE REPRESENTATION 9

Problem solving using AI, search techniques, breadth first search, depth first search, depth limited search, bidirectional search, heuristic search, problems and examples – Knowledge representation, frames, methods and demons, correlations, decision trees, fuzzy trees.

UNIT IV PHILOSOPHY AND ETHICS OF AI 9

Philosophy of AI, Penrose's pitfall, weak AI, strong AI, rational AI, brain prosthesis experiment – the Chinese room problem, emergence of consciousness, technological singularity, Turing test.

UNIT V MODERN AI TECHNIQUES AND AGENTS 9

Modern AI, biological brain, basic neuron model, perceptrons and learning – self organizing neural network, N-tuple network, evolutionary computing, genetic algorithms, agent methods, agents for problem solving, software agents, multi agents, hardware agents.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the engineering knowledge to explain the fundamentals, types and applications of AI in agricultural and real-world systems
- Interpret and describe expert systems and fuzzy logic systems for solving agriculture
- Construct AI search and problem-solving techniques such as decision trees and heuristics in agricultural contexts
- Apply philosophical challenges of AI and implications of emerging technologies
- Discover AI systems using neural networks, genetic algorithms and agents to solve complex agricultural problems

TEXTBOOKS:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson Education, 2021
2. Latief Ahmad, Firasath Nabi, "Agriculture 5.0: Artificial Intelligence", IoT and Machine Learning, CRC Press, 2021

REFERENCES:

1. Ajith Abraham et al, AI Edge and IoT-Based Smart Agriculture, Elsevier, 2021
2. K R Krishna, "Precision Farming: AI Applications in Agriculture", Apple Academic Press, 2020

Mapping of COs with POs and PSOs

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CO3	3	3	2	2	1	-	-	-	-	-	1	2	-
CO4	3	3	2	2	1	-	-	-	-	-	1	2	-
CO5	3	3	2	2	1	-	-	-	-	-	1	2	-



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Explain the scope, significance and key features of Agri-business and its management functions
- Apply the principles, organizational structures and management approaches in Agri-business
- Execute concepts of agricultural marketing, including planning, inventory control and marketing strategies
- Analyze the structure, governance and financial operations of agribusiness cooperatives with MIS integration
- Examine market promotion techniques and human resource practices relevant to Agri-business

UNIT I CONCEPTS OF AGRICULTURAL BUSINESS 9

Agri-business – scope, characteristics, types, Management – importance, definition, management and administration, management thoughts, Small business – characteristics and stages of growth – Management functions – planning, organizing, leading.

UNIT II AGRI – BUSINESS ORGANIZATION 9

Principles, forms of agri-business organizations, staffing, directing, supervision and motivation, Controlling – types, performance evaluation and control techniques, Management approaches – Profit Centered Approach, Management by objectives and Quality Circles, Strength, Weakness, Opportunities and Threat (SWOT) Analysis.

UNIT III AGRICULTURAL MARKETING 9

Functional areas of Agri-business – Production and Operations management – functions, planning physical facilities and managing quality, Agro-inputs and products inventory management – raw material procurement, inventory types and costs, Marketing management – Marketing environment, marketing mix – Agricultural input marketing firms.

UNIT IV AGRICULTURAL BUSINESS FINANCE AND COOPERATIVES 9

Forms of agri-business organizations – Role of lead bank in agribusiness finance – Financial management- Acquiring capital – Budget analysis, Concepts and determinants – Business project scheduling of raw material procurement – production management – launching products (branding and placement) – Input marketing promotion activities- Principles of cooperation- process of cooperative formation- cooperative legislation- governance in agribusiness cooperatives- management of cooperatives.

UNIT V MARKET PROMOTION AND HUMAN RESOURCES 9

Agricultural products – marketing promotion activities – product pricing methods, District Industries Centre – Consumer survey – Agricultural inputs retailing – Market potential assessment – types of distribution channels – Return on Investment – Personnel management, Recruitment, selection and training – Technology in Agri Business.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE)

16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the scope, importance and characteristics of Agri-business and its management functions to develop engineering knowledge
- Implement the principles, organizational structures and management approaches of Agri-business to identify and analyze complex problems
- Utilize agricultural marketing concepts including production planning, inventory management and marketing mix to design solutions meeting identified needs
- Examine the formation, governance and financial aspects of agribusiness cooperatives using MIS tools by conducting investigations and interpreting data
- Evaluate and select appropriate modern engineering for assessing market promotion strategies and human resource practices in Agri-business

TEXTBOOKS:

1. Meena G L, Burark S S, Pant D C and Rajesh Sharma. "Fundamentals of Agribusiness Management", Agro Tech Books, 2021
2. Satyveer Singh Meena, Amita Sharma and Aditi Mathur. "Agri Business: A Managerial Perspective", Scientific Publishers, 2024

REFERENCES:

1. Verma S B. "Agricultural Marketing in India: Concept & Challenges" Om Publications, 2023
2. Thakur S, Wasnik, S B, Sharma P, Kush B and Nelson R. "Agribusiness Management" Routledge Publication, 1st edition, 2025

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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CO4	3	3	3	2	-	1	-	-	-	-	1	2	2
CO5	3	3	3	2	-	1	-	-	-	-	1	2	2



CHAIRMAN
BoS (AGE)

24AG602PE	SUSTAINABLE AGRICULTURE AND FOOD SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the importance of land and water resources for sustainable agriculture in India
- Apply knowledge of rainfall, surface water and groundwater in crop growth and productivity
- Demonstrate the impact of climate change on sustainable and natural farming practices
- Illustrate the role of science and technology in enhancing food production and ensuring food security
- Examine relevant policies and programs to manage and promote sustainable agriculture and livelihoods

UNIT I SUSTAINABILITY OF NATURAL RESOURCES 9

Land Resources of India. Population and land. Land utilization. Net Area Sown. changes in cropping pattern. land degradation. Rainfall forecasting - Adequacy of Rainfall for crop growth –Rainfall. Drought and production instability – Irrigation potential – Available, created and utilized –River basins: Watersheds and Utilizable surface water – Utilizable water in future (Ground water & Surface water)

UNIT II SUSTAINABLE AGRICULTURE 9

Sustainable agriculture-definition. Agro-ecosystems - Impact of climate change on Agriculture. Effect on crop yield, effect on Soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance.

UNIT III ORGANIC FARMING 9

Natural farming principles – Sustainability in rain fed farming – organic farming – principles and practices. Organic farming-regulation and sustainability – The scale and productivity of organic sustainable systems.

UNIT IV SUSTAINABLE FOOD PRODUCTION FOR FOOD SECURITY 9

Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force – Vertical farming – Controlled Environment Agriculture- Genetics diversity- GMO's Sustainable food security indicators and index – Indicator of sustainability of food Security.

UNIT V POLICES AND PROGRAMMES FOR SUSTAINABLE AGRICULTURE AND FOOD SECURITY 9

Food and Crop Production policies – Agricultural credit Policy – Crop insurance –Policies of Natural Resources Use – Policies for sustainable Livelihoods – Virtual water and trade – Sustainable food Security Action Plan.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 14/10/20

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the role of land and water resources in sustainable agriculture using engineering fundamentals
- Apply analytical techniques to identify and assess complex agricultural and environmental problems
- Compute the concepts of organic farming and natural farming for sustainable food production design
- Analyze real-world agricultural data to find the effectiveness of sustainable practices and solutions
- Examine the effectiveness and limitations of engineering tools used in sustainable agriculture planning

TEXTBOOKS:

1. Sandeep Kumar, Ram Swaroop Meena, Parvender Sheoran and Manoj Kumar Jhariya. "Regenerative Agriculture for Sustainable Food Systems". Springer Publisher, Singapore, 1st edition, 2024
2. Chavda M H, Vala Y B, Patel CK, Chaudhari P P and Patel D K. "Sustainable Agriculture: A Vision for Resilience Future". KD Publications, 2024

REFERENCES:

1. Madhu Choudhary et al., "Climate Smart Agriculture (CSA) for Sustainable Resource Management", 2025
2. Walia S S and Walia U S. "Farming System and Sustainable Agriculture". 2025

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	2	2	-	-	-	2	2	1
CO2	3	3	3	2	-	2	2	-	-	-	2	2	1
CO3	3	3	3	2	-	2	2	-	-	-	2	2	1
CO4	3	3	3	2	-	2	2	-	-	-	2	2	1
CO5	3	3	3	2	-	2	2	-	-	-	2	2	1


CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand the principles and components of organic farming and sustainable agriculture
- Apply composting methods and organic pest management techniques in crop production
- Implement organic practices in crop management and animal husbandry systems
- Analyze standards and processes involved in organic food processing and certification
- Evaluate the quality, health benefits and marketing strategies of organic products

UNIT I INTRODUCTION TO ORGANIC FARMING 9

Organic farming: Introduction – Concepts and principles of organic farming –Components of organic farming –SWOT analysis of organic farming –Sustainable agriculture: Key indicators of sustainable agriculture, organic farming and climate change.

UNIT II INPUT MANAGEMENT AND PLANT PROTECTION MEASURES 9

Input management: Principles of compost production, vermin composting, compost quality, compost utilization and marketing – Introduction to pest and disease management in organic farming.

UNIT III ORGANIC CROP MANAGEMENT 9

Introduction to organic crop management – Organic vegetable crop management – Organic field crop management – Organic plantation crop management -Organic meat production

UNIT IV ORGANIC ANIMAL HUSBANDRY, FOOD PROCESSING AND HANDLING 9

Livestock living condition – Length of conversion period – Animal sources/origin – Breeds and breeding – Mutilations – Animal nutrition — Transport and slaughter – Bee keeping – Food processing ingredients and methods – Storage pest management – Packaging – Labelling - Cleaning and sanitizing of food processing facilities

UNIT V QUALITY AND MARKETING OF ORGANIC PRODUCTS 9

Quality of organic food – Natural resources of antioxidants for health care – Antioxidants capacity of fruits and vegetables – Organic food and Human health – Organic standards – Organic certification process – Operation structure of organic certification – Marketing of organic products.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AGE) 16/10/2017

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principles, components and sustainability aspects of organic farming to develop engineering knowledge
- Demonstrate composting techniques and organic pest management practices in farming to identify and analyse complex problems
- Apply organic crop and animal husbandry practices to design and develop effective solutions
- Analyze organic food processing, certification standards, and handling methods by conducting research-based investigations and interpreting data
- Evaluate the ethical aspects of quality, health benefits, and marketing practices in organic products

TEXTBOOKS:

1. Somani L L. "Textbook on Principles of Organic Farming". Agro Tech Books. 2023
2. Amzad Basha Kolar T A, Sathya Beema Jainab S, Muthukumaran M, Diptendu Sarkar, Abdul Kapur M, Jahirhussain G and Arumugam M. "Organic Farming for Sustainable Future". 2024

REFERENCES:

1. Palaniappan and Annadurai. "Organic Farming: Theory and Practice". 2019
2. Devi O R, Ojha N, Laishram B and Pathak K. "Organic Farming: Cultivating Sustainable Future". 2024

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	2	-	-	-	2	2	1
CO2	3	3	3	2	-	-	2	-	-	-	2	2	1
CO3	3	3	3	2	-	-	2	-	-	-	2	2	1
CO4	3	3	3	2	-	-	2	-	-	-	2	2	1
CO5	3	3	2	2	-	-	2	-	-	-	2	2	1



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand key concepts of agricultural economics and farm management
- Demonstrate economic laws and cost concepts in farming
- Apply cost estimation and input combination techniques
- Analyze resource management and risk reduction strategies
- Evaluate farm financial statements and budgeting methods

UNIT I FARM MANAGEMENT

9

Agricultural Economics – definition and scope – Farm Management – definition – scope- Classification of farms – Basic concepts in farm management - Relationship between farm management and other basic sciences - Farm layout – Farm records and accounts – Farm appraisal techniques – Valuation

UNIT II LAWS OF ECONOMICS

9

Basic laws of economics – demand and supply concepts – law of increasing, diminishing and constant returns – Equi-marginal returns - Product relationship – Production function – definition and types - Cost concepts – types - Opportunity cost – comparison of costs – Factor relationship – concepts

UNIT III COST CURVES

9

Principle of substitution – isoquant, isocline, expansion path, ridge line and – Cost curves – factor relationship – Least cost combination of inputs – Estimation of cost of cultivation and cost of production of crops - annual and perennial crops – Preparation of interview schedule and farm visit for data collection-Product – Product relationship: Optimum Combination of Products – Principle of Equi – Marginal Returns – Principle of Opportunity Cost and Minimum Loss Principle, Law of Comparative Advantage.

UNIT IV MANAGEMENT OF RESOURCES

9

Concept of risk and uncertainty – causes for uncertainty – Managerial decisions to reduce risks in production process – Management of resources – types of resources- land, labour, capital and measurement of their efficiencies – Mobilization of farm resources- Cost of machinery and maintenance – Break even analysis – Investment analysis – Discounting techniques.

UNIT V FARM MANAGEMENT AND FINANCIAL ANALYSIS

9

Farm management- need and analysis – Farm financial analysis – Balance sheet – Income statement – Elements of farm planning – Whole farm planning and partial planning – Farm budgeting – whole farm budgeting and partial budgeting – Estimation of credit - examples of farm planning and budgeting.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AGE) 18/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principles of farm management and agricultural economics to build foundational engineering knowledge in sustainable agricultural practices
- Demonstrate economic laws and cost concepts relevant to farming decisions by identifying and formulating solutions to agricultural problems
- Apply cost curve analysis to design optimal input combinations for efficient farm operations
- Analyze farm resource management, risk handling and investment decisions through interpretation of farm-level data and decision-making models
- Evaluate ethical implications in farm budgeting, financial planning and resource use with respect to fairness, equity and responsible decision-making

TEXTBOOKS:

1. Raju V T, "Economics of Farm Production and Management", 2024
2. Supriya, Aditya Bhooshan Srivastava, Gaurav Sharma, Abdullah Mohammad Ghazi Al Khatib and Mostafa Abotaleb, "Farm Management, Production and Resource Economics", NIPA publisher, 1st Edition, 2024

REFERENCES:

1. Somani L L, "Farm Management, Production & Resource Economics", Agro Tech Books, Udaipur, 2023
2. Raju V T and Rao D V S, "Economics of Farm Production and Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2024

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	-	2	-	-	-	2	2	1
CO2	3	3	3	2	2	-	2	-	-	-	2	2	1
CO3	3	3	3	2	2	-	2	-	-	-	2	2	1
CO4	3	3	3	2	2	-	2	-	-	-	2	2	1
CO5	3	3	3	2	2	-	2	-	-	-	2	2	1



CHAIRMAN
BoS (AGE)

24ME705PE

TOTAL QUALITY MANAGEMENT
(COMMON TO AGE, BME, ECE, EEE, CIVIL AND MECH)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn the fundamental approaches and philosophy of Total Quality Management (TQM)
- Know the core concepts and principles of TQM
- Equip with knowledge of both traditional and modern quality improvement tools
- Understand the different types of TQM techniques across different industries
- Study the various quality systems, international standards, and procedural frameworks

UNIT I INTRODUCTION

9

Definition of quality and TQM – basic needs of TQM – contributions of Deming, Juran, Crosby – TQM framework – history review of quality management – dimensions of quality – barriers to TQM – benefits of TQM – quality council – quality statements.

UNIT II TQM PRINCIPLES

9

Customer satisfaction – customer perception of quality, customer complaints, service quality, Kano Model and customer retention – employee involvement – motivation, empowerment, team and teamwork, recognition and reward, performance appraisal – continuous process improvement – PDCA cycle, 5s and Kaizen – supplier partnership– supplier selection and supplier rating and relationship development.

UNIT III TQM TOOLS

9

Basic seven tools of quality – new seven management tools – six-sigma – concepts and process – quality costs – BPR - reengineering process – improvement strategies – Taguchi principles – quality loss function – role of IT in TQM.

UNIT IV TQM TECHNIQUES

9

Benchmarking – reasons, types and process – Failure Mode of Effect Analysis (FMEA) – procedures and types – Quality Function Deployment (QFD) – benefits and process – Total Productive Maintenance (TPM) – process.

UNIT V QUALITY SYSTEMS

9

Benefits of ISO registration – ISO 9000 series of standards – ISO 9000 requirements and implementation – other sectors specific standards – documentation – audit – ISO 14000 series of standards – concepts, requirements and benefits – quality awards.

TOTAL: 45 PERIODS

CHAIRMAN
(BoS /MECH)

28/10/20

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the basic approaches and philosophy of TQM in organizational contexts.
- Interpret the key principles and concepts of Total Quality Management.
- Apply basic and advanced quality tools for process improvement and problem-solving.
- Identify the use of TQM techniques in real-world industrial scenarios.
- Build standardized quality systems and procedures to ensure improved quality assurance

TEXT BOOKS:

1. Dale H Besterfield, "Total Quality Management", Pearson Education Asia, 5th Edition, 2018.
2. Poonia M P and Sharma S C, "Total Quality Management", Khanna Publication, 1st Edition 2019

REFERENCES:

1. James R Evans and William M Lindsay, "The Management and Control of Quality", South-Western Cengage Learning, 11th Edition, 2020.
2. Vijayan V and Ramakrishnan H "Total Quality Management", S Chand Publication, Pune, 1st Edition, 2014.
3. Suganthi L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 7th Edition, 2011.
4. Poornima M Charantimath, "Total Quality Management", Pearson Education, 4th Edition, 2022.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	-	-	2	2	-
CO2	2	2	-	-	-	-	-	-	2	2	-
CO3	3	2	-	-	2	-	-	-	2	2	-
CO4	3	2	-	-	2	-	-	-	2	2	-
CO5	3	2	-	-	2	-	-	-	2	2	-

CHAIRMAN
(BoS / MECH)

OBJECTIVES:**The student should be made to:**

- Understand human values, morals, and ethics to promote integrity and social responsibility among engineers.
- Outline the concepts of engineering ethics, moral reasoning, and professional responsibilities.
- Know a social experiment, fostering accountability and ethical decision-making.
- Familiarize with safety, rights, and responsibilities in engineering practice, including legal and professional standards.
- Learn global issues, environmental ethics, and the role of engineers in sustainable and ethical technological development.

UNIT I HUMAN VALUES**9**

Morals, values and ethics - integrity work ethic - service learning - civic virtue - respect for others living peacefully - caring - sharing - honesty - courage - valuing, time - cooperation - commitment- empathy-self-confidence - character-spirituality.

UNIT II ENGINEERING ETHICS**9**

Senses of 'engineering ethics' - variety of moral issues - types of inquiry - moral dilemmas -moral autonomy - Kohlberg's theory and Gilligan's theory-consensus and controversy – models of professional roles - theories about right action-self interest - customs and religion - uses of ethical theories.

UNIT III ENGINEER AS SOCIAL EXPERIMENTATION**9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics -balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS**9**

Safety and risk assessment of safety and risk risk benefit analysis and reducing risk – the three mile island and Chernobyl case studies. Respect for authority collective bargaining - confidentiality conflicts of interest- occupational crime - professional rights-employee rights - Intellectual Property Rights (IPR)-discrimination.

CHAIRMAN
(BoS / MECH)

28/10/25

UNIT V GLOBAL ISSUES

9

Multinational Corporation (MNC) environmental ethics computer ethics weapons development - engineers as managers - consulting engineers - engineers as expert witnesses and advisors -- moral leadership - code of conduct - corporate social responsibility.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the importance of human values, integrity, and ethical behaviour in personal and professional life.
- Analyze moral dilemmas using ethical theories and professional standards.
- Apply the concept of social experimentation to real-world engineering problems.
- Select safety concerns, risk management principles, and professional rights and responsibilities in engineering practice.
- Summarise global engineering issues, environmental ethics, and the engineer's role in corporate social responsibility.

TEXT BOOKS:

1. Mike W Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 4th Edition, 2017.
2. Naagarazan R S, "Professional Ethics and Human Values", New Age International Publishers, 1st Edition, 2017

REFERENCES:

1. Govindarajan M, Natarajan S and Senthil Kumar V S, "Engineering Ethics", Prentice Hall of India, New Delhi, 12th Edition, 2011.
2. Charles B Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 4th Edition, 2014.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	3	3	2	2	-	-
CO2	-	-	-	-	-	3	3	2	2	-	-
CO3	-	-	-	-	-	3	3	2	2	-	-
CO4	-	-	-	-	-	-	3	2	2	-	-
CO5	-	-	-	-	-	3	3	2	2	-	-

CHAIRMAN
(BoS / MECH)

24ME707PE

PROJECT MANAGEMENT FOR MANAGERS

(COMMON TO AGE AND MECH)

L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand core concepts, principles, and scope of project management.
- Build skills in financial evaluation, capital budgeting, and risk analysis.
- Develop abilities in HR management and project scheduling.
- Provide expertise in advanced network analysis and crashing methods.
- Assess capabilities in project monitoring, quality, and procurement management.

UNIT I INTRODUCTION TO PROJECT MANAGEMENT

9

Introduction of project management - types of structure organizations - project management - stakeholders management - types of projects and project life cycle - project appraisal - methods of project selection - Multi-Criteria Decision Making (MCDM) - market and demand analysis – methods of demand forecasting.

UNIT II PROJECT FINANCIAL EVALUATION

9

Financial analysis - capital budgeting techniques - financing of projects – risk management – process - stages - control and documentation – techniques for risk analysis - analysis of standalone risk: sensitivity analysis, scenario analysis, break even analysis, hillier model, simulation analysis, decision tree analysis and analysis of contextual risk: corporate risk analysis, market risk analysis - abandonment analysis - product mix and plant capacity analysis.

UNIT III HUMAN RESOURCE AND SCHEDULING IN PROJECTS

9

Project team building, conflict and negotiation - HRM issues and time management - project time management- project scheduling - numbering of nodes - Program Evaluation and Review Technique (PERT) Networks - Critical Path Method (CPM) - laddering in PERT/CPM.

UNIT IV PROBABILITY MODELS AND NETWORK ANALYSIS

9

Probability models in networks - simulation of network - slacks and floats - time and cost relationship - crashing of networks - free float method

UNIT V PROJECT MONITORING AND CONTROL

9

Project Cost Management - Tools and Techniques of cost control - Cost Estimation - Quality Management - Source of variability and Six Sigma - Six Sigma Tools - Procurement Management - Project Termination – elements of project closeout management.

TOTAL: 45 PERIODS

CHAIRMAN
(BoS / MECH)

28/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the fundamentals, life cycle phases, and selection methods of projects.
- Apply capital budgeting, risk management, and technical analysis techniques for evaluating projects.
- Utilize human resources effectively and project schedules using PERT and CPM methods.
- Describe the probability models and crashing techniques for optimizing project timelines and resources.
- Implement cost control measures, quality management systems, and procurement processes in project execution.

TEXT BOOKS:

1. K.Nagarajan, " Project Management", New Age International Publishers, New Delhi,, 8th Edition, 2020
2. Prasanna Chandra, " Projects: Planning, Analysis, Selection, Financing, Implementation, and Review", McGraw Hill Education, New Delhi, 9th Edition, 2021.

REFERENCES:

1. Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", 13th edition, John Wiley & Sons, Hoboken, 2022.
2. Roderick A. Munro and Govindarajan Ramu and Daniel J. Zrymiak, "The certified six sigma Green Belt Handbook", ASQ Quality Press and Infotech Standards India Pvt. Ltd, 2nd Edition, 2017.
3. Pinto, Jeffrey K. "Project Management: Achieving Competitive Advantage", Pearson Education, 6th Edition, 2023.
4. Meredith, Jack R., Mantel, Samuel J., and Shafer, Scott M., "Project Management: A Managerial Approach", Wiley India, 10th Edition, 2021.
5. https://onlinecourses.nptel.ac.in/noc25_mg90/preview

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	-	2	2	-	1
CO2	3	2	-	-	-	-	-	2	2	-	1
CO3	2	2	-	-	-	-	-	2	2	-	1
CO4	2	2	-	-	-	-	-	2	2	-	1
CO5	3	2	-	-	-	-	-	2	2	-	1

CHAIRMAN
(BoS / MECH)

24ME708PE

PRINCIPLES OF MANAGEMENT
(COMMON TO AD, AGE, CIVIL, CSE, ECE, IT AND MECH)

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand basic concepts and evolution of management.
- Learn planning, forecasting, and decision-making tools.
- Explain organization structures, staffing, and coordination.
- Explore career development and leadership roles.
- Acquire organizational communication and ethics.

UNIT I MANAGEMENT AND EVOLUTION OF MANAGEMENT THOUGHT 8

Management – An Emerging Profession - Definition - Nature - Scope - Purpose - Characteristics, Functions - Roles and Skills of an Effective Manager, Evolution of Management Thought: Classical Theory - Scientific Management - Administrative Management / Management Process - Bureaucracy - Behavioural Science Approach - Quantitative Approach - Systems Approach - Contingency Approach - Operational Approach

UNIT II PLANNING, FORECASTING, DECISION-MAKING AND MANAGEMENT BY OBJECTIVES 11

Planning – Types of Plans - Planning Process, Strategic Management – Introduction - Types of Strategies, Understanding Environment of Business: Environmental Appraisal - Industry Analysis - Porter's Model of Competitive Advantage - Analysis of Organizational Resources and Capabilities, Forecasting and Premising: Concept - Components - Determinants - Benefits and Limitations - Forecasting Techniques, Decision-making – Components and Process, Group Decision-making, Creativity Problem-Solving, Management by Objectives (MBO): Concepts - Characteristics - Process - Goal Setting - Action Plan - Review - Benefits and Limitations, Styles of Management: American - Japanese - Indian

UNIT III ORGANIZING, DIRECTING, STAFFING AND COORDINATION 9

Organization Design, Hierarchical Systems, Organization Structures - Types of Organizational Structures, Formal and Informal Organization, Factors Determining Span of Management, Centralization & Decentralization, Span of Control, Understanding Authority and Responsibility, Principles of Delegation, Developing a culture of Innovation and performance, Staffing: HRM Introduction - Recent Trends - Technology in HRM - Workforce Diversity - Economic Challenges, Coordination: Concept - Need - Importance - Principles - Process - Type - Issues and Systems Approach - Techniques

UNIT IV CAREER DEVELOPMENT STRATEGY AND LEADERSHIP 9

Introduction, Concept and Elements of Career, Overview of Career Development - Significance and Advantages - Objectives - Types - Programmes - Different Stages or Cycles of Career Development Process, Career Anchors, Steps in the Career Planning Process, Leadership: Concept - Nature - Importance, Attributes of a Leader - Role of a Leader in Demonstrating Awareness of Legal - Personnel - Strategic Issues Relating to Globalization - Culture and Gender Diversity - Role of Leader in Conflict Resolution and Negotiation


CHAIRMAN
(BOS / MECH)

28/10/25

UNIT V COMMUNICATION, CHANGE AND ETHICS

8

Communication in Organizations: Process - Importance - Barriers - Use of Tone - Styles - Language - Role of Perception in Influencing Communication - Role of Culture, Change Management: Concept - Importance - Causes of Change (Social, Economic, Technological, Organizational) - Developing a Climate for Learning, Concept of Learning Organizations, Challenges of Contemporary Business: Role of Ethics, Corporate Social Responsibility, and Environmental Issues

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain management roles, functions, and theories.
- Summarize strategic planning and MBO in business settings.
Examine organizing and staffing principles in modern trends of HRM
- Develop leadership and career planning skills in a globalized business environment.
- Apply effective communication and ethical practices to suit professional settings.

TEXT BOOKS:

1. Stephen P. Robbins, David A. Decenzo, 2016. Fundamentals of Management, Pearson Education, 9th Edition
2. Harold Koontz, O'Donnell and Heinz Weihrich, 2012. Essentials of Management. New Delhi, 9th edition, Tata McGraw Hill

REFERENCES:

1. Management Fundamentals: Concepts, Applications, & Skill Development, 6th edition, Sage. 2014
2. Richard L. Daft, Principles of Management, Cengage Learning. 2009
3. https://onlinecourses.nptel.ac.in/noc25_mg52/preview

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	-	-	2	2	-
CO2	2	2	-	-	-	-	-	-	2	2	-
CO3	3	2	-	-	-	-	-	-	2	2	-
CO4	3	2	-	-	-	-	-	-	2	2	-
CO5	3	2	-	-	-	-	-	-	2	2	-

CHAIRMAN
(BoS / MECH)

OBJECTIVES:

The students should be made to:

- Demonstrate the role of macro, secondary and micronutrients in soil–plant relationships and crop productivity
- Apply appropriate soil testing and fertility evaluation methods for diverse agricultural soils
- Construct fertilizer quality control procedures to ensure proper nutrient management in the field
- Examine soil nutrient status and recommend integrated plant nutrient management strategies for sustainable farming
- Evaluate the impact of nutrient management practices on agricultural productivity and environmental quality

UNIT I FUNDAMENTALS OF SOIL NUTRIENT MANAGEMENT 9

Importance of soil nutrient management in agriculture – Basic soil–plant relationship and nutrient uptake mechanisms – Soil nutrient cycles and interactions in crop production.

UNIT II MAJOR PLANT NUTRIENTS: ROLES AND MANAGEMENT 9

Nitrogen (N): Soil N forms, transformations and role in plant growth – Phosphorus (P) and Potassium (K): Soil sources, functions and plant utilization – Secondary nutrients (Ca, Mg, S): occurrence, deficiency symptoms and corrective measures.

UNIT III MICRONUTRIENTS AND SOIL FERTILITY EVALUATION 9

Micronutrients (Zn, Fe, Mn, Cu, B, Mo, Cl): importance, deficiency/toxicity and management practices – Soil testing principles and procedures – Soil fertility evaluation methods and interpretation of soil test results – Soil quality, soil health and land capability classification.

UNIT IV FERTILIZER SCIENCE AND TECHNOLOGY 9

Manufacturing processes, properties and field behavior of N, P and K fertilizers – Fertilizer quality control, adulteration issues and fertilizer testing procedures – Fertilizer legislation and standards.

UNIT V IPNM AND ENVIRONMENTAL CONCERNS 9

Management of fertilizers and organic manures in soil – Fertilizer recommendation approaches for different crops and soils – Integrated Plant Nutrient Management (IPNM) strategies – Agricultural productivity enhancement while maintaining environmental quality.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/11/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate understanding of essential plant nutrients and their role in crop production
- Apply soil sampling and testing methods to support effective nutrient management
- Construct fertilizer quality assessment techniques to ensure compliance with standards
- Formulate integrated nutrient management plans based on soil test interpretations
- Analyze nutrient management strategies for their impact on crop yield and sustainability

TEXT BOOKS:

1. Tisdale S L, Nelson W L, Beaton J D and Havlin J L. "Soil Fertility and Fertilizers". Pearson Education, 8th Edition, 2021
2. Brady N C and Weil R R. "The Nature and Properties of Soils". Pearson Education, 15th Edition, 2017

REFERENCES:

1. Fageria N K, Baligar V C and Jones C A. "Growth and Mineral Nutrition of Field Crops", CRC Press, 3rd Edition, 2010
2. Marschner P. "Marschner's Mineral Nutrition of Higher Plants". Academic Press, 4th Edition, 2022

Mapping of COs with POs and PSOs

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CO3	3	3	3	-	3	1	2	-	-	-	2	2	1
CO4	3	3	3	3	3	1	-	-	-	-	2	2	2
CO5	3	3	3	2	2	3	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand the fundamental concepts of genes, Mendelian genetics and classical plant breeding principles
- Apply molecular marker techniques and tissue culture methods in plant breeding programs
- Utilize marker-assisted selection and genetic transformation tools for crop improvement
- Analyze transgenic plant screening methods and interpret molecular diagnostic results
- Evaluate the integration and effectiveness of genetic engineering strategies in crop development

UNIT I FUNDAMENTALS OF GENETICS AND PLANT BREEDING 9

Concept of gene – Mendelian genetics – Principles of conventional plant breeding: pureline selection – pedigree method – back cross method – mass selection – recurrent selection – heterosis – inbreeding depression – population genetics.

UNIT II ADVANCED GENETIC CONCEPTS IN PLANT BREEDING 9

Polyploidy – reverse breeding – molecular markers: RFLP – RAPD – AFLP – SSR – ISSR – CAPS – applications of molecular markers in crop improvement.

UNIT III MARKER-ASSISTED BREEDING AND PLANT TISSUE CULTURE 9

Marker assisted selection (MAS) – introduction to genetic engineering – plant tissue culture techniques – preparation of gene constructs – promoter-reporter constructs – applications of tissue culture in plant breeding and genetic engineering.

UNIT IV PLANT GENETIC TRANSFORMATION AND SCREENING 9

Methods of plant genetic transformation – selection and screening of transgenic plants: PCR – Southern blot – Northern blot – Western blot – microarray analysis – molecular tools for transgene confirmation.

UNIT V MOLECULAR ANALYSIS OF TRANSGENIC PLANTS 9

Analysis of Southern blot for integration events – double integration – gene stacking – molecular characterization of transgenic plants – applications of genetic engineering in crop improvement.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify gene concepts, relate Mendelian laws and compare conventional breeding approaches for crop improvement
- Apply molecular marker techniques and construct plant tissue culture methods for advanced breeding practices
- Build genetic transformation approaches to develop crops with desired traits
- Examine PCR, blotting and microarray data to determine transgene integration and expression
- Analyze molecular results to evaluate the effectiveness of genetic engineering in crop improvement

TEXTBOOKS:

1. Singh B D. "Plant Breeding: Principles and Methods". Scientific International. 12th Edition. 2022
2. Acquaah G.. "Principles of Plant Genetics and Breeding". Wiley. 3rd Edition. 2020

REFERENCES:

1. Gupta P K. "Molecular Biology and Genetic Engineering". Rastogi Publications. 2018
2. Chawla H S. "Introduction to Plant Biotechnology". CBS Publishers & Distributors. 4th Edition. 2023
3. Chrispeels M J and Sadava D E. "Plants, Genes and Crop Biotechnology". Jones & Bartlett Learning. 3rd Edition. 2014

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	1	1	-	-	-	-	2	2	2
CO2	3	3	3	3	3	-	-	1	-	-	2	3	2
CO3	3	3	3	3	3	1	-	-	-	-	2	3	2
CO4	3	3	2	3	3	1	-	-	-	-	2	3	2
CO5	3	2	-	-	1	1	-	-	-	-	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand the environmental and ecological factors influencing crop growth across diverse geo-ecological zones
- Apply quantitative agro-biological principles and yield equations to predict crop performance
- Apply plant population optimization and ideal plant type concepts to enhance yield under varying resources
- Analyze farm mechanization, energy management and conservation tillage practices in crop production
- Analyze modern crop production technologies and precision agriculture tools for sustainable farming systems

UNIT I CONCEPTS OF CROP GROWTH AND DISTRIBUTION 9

Agro ecological zones of India. Crop distribution - physical, chemical and biological factors. Soil and climate influence on crop growth. Crop growth analysis in relation to environment and production functions. Scientific principles of crop production. Concept of soil plant relations. Yield and environmental stress. Relationship between plant population and yield and response curves. Use of growth hormones and growth regulators for better adaptation in stressed condition.

UNIT II SOIL NUTRIENT LAWS IN CROP PRODUCTION 9

Quantitative agro-biological principles and inverse yield nitrogen law, Mitscherlich yield equation, Bray's nutrient mobility concept, Baule unit - its interpretation and applicability. Soil Health Care (SHC). Sensor based techniques in soil nutrient management. Balanced nutrition and INM. Crop response functions in yield management - future strategies.

UNIT III PLANT IDEOTYPES 9

Effect of lodging in cereals - management. Physiology of grain yield in cereals. Optimization of plant population and planting geometry for various situations. Plant ideotypes – concepts and applications. Yield maximization.

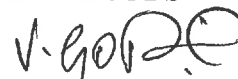
UNIT IV FARM MECHANIZATION AND ENERGY MANAGEMENT 9

Modern concepts in tillage: zero, minimum and conservation tillage; resource conservation techniques in conventional and modern tillage – conservation agriculture - Energy concepts in farming systems under varied situations. Modern techniques in post-harvest technology. Farm mechanization. Organic agriculture. ITK and its role in crop production.

UNIT V MODERN CONCEPTS AND APPROACHES 9

Crop models- definition, concepts and types (empirical and mechanistic), model application. Precision agriculture- definition, basic concepts, scope and approach. Technologies for precision agriculture – GIS, GPS, sensors and remote sensing. Modern crop production concepts and approach. Soil less cultivation - aeroponic, hydroponic - Vertical farming – artificial intelligence – concept and application. Robotic and drones in agriculture. Protected agriculture - Current stream of taught.

TOTAL: 45 PERIODS



CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify environmental and geo-ecological factors affecting crop growth and yield
- Apply yield equations and nitrogen laws to estimate crop productivity
- Construct planting geometry and crop models for achieving target yields
- Examine conservation tillage and mechanization for efficient resource use
- Analyze integrated and precision farming systems for sustainable agriculture

TEXTBOOKS:

1. Balasubramaniyan P and Palaniappan S P. "Principles and Practices of Agronomy". Agrobios. 2nd Edition. 2024
2. Fageria N K. "Maximizing Crop Yields". Marcel Dekker. 1st Edition. 1992

REFERENCES:

1. Donald C M and Hamblin J. "The Biological Yield and Harvest Index of Cereals as Agronomic and Plant Breeding Criteria". chapter in Advances in Agronomy. 1976
2. Gardner F P, Pearce R. B and Mitchell R L. "Physiology of Crop Plants". Scientific Publishers. 2nd Edition. 2017

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	-	-	1	-	-	-	2	2	-
CO2	3	3	2	2	1	-	-	-	-	-	2	2	-
CO3	3	3	3	2	2	-	1	-	-	-	2	2	-
CO4	3	3	2	2	3	-	2	-	-	-	2	2	1
CO5	3	3	2	2	-	-	1	-	-	-	2	2	-



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Explain the characteristics, quality parameters and legal aspects of seed production in crop plants
- Demonstrate seed multiplication, hybrid seed production and certification procedures in compliance with standards
- Utilize seed processing, treatment, drying and testing techniques to ensure seed quality and viability
- Examine the organizational, economic and marketing strategies involved in developing sustainable seed programmes
- Evaluate seed production techniques for specific agricultural crops to optimize yield, quality and market potential

UNIT I SEED CHARACTERS**9**

Definition – characteristics of seed and how it differs from grain – Propagation of crop plants through true seed and vegetative means – Features of good quality seed – Importance of seed in successful crop production. Floral biology: self and cross pollination – Methods of genetic improvement of crop plants such as selection, hybridization, mutation and polyploidy – Seed legislations promulgated in India from 1966 to date and the purpose of each of these legislations.

UNIT II SEED PRODUCTION AND CERTIFICATION**9**

Multiplication of seed and seed material: systems of seed multiplication, classes of seed, multiplication models, multiplication ratio, field selection, planting ratio, isolation needs and rouging – Harvest and extraction of seed – Methods of hybrid seed production – Genetic deterioration during crop production cycles – Seed certification process: legal basis, pre-requisites for applicability, detailed description of the specific steps of the certification process.

UNIT III SEED PROCESSING AND TESTING**9**

Components of seed processing in a broader sense – Steps in seed processing in its narrower sense: preliminary cleaning, basic cleaning and grading and equipment used in each of the steps – Seed treatment – Seed drying – Seed sampling – Seed testing: details of specific tests conducted for different purposes – Standards prescribed for different crops.

UNIT IV DEVELOPING SEED PROGRAMMES**9**

Types of organizations involved in seed production and their objectives and features – Organizational set up of a seed company – Steps involved in planning and developing a seed programme – Seed marketing activities and analysis of seed demand and supply – Costing and pricing strategies – Economics of production of different crop seed – Seed packaging – Opportunities for Indian seed companies to have a greater share of world seed market – Visit to seed organizations – Preparing seed projects to obtain credit – Export procedures and formalities – Seed/plant quarantine methods.



CHAIRMAN
BoS (AGE) 16/10/20

UNIT V SEED PRODUCTION IN AGRICULTURAL CROPS**9**

Principles and special techniques used for seed production in important agricultural crops by selecting representatives of cereals, pulses and oil seeds crops.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Classify the distinguishing features, quality standards and legislative frameworks of seed production
- Construct seed multiplication, hybridization and certification processes using agronomic protocols
- Organize seed processing, treatment, drying and testing methods with modern tools
- Examine organizational structures, economic considerations and marketing strategies for seed programs
- Analyze crop-specific seed production techniques to ensure genetic purity and market competitiveness

TEXTBOOKS:

1. Singh S P. "Commercial Vegetable Seed Production". Bio-Green Books, 2nd Edition, 2022
2. Agarwal R L. "Seed Technology". Oxford & IBH Publishing Co., 2018

REFERENCES:

1. Subir Sen and Ghosh N. "Seed Science Technology". Kalyani Publishers, Chennai, 1999
2. Dahiya B S and Rai K N. "Seed Technology". Kalyani Publishers, Chennai, 1997
3. George and Raymond. A T. "Vegetable Seed Production", Longman Orient Press, New York, 2009

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	1	1	-	-	-	-	-	2	2	-
CO2	3	3	3	1	1	-	-	-	-	1	2	2	-
CO3	3	3	3	1	2	-	-	-	-	1	2	2	2
CO4	3	3	3	2	1	1	1	1	1	1	2	2	-
CO5	3	3	3	2	2	1	1	-	-	1	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Understand the principles, scope and types of farming systems including integrated farming
- Apply integrated farming system components to optimize resource use in different agro-ecological zones
- Implement livestock and allied enterprise management practices within integrated farming systems
- Analyze the role of allied enterprises and their impact on farm productivity and sustainability
- Evaluate resource recycling and sustainable practices to enhance efficiency in integrated farming systems

UNIT I INTRODUCTION OF FARMING SYSTEM**9**

Farming system – introduction – scope of farming system – importance – concept – principles of farming system - Types of farming systems – Advantages and limitations - suitability – factors affecting the farming system.

UNIT II INTEGRATED FARMING SYSTEM**9**

Integrated farming system-historical background - objectives and characteristics advantages of IFS – Components of IFS - Integrated Farming System in Wetland – IFS in garden land – IFS in dryland and fallow land.

UNIT III LIVESTOCK PRODUCTION IN IFS**9**

IFS With Goats and Sheep – housing and feeding management – deworming – Young stock management - Dairy Farming in IFS - Fodder production in IFS - IFS With poultry rearing - Duck farming – Rabbit farming – Piggery.

UNIT IV IFS COMPONENTS**9**

Agroforestry – definition – types of agroforestry system – benefits of agroforestry system– Aquaculture – Fish cum agriculture and horticulture – Beekeeping – types and cast of bees – care and management in beekeeping – Sericulture - Mulberry cultivation – Silkworm rearing – Organic farming – Azolla – Small scale nursery.

UNIT V RESOURCE RECYCLING IN IFS**9**

Resource recycling in wetland IFS - Resource flow in crop + dairy + biogas + spawn + silviculture In IFS - Biogas production through IFS – Resource recycling in crop + goat IFS - Uses and features of biogas - Structure and function of Dheenabandhu Gas plant - Vermicompost - Preparation of vermicompost from farm residue – Mushroom production in IFS.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Compare principles, types and significance of farming systems using engineering concepts
- Illustrate integration of crop and livestock components for different agro-ecological zones in IFS
- Construct livestock management practices with modern tools for sustainable productivity
- Dissect allied enterprises such as agroforestry, aquaculture and beekeeping for diversification
- Inspect resource recycling methods like biogas, vermicomposting and mushroom cultivation for sustainability

TEXTBOOKS:

1. Nanda S. "Integrated Farming System Practices: Challenges and Opportunities". New India Publishing Agency. 1st Edition. 2016
2. Mane R V. "Integrated Farming System: A Strategy for Sustainable Farm Production & Livelihood Security". Scitus Academics. 2016

REFERENCES:

1. Zaman. "Integrated Farming System and Agricultural". New India Publishing Agency. 2019
2. Nanwal R K. "Farming System and Sustainable Agriculture". Kalyani Publishers. 2017

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	1	-	-	-	-	-	-	2	2	-
CO2	3	3	3	1	-	-	-	-	-	-	2	2	1
CO3	3	3	3	-	1	-	-	-	-	-	2	2	1
CO4	3	3	3	1	-	1	-	-	-	-	2	2	1
CO5	3	3	3	-	-	1	1	-	-	-	2	2	1



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand the concepts, importance and scope of protected cultivation in horticultural crops
- Demonstrate the application of protected cultivation practices for vegetables, flowers and specialty crops
- Utilize precision farming technologies such as GIS, GPS, sensors and automation for horticultural management
- Examine the interrelationship between structural design, environmental control and crop performance in protected systems
- Impart knowledge on challenges, management practices and economic aspects of vegetable cultivation in protected structures

UNIT I PROTECTED CULTIVATION AND ITS TYPES 9

Importance and methods of protected culture in horticultural crops – Importance and scope of protected cultivation – different growing structures of protected culture viz., green house, poly house, net house, poly tunnels, screen house, protected nursery house – study of environmental factors influencing greenhouse production – cladding / glazing / covering material – ventilation systems – cultivation systems including nutrient film technique / hydroponics / aeroponic culture – growing media and nutrients – canopy management – micro irrigation and fertigation systems.

UNIT II PROTECTED CULTIVATION OF VEGETABLE CROPS 9

Protected cultivation technology for vegetable crops – Hi-tech protected cultivation techniques for tomato, capsicum nursery, cucumber, gherkins strawberry and melons – integrated pest and disease management – post harvest handling.

UNIT III PROTECTED CULTIVATION OF FLOWER CROPS 9

Protected cultivation technology for flower crops – Hi-tech protected cultivation of cut roses, cut chrysanthemum, carnation, gerbera, asiatic lilies, anthurium, orchids, cut foliage's and fillers – integrated pest and disease management – postharvest handling.

UNIT IV PRECISION FARMING TECHNIQUES 9

Concept and introduction of precision horticulture – Importance, definition, principles and concepts – Role of GIS and GPS – Mobile mapping system and its application in precision farming – design, layout and installation of drip and fertigation in horticultural crops – role of computers in developing comprehensive systems needed in site specific management (SSM) – georeferencing and photometric correction – Sensors for information gathering – geostatistics – robotics in horticulture – postharvest process management (PPM) – remote sensing – information and data management and crop growth models – GIS based modeling.

V. G. P. P.

CHAIRMAN
BoS (AGE) 16/10/25

UNIT V CHALLENGES, MANAGEMENT AND ECONOMICS OF PROTECTED CULTIVATION

9

Problems of growing vegetables in protected structures and their remedies. physiological disorders. insect and disease management in protected structures: Use of protected structures for seed production: Economics of greenhouse crop production.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain principles. structural components and environmental factors of protected cultivation for sustainable crop production
- Implement and design protected cultivation techniques for vegetables and flowers in diverse climatic conditions
- Apply modern tools such as GIS. GPS and sensors and conduct research-based investigations for precision horticulture
- Analyze and integrate irrigation. fertigation and canopy management practices using sustainability and project management concepts
- Examine issues in protected vegetable cultivation and propose suitable management strategies

TEXTBOOKS:

1. Singh B. "Protected Cultivation of Vegetable Crops". Kalyani Publishers. Ludhiana. 2006.
2. Singh B. "Advances in Protected Cultivation". New India Publishing Agency. New Delhi. 1st Edition. 2014.

REFERENCES:

1. Reddy P. Parvatha. "Sustainable Crop Protection under Protected Cultivation". Springer Publications. USA. 1st Edition. 2016.
2. Singh J.. "Precision Farming in Horticulture". New India Publishing Agency. New Delhi. 1st Edition. 2013.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	1	1	1	-	-	-	1	2	2	1
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CO3	3	3	3	-	1	1	-	-	-	1	2	2	1
CO4	3	3	3	1	1	-	1	1	-	-	2	2	2
CO5	3	3	3	1	1	1	-	-	-	1	2	2	1



CHAIRMAN
BoS (AGE)

OBJECTIVE:**The student should be made to:**

- Understand the Earth's climate system and its environmental importance
- Apply knowledge of atmospheric composition to explain environmental processes
- Implement climate change impact knowledge to design sector-specific adaptation
- Analyze the scope and implications of international climate change agreements
- Examine and adopt climate-smart agricultural practices for sustainability

UNIT I EARTH'S CLIMATE SYSTEM 9

Role of ozone in environment – ozone layer – ozone depleting gases – Green House Effect. Radiative effects of Greenhouse Gases – Hydrological Cycle – Green House Gases and Global Warming – Carbon Cycle.

UNIT II ATMOSPHERE AND ITS COMPONENTS 9

Importance of Atmosphere – Physical Chemical Characteristics of Atmosphere – Vertical structure of the atmosphere – Composition of the atmosphere – Atmospheric stability – Temperature profile of the atmosphere – Lapse rates – Temperature inversion – effects of inversion on pollution dispersion.

UNIT III IMPACTS OF CLIMATE CHANGE 9

Causes of Climate change: Change of Temperature in the environment – Melting of ice Pole – sea level rise – Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions – Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV OBSERVED CHANGES AND ITS CAUSES 9

Climate change and Carbon credits – CDM – Initiatives in India – Kyoto Protocol Intergovernmental Panel on Climate change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Evidences of Changes in Climate and Environment – on a Global Scale and in India.

**UNIT V SUSTAINABLE FARMING PRACTICES FOR CLIMATE CHANGE
ADAPTATION 9**

Definition, principles, need and importance – Climate change impacts on crops and farmers – CSA approaches for soil and water management, crop diversification, integrated and organic farming and efficient resource use – Agroforestry, pest and disease management, harvesting and post-harvest practices – Risk management, crop insurance and gender inclusion in climate-resilient agriculture.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AGE) 16/10/25

OUTCOMES:

After successful completion of this course students are expected to be able to:

- Classify the interactions between ozone, greenhouse gases and the Earth's climate system for sustainable agriculture
- Determine factors influencing stability and pollution dispersion using atmospheric data
- Construct mitigation and adaptation measures for climate-resilient farming practices
- Examine the effectiveness of global and national climate change policies for agricultural sustainability
- Inspect climate change impacts on agriculture and recommend climate-smart strategies

TEXTBOOK:

1. Lal R, Stewart B A and Horn R. "Climate Change and Soil Management: Sustainable Agriculture and Food Security", CRC Press, Taylor & Francis, 2nd Edition, 2024
2. Rosenzweig C and Hillel D. "Climate Change and the Global Harvest: Impacts of El Niño and Other Extreme Events on Agriculture", Oxford University Press, Updated Edition, 2023

REFERENCES:

1. Howden S M, Soussana J F and Porter J R. "Climate Change and Agriculture: Future Prospects for Food Security", Springer, 1st Edition, 2025
2. Vermeulen S and Aggarwal P K. "Climate-Smart Agriculture: Building Resilience to Climate Change", Elsevier, 2nd Edition, 2024

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	-	-	1	-	-	-	-	2	2	-
CO2	3	3	3	1	1	1	-	-	-	-	2	2	2
CO3	3	3	3	-	1	1	-	-	-	1	2	2	2
CO4	3	3	3	1	-	1	1	1	1	1	2	2	2
CO5	3	3	3	1	1	1	1	1	1	1	2	2	2



CHAIRMAN
BoS (AGE)

OBJECTIVES:

The students should be made to:

- Describe the fundamental concepts, principles and frameworks of communication and extension programme planning
- Implement individual, group and mass contact methods in agricultural extension activities
- Employ innovative information sources and agricultural journalism techniques to support extension goals
- Investigate the process of diffusion and adoption of innovations among farming communities
- Assess factors influencing capacity building and training requirements of farmers and extension personnel

UNIT I COMMUNICATION AND EXTENSION PROGRAMME PLANNING 9
Communication – meaning – definition – models – elements – characteristics – types – barriers – Extension programme planning – meaning – definitions – importance – principles – steps in programme development process – monitoring – evaluation of extension programmes.

UNIT II EXTENSION TEACHING METHODS 9
Extension teaching methods – meaning – definition – functions – classification. Individual contact methods – farm and home visit – result demonstration – field trials. Group contact methods – group discussion – method demonstration – field trips. Small group discussion techniques – lecture – symposium – panel – debate – forum – buzz group – workshop – brainstorming – seminar – conference.

UNIT III MASS CONTACT METHODS AND MEDIA MIX 9
Mass contact methods – campaign – exhibition – kisan mela – radio – television – Steps – importance – merits – demerits of mass contact methods – Factors influencing selection of teaching methods – combination of teaching methods.

UNIT IV INNOVATIVE INFORMATION SOURCES 9
Innovative information sources – internet – cyber cafes – video conferences – teleconferences – kisan call centres – consultancy clinics – Agricultural journalism – meaning – scope – importance – sources of news – types of news – merits – limitations.

UNIT V DIFFUSION, ADOPTION AND CAPACITY BUILDING 9
Diffusion and adoption of innovations – meaning – definitions – models of adoption process. Innovation–decision process – elements – adopter categories – Characteristics of adopter categories – factors influencing adoption – Capacity building – extension personnel – farmers – types of training – training for farmers – farm women – rural youth.

TOTAL: 45 PERIODS

V. G. R. P. E.

CHAIRMAN
BoS (AGE) 16/11/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify communication models and programme planning steps in agricultural extension
- Build individual and group contact approaches for farmer engagement
- Construct agricultural messages using ICT tools and journalism practices
- Examine adopter classifications and determinants of technology uptake
- Assess training and capacity-building strategies for rural agricultural development

TEXTBOOKS:

1. Ray G L. "Extension Communication and Management". Kalyani Publishers. Ludhiana, 2022
2. Reddy A A and Banerjee S. "Extension Education and Rural Development". Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2014

REFERENCES:

1. Van den Ban A W and Hawkins H S. "Agricultural Extension". CBS Publishers & Distributors, New Delhi, 2002
2. Swanson B E, Bentz R P and Sofranko A J. "Improving Agricultural Extension: A Reference Manual". FAO, Rome, 1997
3. Leeuwis C and Van den Ban A W. "Communication for Rural Innovation: Rethinking Agricultural Extension". Wiley-Blackwell, UK, 2004

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	-	-	1	-	-	1	-	2	2	-
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CO3	3	3	3	1	2	1	-	2	2	-	2	2	2
CO4	3	3	3	1	-	1	-	1	1	1	2	2	2
CO5	3	3	3	1	-	1	1	1	1	1	2	2	2


CHAIRMAN
BoS (AGE)

OBJECTIVES:

The student should be made to:

- Understand the principles of biopotential generation and electrode interfaces
- Explore techniques for measuring bioelectrical signals
- Analyze signal conditioning circuits used in biomedical applications
- Examine instrumentation for non-electrical physiological measurements
- Investigate biochemical sensors and biosensing techniques

UNIT I BIOPOTENTIAL ELECTRODES

9

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode-skin interface, half-cell potential, Contact impedance, polarization effects of electrode - non polarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - motion artifacts, measurement with two electrodes.

UNIT II BIOPOTENTIAL MEASUREMENTS

9

Bio signals characteristics - frequency and amplitude ranges. ECG - Einthoven's triangle, standard 12 lead system, Principles of vector cardiography. EEG- 10-20 electrode system, unipolar, bipolar and average mode. EMG-unipolar and bipolar mode. Recording of ERG, EOG and EGG.

UNIT III SIGNAL CONDITIONING CIRCUITS

9

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier, Impedance matching circuit, isolation amplifiers - transformer and optical isolation - isolated DC amplifier and AC carrier amplifier., Power line interference, Right leg driven ECG amplifier, Band pass filtering.

UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETERS

9

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - Auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers, Systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method. Electromagnetic and ultrasound blood flow measurement.

UNIT V BIOCHEMICAL MEASUREMENT AND BIOSENSORS

9

Biochemical sensors - pH, pO₂ and pCO₂, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors, Blood gas analysers - colorimeter, Sodium Potassium Analyser, spectrophotometer, blood cell counter, auto analyser (simplified schematic description) - Bio Sensors - Principles - amperometry and voltametric techniques.

TOTAL: 45 PERIODS
Chairman
BoS/BME

OUTCOMES:

On successful completion of this course, the student will be able to,

- Explain the origin of biopotentials and analyze the characteristics of various electrodes and their circuits
- Describe the methods for recording ECG, EEG, EMG, and other biosignals using standard electrode systems
- Design and evaluate bio-amplifier circuits and filtering techniques for accurate biosignal acquisition
- Compare methods for measuring temperature, blood pressure, and cardiac output using various technologies
- Demonstrate the working principles of biosensors and assess their applications in clinical diagnostics

TEXT BOOK:

1. Leslie Cromwell, —Biomedical Instrumentation and measurement|, 2nd edition, Prentice Hall of India, New Delhi, 2015.

REFERENCES:

1. John G. Webster, —Medical Instrumentation Application and Design|, 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.
2. Joseph J. Carr and John M. Brown, —Introduction to Biomedical Equipment Technology|, Pearson Education, 2004.
3. Myer Kutz, —Standard Handbook of Biomedical Engineering and Design|, McGraw Hill Publisher, 2003.
4. Khandpur R.S. —Handbook of Biomedical Instrumentation|. 3rd edition. Tata McGraw-Hill New Delhi. 2014.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	1	2	-	-	-	1	-	2
CO2	3	2	1	1	3	-	-	-	2	-	2
CO3	3	2	3	2	3	-	-	-	2	1	2
CO4	3	3	2	2	3	2	-	-	2	1	2
CO5	3	2	2	2	3	3	2	-	2	1	3


Chairman
BoS/BME

OBJECTIVES:

The student should be made to:

- Understand the role of food sources and microbiological safety in public health
- Explore the biochemical and physiological roles of macro and micronutrients
- Examine the applications of nanotechnology in food science
- Investigate nutritional disorders and energy balance in relation to diet planning
- Critically assess consumer perspectives and regulatory issues surrounding GM foods

UNIT I FOOD AND MICROBIOLOGY OF HEALTH

9

Food resources (plant, animal, microbes); Overview of current production systems; constraints and necessity of novel strategies. Functional and “Super” Foods - role in optimal nutrition. Sugar, protein and fat substitutes. Food and behaviour- physiological disturbances in alcoholism, drug abuse and smoking. Food Related Laws: Inspection – Microbial Indicators of product quality – Indicators of food safety – 229 Microbiological safety of foods - control strategies – Hazard Analysis Critical Point System (HACCP concept)- Microbiological criteria.

UNIT II NUTRIENTS AND FOOD ADDITIVES

9

Macro nutrients- carbohydrates, proteins and lipids. Micronutrients-Minerals: Calcium, Magnesium, Iron, Zinc, Copper and Selenium; Vitamins. Nutritional Physiology: Digestion, absorption, and utilization of major and minor nutrients. Biotechnology of food additives- Bioflavors and colors, microbial polysaccharides, recombinant enzymes in food sector.

UNIT III NANO FOOD TECHNOLOGY

9

Nano materials as food components, food packaging and nano materials, policies on usage of nanomaterials in foods. Food product development: steps involved in food product development, shelf-life assessment.

UNIT IV FOOD RELATED NUTRITIONAL DISORDERS AND ENERGY CALCULATION

9

Type I Disorders-Causes of life style and stress related diseases. Cardio-vascular diseases, hypertension, obesity. Type-II Disorders: Cancer, diabetics, ulcers, electrolyte and water imbalance. Health indices. Preventive and remedial measures. Energy balance and methods to calculate individual nutrient and energy needs. Planning a healthy diet.

UNIT V CONSUMERS ON GM FOODS AND CONTEMPORARY ISSUES

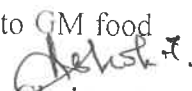
9

Global perspective of consumers on GM foods: Major concerns of transgenic, foods GM ingredients in food products. (labeling, bioavailability, safety aspects); regulatory agencies involved in GM foods, Case studies- GM foods.

TOTAL:45 PERIODS**OUTCOMES:**

On successful completion of this course, the student will be able to,

- Identify various food resources and explain microbial indicators used in food safety and HACCP principles
- Analyze the digestion, absorption, and utilization of nutrients and evaluate the role of food additives
- Demonstrate knowledge of nano materials in food packaging and assess their impact on shelf-life and safety
- Diagnose common nutritional disorders and design balanced diets based on individual energy requirements
- Debate ethical concerns and interpret labeling and safety regulations related to GM food products


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TEXT BOOKS:

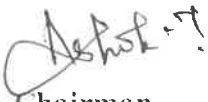
1. P.J. Fellows.2009. Food Processing Technology -Principles and Practice (Third Edition). A volume in Woodhead Publishing Series in Food Science, Technology and Nutrition.
2. Kalidas Shetty, Gopinadhan Paliyath, Anthony Pometto, Robert E. Levin. 2015. Food Biotechnology. CRC Press. Second edition.

REFERENCES:

1. Understanding Nutrition. 2010. Ellie Whitney, Sharon Rady Rolfes, 11e. Thompson Wadsworth.
2. Nutritional Sciences- From Fundamentals to Food.2013. Michelle McGuire, Kathy A. Beerman, second edition, Thompson Wadsworth.
3. Yasmine Motarjemi, Huub Lelieveld. Food Safety Management - A Practical Guide for the Food Industry (2014), 1st Edition, Academic Press, London, UK.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	2	2	2	3	2	-	2	1	2
CO2	3	3	2	2	2	2	-	-	2	1	2
CO3	3	2	3	2	3	3	2	-	2	1	3
CO4	3	3	3	2	2	2	-	-	2	2	3
CO5	2	2	1	1	1	3	3	2	3	2	3


Chairman
BoS/BME

24CE101OE

INDUSTRIAL WASTE MANAGEMENT

L T P C

3 0 0 3

OBJECTIVES:**The student should be made to:**

- Understand the various characteristics of industrial waste water.
- Interpret the process and mechanism of different wastewater treatment process.
- Infer awareness on waste that emits from industries, waste minimization and clean technologies.
- Demonstrate biological waste water treatment process.
- Make use of treatment of sludge and its disposal methods.

UNIT I**INTRODUCTION****9**

Undesirable waste water characteristics – Characteristics of industrial waste waters – Waste water characteristics – Estimating the organic content – Measuring the efficiency toxicity – In plant waste control and waste reuse – Storm water control.

UNIT II**WASTE WATER TREATMENT PROCESSES****9**

Pre and primary treatment of waste water – Equalization – Neutralization – Sedimentation – Oil separation-sour water strippers – Floatation – Coagulation, precipitation and metals removal– coagulation – Heavy metals removal – Aeration and mass transfer; mechanism of oxygen transfer – Aeration equipment – Air stripping of volatile organic compounds.

UNIT III**POLLUTION FROM MAJOR INDUSTRIES****9**

Sources, Characteristics, waste treatment flow from industries such as Textiles, pulp and paper mill wastes breweries and distilleries waste, Tanneries, Pharmaceuticals, Dairy, Sugar mill wastes, Steel plants, oil Refineries, fertilizer plant waste, petrochemical complex waste, corn starch industry waste –Odour and its removal-removal color from waste waters – Waste minimization and clean technologies.



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UNIT IV**BIOLOGICAL WASTE WATER TREATMENT
PROCESS****9**

Lagoons and stabilization basins – Aerated lagoons-activated sludge processes – Trickling filtration – Rotating biological contactors – Anaerobic decomposition- laboratory evaluation of anaerobic treatment – Adsorption – Theory of activated carbon– Sludge quality considerations – Stripping of volatile organics – Nitrification and denitrification.

UNIT V**SLUDGE TREATMENT AND DISPOSAL****9**

Characteristics of sludge for disposal – Aerobic digestion – Gravity thickening – Flotation thickening –Rotatory drum screen – Gravity belt thickener – Centrifugation – Vacuum filtration – Pressure filtration – Belt filter press – Sand bed drying-factors affecting dewatering performance – Land disposal of sludges– Incineration.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Summarize undesirable wastewater characteristics with estimation of organic content.
- Explain various methods dealt with treatment of wastewater.
- Utilize waste minimization and clean technologies to reduce pollution
- Apply biological waste treatment process
- Analyze characteristics of sludge for effective sludge treatment and disposal

TEXT BOOKS:

1. Wesley Eckenfelder W, Jr Industrial Water Pollution Control 3rd Edition, Mc–Graw Hill Book Company, New Delhi, 2000.
2. Stephenson R L and Blackburn J B, Industrial Wastewater Systems Hand book, Lewis Publisher, New York, 1998.

REFERENCES:

1. M.N.Rao&A.K.Dutta, Wastewater Treatment, Oxford - IBH Publication, 1995.
2. H.M. Freeman, Industrial Pollution Prevention Hand Book, McGraw-Hill Inc., New Delhi, 1995.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	2	2	-	-	-	-
CO2	2	3	-	-	2	2	2	-	-	-	-
CO3	2	2	-	-	-	2	2	-	-	-	-
CO4	2	2	-	-	2	2	2	-	-	-	-
CO5	2	2	-	-	2	2	2	-	-	-	-


CHAIRMAN
BoS (CIVIL)

24CE102OE

ECOLOGICAL ENGINEERING

L T P C

3 0 0 3

OBJECTIVES:**The students should be made to:**

- Interpret Principles and Concepts of ecosystem
- Infer the function of ecosystem and its biochemical reaction
- Outline Rehabilitation of ecosystem through ecological Principles
- Organize ecological effects due to industrialization
- Examine the need for environmental sustainability with related case studies.

UNIT I PRINCIPLES AND CONCEPTS**9**

Scope- applications of Ecological Engineering - Development - evolution of ecosystems - Principles - concepts pertaining to species - populations - community.

UNIT II ECOSYSTEM FUNCTIONS**9**

Biological magnification - diversity - stability - immature - mature systems - Primary productivity - Biochemical cycling of nitrogen - phosphorous - sulphur - carbon dioxide - Habitat ecology - Terrestrial - fresh water - estuarine - marine habitats.

UNIT III ECOLOGICAL ENGINEERING METHODS**9**

Bio monitoring - role in evaluation of aquatic ecosystem - Rehabilitation of ecosystems through ecological principles - Step cropping - bio-wind screens - Wetlands - ponds - Root Zone Treatment for wastewater - Reuse of treated wastewater through ecological systems - green building and Bio mimicry.

UNIT IV ECOLOGICAL EFFECTS OF INDUSTRIALISATION**9**

Ecological effects of exploration – production- extraction – processing – manufacture - transport - Control of Particulate Emission – Control of Gaseous Emission – Flue Gas Treatment Methods - Stacks Gravitational - Inertial Separation - Settling Chambers -Dynamic Separators - Cyclones - Filtration - Liquid Scrubbing - Electrostatic Precipitators.



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BoS (CIVIL)

UNIT V CASE STUDIES AND ENVIRONMENTAL SUSTAINABILITY 9

Case studies of integrated ecological engineering systems - Planning -Measuring Sustainability - Carrying Capacity and its limits - Concept of Ecological Foot print.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain the development and evolution of ecosystem.
- Summarize the structure and function of natural ecosystems and biological magnification.
- Utilize ecological engineering principles into sustainable Practices.
- Organize ecological effects of exploration and industrialization.
- Analyze integrated ecological engineering systems.

TEXT BOOKS:

1. Jainul Alam, “Ecological Engineering”, Discovery Publishing House, 2025
2. Geoff Gurr, Miguel A Altieri, Steve Wratten, “Ecological Engineering for Pest Management: Advances in Habitat Manipulation for Arthropods”, CABI Publishing, 2004.

REFERENCES:

1. Majeti Narasimha Vara Prasad, “Handbook of Ecological and Ecosystem Engineering”, Wiley; 1st edition, 2021.
2. Theodore Sudia, “Ecological Engineering of the City: The Urban Ecosystem”, Forgotten Books, 2018
3. Patrick Kangas, “Ecological Engineering: Principles and Practice”, CRC Press Inc, 1st edition, 2003.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	2	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	2	2	-	-	-	-	-
CO4	2	2	-	-	2	-	-	-	-	-	-
CO5	2	2	-	-	-	3	-	-	-	-	-


CHAIRMAN
BoS (CIVIL)

24CS1010E PYTHON PROGRAMMING FOR DATA SCIENCE L T P C
(Common to AGE, CIVIL, BME, ECE, EEE & 3 0 0 3
MECH)

OBJECTIVES:

The Student should be made to:

- Familiarize with the data science work environment, including IPython and Jupyter.
- Learn the ndarray object for efficient storage and manipulation of dense data arrays in Python using NumPy.
- Explore the DataFrame object for handling labeled/columnar data in Python using Pandas.
- Perform data visualizations in Python using Matplotlib.
- Apply machine learning algorithms in Python using Scikit-Learn.

UNIT I IPYTHON: BEYOND NORMAL PYTHON 9

Shell and Notebook- Help and Documentation in IPython - Keyboard Shortcuts in the IPython Shell - IPython Magic Commands- Input and Output History - IPython and Shell Commands- Errors and Debugging- Profiling and Timing Code.

UNIT II INTRODUCTION TO NUMPY 9

Understanding Data Types in Python - The Basics of NumPy Arrays - Computation on NumPy Arrays: Universal Functions – Aggregations - Computation on Arrays - Comparisons, Masks, and Boolean Logic - Fancy Indexing - Sorting Arrays - Structured Data.

UNIT III DATA MANIPULATION WITH PANDAS 9

Installing and Using Pandas- Introducing Pandas Objects- Data Indexing and Selection- Operating on Data in Pandas- Handling Missing Data - Hierarchical Indexing- Combining Datasets - Aggregation and Grouping - Pivot Tables - Vectorized String Operations - Working with Time Series - High-Performance Pandas.

UNIT IV VISUALIZATION WITH MATPLOTLIB 9

General Matplotlib Tips - Simple Line Plots - Simple Scatter Plots - Visualizing Errors - Density and Contour Plots - Histograms, Binnings, and Density - Customizing Plot Legends - Customizing Colorbars - Multiple Subplots - Text and Annotation - Customizing Ticks - Customizing Matplotlib - Three-Dimensional Plotting in Matplotlib - Geographic Data with Basemap - Visualization with Seaborn.


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UNIT V MACHINE LEARNING WITH SCIKIT-LEARN**9**

Machine Learning - Introducing Scikit – Learn - Hyper parameters and Model Validation - Feature Engineering - Naive Bayes Classification - Linear Regression - Support Vector Machines - Decision Trees and Random Forests - Principal Component Analysis - k-Means Clustering - Gaussian Mixture Models - Application: A Face Detection Pipeline.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Leverage IPython and Jupyter for streamlined development and interactive data analysis.
- Utilize NumPy's ndarray for optimized storage and manipulation of numerical data.
- Manage and analyze structured datasets effectively using Pandas DataFrame.
- Design clear and impactful data visualizations using Matplotlib in Python.
- Implement machine learning models in Python using Scikit-Learn for analytical problem-solving.

TEXT BOOK:

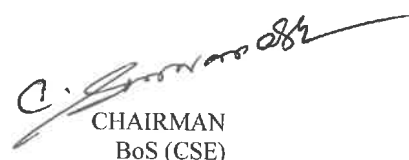
1. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2023.

REFERENCE:

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", 3rd Edition, O'Reilly, 2022.
2. John Paul Mueller, Luca Massaron, Wiley, "Python for data science for dummies", 3rd Edition, 2023.

COs – POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	1	1	3	1	1	1	1	2	1
2	3	3	2	1	3	1	1	1	1	2	1
3	3	3	2	2	3	1	1	1	2	2	1
4	2	2	2	1	2	2	1	1	2	1	1
5	3	3	3	2	3	2	1	1	2	3	2


CHAIRMAN
BoS (CSE)

29/10/18

24CS102OE	PROGRAMMING AND DATA STRUCTURES	L	T	P	C
	(Common to AGE, CIVIL, BME, ECE, EEE & MECH)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Explain the basic concepts, syntax, and flow of C programming.
- Apply advanced features of C for problem-solving.
- Demonstrate the concepts and applications of linear data structures.
- Analyze the representation and use of non-linear data structures.
- Illustrate fundamental techniques in searching, sorting, and hashing.

UNIT I C PROGRAMMING BASICS 9

Structure of C program - Data Types - Storage classes – Variables - Constants - Keywords - Operators - Input/output statements, Assignment statements - Decision making statements - Switch statement - Looping statements - Introduction to Arrays: Declaration, Initialization - One dimensional array - Two dimensional arrays.

UNIT II FUNCTIONS, POINTERS AND STRUCTURES 9

Introduction to functions: Function prototype, function definition, function call, Recursion - Pointers - Pointer operators - Pointer arithmetic - Array of pointers - Parameter passing: Pass by value, Pass by reference. Structure - Nested structures - Pointer and Structures - Array of structures - Self-referential structures - Dynamic memory allocation.

UNIT III LINEAR DATA STRUCTURES 9

List - Singly Linked lists - Application of List - Polynomial addition - Linked list implementation of Stacks - Applications of Stack - Evaluating arithmetic expressions - Linked list implementation of Queues - Application of Queue.

UNIT IV NON-LINEAR DATA STRUCTURES 9

Trees - Binary Trees - Binary tree representation and traversals - Binary Search Trees - Applications of trees. Graph and its representations - Graph Traversals - Topological Sort - Applications of graphs.


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UNIT V SEARCHING, SORTING AND HASH TABLE

9

Linear Search - Binary Search. Bubble Sort - Insertion sort - Merge sort - Quick sort - Hashing functions - Hash tables - Introduction to Overflow handling.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Construct programs using the fundamental concepts of C programming.
- Employ advanced features of C to solve computational problems.
- Select and apply appropriate linear data structures for effective problem solving.
- Design and implement non-linear data structures such as trees and graphs for application development.
- Evaluate and compare various searching, sorting algorithms, and hashing techniques.

TEXTBOOK:

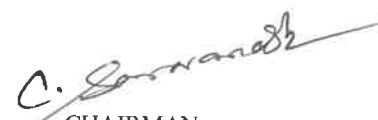
1. Reema Thareja, "Data Structures Using C", Third Edition, Oxford University Press, 2023.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Fourth Edition, Pearson Education, 2013.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	2	2	1	-	-	-	1	1	1
2	3	2	3	2	2	-	-	-	1	1	1
3	3	3	3	3	2	-	-	-	1	1	1
4	3	3	3	3	2	-	-	-	1	1	1
5	3	3	3	3	2	-	-	-	1	1	1


CHAIRMAN
BoS (CSE)

OBJECTIVES:

The Student should be made to:

- Understand the basics of signals and systems as a foundation for all engineering-related courses.
- Analyze the fundamental characteristics of Linear Time-Invariant (LTI) systems.
- Gain knowledge of signal transmission requirements and system bandwidth considerations.
- Learn the statistical properties of signals, including correlation and power spectrum concepts.
- Acquire knowledge of noise sources, their characteristics, and impact on system performance.

UNIT I SIGNAL ANALYSIS

9

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT II SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS LINEAR SYSTEM

9

Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT III SAMPLING THEOREM

9

Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

UNIT IV TEMPORAL CHARACTERISTICS OF SIGNALS

9

Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Time Averages and Ergodicity, Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Cross-Correlation Function and Its Properties, Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function.

UNIT V NOISE SOURCES

9

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TOTAL: 45 PERIODS
CHAIRMAN
BoS (ECE)

OUTCOMES:

On successful completion of this course, the students will be able to,

Understand how to solve the given standard partial differential equations.

- Explain the fundamental concepts of signals, systems, and standard signal functions.
- Apply orthogonal functions, convolution, and correlation techniques to analyze system responses.
- Analyze the characteristics and behavior of Linear Time-Invariant (LTI) systems in time and frequency domains.
- Interpret temporal and statistical properties of signals, including correlation, ergodicity, and power spectral density.
- Identify various noise sources such as thermal, resistive, and arbitrary noise.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, Reprint 2017
2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Ed., 2001.

REFERENCES :

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and Systems," 2nd Ed., Pearson Prentice Hall, 2008.
2. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
3. Random Processes for Engineers-Bruce Hajck, Cambridge unipress, 2015
4. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	-	1	2
CO2	3	3	2	2	1	-	-	-	-	-	2
CO3	3	3	2	2	2	-	-	-	-	-	2
CO4	2	3	-	3	2	-	-	-	-	-	2
CO5	3	2	-	2	1	2	-	-	-	-	2


CHAIRMAN
BoS (ECE)

24EC102OE**CONSUMER ELECTRONICS****L T P C****3 0 0 3****OBJECTIVES:****The student should be made to:**

- Gain knowledge of semiconductor devices, logic circuits, and microcontrollers used in consumer electronics.
- Understand the construction and working of audio, video, and display systems in entertainment electronics.
- Familiarize with the technology and functionality of modern home appliances.
- Learn the concepts, sensors, and technologies involved in smart home automation and security.
- Explore the fundamentals of communication systems and recent advancements such as IoT, Li-Fi, and GPS.

UNIT I ELECTRONIC FUNDAMENTALS**9**

Semiconductor Devices: Diodes, Transistors, Logic gates, Integrated Circuits, -Moor's law, ADC, DAC, Introduction about Microcontroller, microcontroller in consumer electronics.

UNIT II ENTERTAINMENT ELECTRONICS**9**

Audio systems: Construction and working principle of Amplifier, Microphone, Home Theater- Display Systems: CRT, LCD, LED. Video Players: DVD and blue ray. Camera and camcorders.

UNIT III HOME APPLIANCES**9**

Home Enablement Systems - RFID Home, Lighting control, Automatic Cleaning Robots, Washing Machines, Microwave Oven, Dishwasher, Induction Stoves, Smart Refrigerators, Smart alarms, Smart toilet, Smart floor, Smart locks

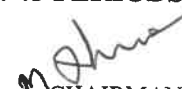
UNIT IV SMART HOME**9**

Technology involved in Smart home, Home Virtual Assistants-Alexa and Google Home, Home Security Systems - Intruder Detection, Automated blinds, Motion Sensors, Thermal Sensors and Image Sensors, PIR, IR and Water Level Sensors.

UNIT V COMMUNICATION SYSTEMS**9**

Cordless Telephones, Fax Machines, PDAs-Tablets, Smart Phones and Smart Watches, Introduction to Smart OS-Android and iOS, Video Conferencing Systems-Web/IP Camera, Video security, Internet Enabled Systems, Wi-Fi, IoT, Li-Fi, GPS and Tracking Systems.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (ECE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the working principles of semiconductor devices, logic circuits, and microcontrollers in electronic systems.
- Describe the operation of entertainment electronics such as amplifiers, microphones, home theaters, display systems, and video players.
- Identify and explain the technologies used in home appliances including smart refrigerators, induction stoves, and cleaning robots.
- Analyze the technologies and sensors used in smart home systems, virtual assistants, and home security.
- Summarize the working principles of communication systems and discuss the role of IoT, GPS, Wi-Fi, and Li-Fi in modern consumer electronics.

TEXT BOOKS:

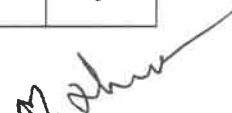
1. Bali S P, Consumer Electronics, Pearson Education Asia Pvt. Ltd., 2008
2. Mitchel E Schultz, Basic Electronics, McGraw Hill Publishers, Tenth Edition, 2017.

REFERENCES:

1. Thomas L Floyd, Electronic Devices, Pearson Education Asia, Tenth Edition, 2018
2. Philp Hoff, Consumer Electronics for Engineers, Cambridge University Press, 1998.
3. Jordan Frith, Smartphones as Locative Media, John Wiley, 2014.
4. Dennis C Brewer, Home Automation Made Easy, Que Publishing, 2013.
5. Thomas M Coughlin, Digital Storage in Consumer Electronics, Springer, 2017.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	2	-	-	-	-	1	2
CO2	3	2	-	-	2	-	-	-	-	1	2
CO3	2	2	1	-	2	2	2	-	-	-	2
CO4	2	3	2	2	3	2	2	-	-	-	2
CO5	3	3	2	2	3	2	2	-	-	1	3


CHAIRMAN
BoS (ECE)

COURSE OBJECTIVES:

The students should be made to:

- Understand the working principles and components of steam power plants
- Explain the operation, classification and governing mechanisms of hydroelectric power plants
- Explore the design, operation, effects and safety measures of nuclear power plants
- Examine the working principles, cycles and recent developments in gas turbine and diesel engine power plants
- Evaluate advanced throwaway and scrubber systems for effective pollution control

UNIT I STEAM POWER PLANTS 9

Introduction – Selection – Steam Flow – Layout – Main Flow Circuits – Main Parts of Steam Power Plant – Cooling of Alternators – Protection of Turbo-Alternators – Excitation and Governing System – Efficiency – Start-up procedure.

UNIT II HYDROELECTRIC POWER PLANTS 9

Introduction – Selection – Hydrology – Classification of hydroelectric plants – Main Components of hydroelectric Plants – Classification of Hydro Turbines – Hydro Generators – Pump Storage Plants – Governing of water turbine.

UNIT III NUCLEAR POWER PLANTS 9

Introduction – Effects of Fossil Fuels – Selection – Components of Nuclear Power Plant – Main Components of Reactors – Types of Reactors – Effect of Radiation – Nuclear waste and its disposal – Safety of Nuclear Power Reactors.

UNIT IV GAS AND DIESEL ENGINE POWER PLANTS 9

Gas Power plant: Introduction – Simple Gas –Turbine Plant – Open–Cycle and Closed–Cycle Power Generation – Features of Combined Cycle Gas Turbine – IGCC Plants.

Diesel Engine Power plant: Introduction – Advantages and disadvantages – Diesel Engine Power – Equipment – Recent Advances in Diesel Plants.

UNIT V SCRUBBER TECHNOLOGY 9

Introduction – Throwaway system – Methods – Non conventional wet scrubber – Types – Sealing and corrosion – Non–conventional throwaway scrubber – Advantages and disadvantages – FGD systems – Dry scrubbing system – Sludge disposal.

TOTAL : 45 PERIODS


CHAIRMAN
BoS (EEE) 28/10/25

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the working principle and purpose of a steam power plant
- Describe components, processes and efficiency measures for effective plant operation
- Analyze the design, operation, effects and safety measures of nuclear power plants
- Demonstrate knowledge of gas and diesel power plant operation, cycles, equipment and modern advancements
- Assess the effectiveness of advanced throwaway and scrubber systems for pollution control in power generation

TEXT BOOKS:

1. Singh S N, "Electric Power Generation, Transmission and Distribution", Second Edition, PHI Learning Private limited, New Delhi, 2023.
2. Arora S C and Domkundwar S, "Power plant Engineering" Sixth Revised and Enlarged Edition, Dhanpat Rai Publications Private Limited, New Delhi, 2012.

REFERENCES:

1. P K Nag, "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.
2. Nagpal G R, "Power Plant Engineering", Khanna Publishers, 2008.
3. El-Wakil M M, "Power Plant Technology", Tata McGraw – Hill Publishing Company Limited, 2010.
4. Rajput R K, "Power Plant Engineering", Laxmi Publications, 2016.
5. Gilbert M Masters, "Renewable and Efficient Electric Power Systems", Second Edition, Wiley, 2013.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	–	–	–	–	–	–	–	–	1
CO2	3	3	2	–	–	–	–	–	–	–	1
CO3	3	3	3	–	–	2	–	–	–	–	1
CO4	3	3	2	2	–	–	–	–	–	–	2
CO5	3	2	–	–	–	2	–	–	–	–	1


CHAIRMAN
BoS (EEE)

COURSE OBJECTIVES:

The students should be made to,

- Understand the fundamentals, classifications and safety regulations of electrical wiring systems
- Learn about protective devices, earthing techniques and safety practices for domestic and industrial installations
- Apply wiring principles to residential, commercial and industrial systems including load calculations and circuit design
- Familiarize with the principles of lighting systems, types of light sources and illumination standards
- Develop skills in designing, estimating, and maintaining wiring and lighting installations

UNIT I FUNDAMENTALS OF WIRING SYSTEMS 9

Electrical wiring – Need, scope, and classifications. Wiring materials and accessories, Wiring tools and practices – Safety regulations (IE rules & ISI standards). Types of wiring systems: CTS, conduit, casing & capping, cleat wiring and their applications.

UNIT II PROTECTIVE DEVICES AND EARTHING 9

Fuses, MCBs, ELCBs, RCCBs, and relays – Earthing: pipe earthing, plate earthing, earth electrodes – Importance of earthing and safety measures – Earthing practices in domestic and industrial installations. Protection against overcurrent, overload and leakage.

UNIT III DOMESTIC AND INDUSTRIAL WIRING 9

Residential building wiring – Single-phase and three-phase systems. Industrial wiring – Bus bar arrangements, distribution boards and industrial accessories. Wiring layout for workshops, factories, and commercial buildings. Design of circuits: load calculation, diversity factor and selection of conductors. Testing of wiring installations.

UNIT IV LIGHTING SYSTEMS 9

Principles of illumination – Lighting terms: luminous flux, luminous intensity, lux, utilization factor, depreciation factor. Light sources: incandescent, fluorescent, LED, HID lamps. Lighting accessories: ballasts, starters, controls. Indoor and outdoor lighting schemes. Energy-efficient lighting systems and standards.

UNIT V DESIGN, ESTIMATION AND MAINTENANCE 9

Design of wiring schemes for residential, commercial and industrial installations – Preparation of wiring diagrams and layouts – Estimation of materials and cost for wiring and lighting projects – Maintenance of wiring installations and lighting systems. Fault detection, troubleshooting and preventive maintenance.

TOTAL: 45 PERIODS

P. S. Prasad

CHAIRMAN

BoS (EEE) 28/10/25

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the types of wiring systems, wiring materials, tools and safety standards
- Apply knowledge of wiring methods to residential, commercial and industrial installations
- Understand the fundamentals of residential, commercial and industrial wiring systems
- Explain lighting principles, light sources, accessories and energy-efficient lighting systems
- Design wiring and lighting installations and perform estimation and maintenance

TEXT BOOK:

1. Uppal S L, "Electrical Wiring, Estimation and Costing", Sixth Edition, Khanna Publishers, 2025.

REFERENCES:

1. Raina K B and Bhattacharya S K, "Electrical Design, Estimating and Costing", Second Edition, New Age International Private Limited, 2017.
2. Gupta J B, "A Course in Electrical Installation Estimating and Costing", Ninth Edition, S K Kataria and Sons, 2022.
3. Giridharan M K, "Electrical Systems Design", Second Edition, I K International Publishing Housing Private Limited, 2016.
4. Sharma Br, "Electrical Estimating and Costing", First Edition, Satya Prakashan Publishers, 2010.
5. National Building Code of INDIA 2016 - Bureau of Indian Standards.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	–	–	–	–	2	–	–	–	1
CO2	3	3	–	–	–	–	–	–	–	–	1
CO3	3	2	–	–	–	–	–	–	–	–	2
CO4	3	2	–	–	–	2	–	–	–	–	2
CO5	3	3	3	–	–	–	–	–	–	2	2


CHAIRMAN
BoS (EEE)

OBJECTIVES:

The student should be made to:

- Study the classification, properties and applications of engineering materials.
- Provide knowledge of various metal casting processes, equipment and defect analysis.
- Explain the principles and applications of welding, soldering, and brazing processes.
- Familiarize with the basic machining operations of the lathe and various machine tool functions.
- Understand the concepts of Computer Numerical Control (CNC) machine tool.

UNIT I ENGINEERING MATERIALS**9**

Engineering Materials – Classification - Mechanical properties of materials - strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability, weldability – Steels and cast irons: Carbon steels, classification based on percentage of carbon as low, medium and high carbon steel – properties and applications. Wrought iron, cast iron – Alloy steels: Stainless steel, tool steel.

UNIT II METAL CASTING PROCESSES**9**

Sand Casting : Sand mould – Type of patterns - Pattern materials – Pattern allowances – Moulding sand properties – Core – Moulding machines – Types and applications; Melting furnaces : Blast and Cupola furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal casting – Stir casting; Defects in sand casting.

UNIT III WELDING**9**

Introduction, classification of welding processes – Gas welding, types of flames and applications – Electric arc welding – Resistance welding – Soldering and Brazing processes and their uses.

UNIT IV MACHINING**9**

Basic principles of lathe – Machine and operations performed on it - Basic description of machines and operations of Shaper, Drilling, Milling and Grinding.

UNIT V CNC MACHINE**9**

Numerical control (NC) machine tools – CNC: types, constitutional details, special features – design considerations of CNC machines for improving machining accuracy - Structural members - Slide ways - Linear bearings - Ball screws - Spindle drives and feed drives.

TOTAL: 45 PERIODS

CHAIRMAN
(BoS / MECH)

25/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify engineering materials based on their properties and applications.
- Explain various metal casting processes, associated equipment and analyze casting defects.
- Apply the principles of welding, soldering and brazing processes in suitable applications.
- Perform basic machining operations using machine tools such as lathe, shaping, drilling, milling, and grinding.
- Explain the concepts and operations of Computer Numerical Control (CNC) machine tools for customized operations

TEXT BOOKS:

1. Kalpakjian and Schmid, "Manufacturing Engineering and Technology", Pearson Education India, 7th Edition, 2014
2. Hajra Choudry S.K, "Elements of Workshop Technology - Vol II", Media promoters & publishers Pvt. Ltd, 13th Edition, 2010

REFERENCES:

1. Jain R.K., "Production Technology: Manufacturing Processes, Technology and Automation", Khanna publication India, 17th Edition, 2011
2. P N Rao, Manufacturing technology, Volume I, Foundry, Forming and Welding, McGraw Hill Education (India) Private Limited, 5th Edition, 2018
3. P N Rao, Manufacturing technology, Volume II, Metal Cutting and Machine Tools, McGraw Hill Education (India) Private Limited, 4th Edition, 2018

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	-	-	-	-	1
CO2	2	2	-	-	-	-	-	-	-	-	1
CO3	3	2	-	-	-	-	-	-	-	-	1
CO4	3	2	-	-	-	-	-	-	-	-	1
CO5	2	2	1	1	2	-	-	-	-	-	1

CHAIRMAN
(BoS / MECH)

OBJECTIVES:

The student should be made to:

- Understand various conventional and non-conventional energy sources.
- Learn liquid fuel production processes from coal and related resources.
- Gain knowledge on the working principles and types of fuel cells.
- Identify the processes, properties, and applications of biodiesel.
- Study about electricity generation from nuclear energy.

UNIT I INTRODUCTION TO ENERGY**9**

World energy consumption – petroleum – natural gas – coal – nuclear energy – geothermal energy – renewable energy - solar, wind, tidal, biomass and hydropower.

UNIT II LIQUID FUELS**9**

Introduction to coal pyrolysis – char oil energy development process – TOSCOAL process – Lurgi-Ruhr gas process – Occidental flash pyrolysis process – Clean coke process – Coalcon process.

UNIT III FUEL CELLS**9**

Introduction – basic concepts – design characteristics – operation – thermal efficiency – cell voltage – fuel cell system – general description – fuel cell classifications – low temperature fuel cells - proton exchange membrane fuel cells and alkaline fuel cells – high temperature fuel cells - molten carbonate fuel cells and solid oxide fuel cells.

UNIT IV BIODIESEL**9**

Introduction – transesterification process for biodiesel manufacture – pretreatment of oil – transesterification reaction in a biodiesel reactor – product and by-product separation – purification – properties of biodiesel – cetane number – calorific value – general physical properties of biodiesel – cold flow properties – material compatibility.

UNIT V NUCLEAR ENERGY**9**

Nuclear fission and nuclear reactor physics – electricity generation from nuclear reactors – nuclear fuel cycle – types of reactors – advanced reactors and concepts – hydrogen production – nuclear waste disposal – nuclear fusion.

TOTAL: 45 PERIODS

CHAIRMAN
(BoS / MECH)

28/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify various conventional and non-conventional energy resources.
- Understand the different coal-based liquid fuel production processes.
- Explain design and working of different fuel cells.
- Use biodiesel with various blends to evaluate its fuel properties.
- Utilize the nuclear reactors and related energy technologies for sustainable developments.

TEXT BOOKS:

1. Sunggyu Lee, James G Speight, “Handbook of Alternative Fuel Technologies”, CRC Press, Taylor & Francis Group, 2014.
2. Arumugam S Ramadhas, “Alternative Fuels for Transportation”, Taylor & Francis, 2016.

REFERENCES:

1. Donald L Klass, “Biomass for Renewable Energy, Fuels and Chemicals”, Elsevier-Academic Press, 1st Edition.
2. Sunggyu Lee, “Alternative Fuels”, CRC Press, Taylor & Francis, 1st Edition.
3. Suresh M, Rajkumar S, Lakshminarayanan A K, “Alternative Energy Sources, Materials and Technologies”, Trans Tech Publications Limited, 2015.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	2	-	-	-	-	-
CO4	2	2	-	-	-	2	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-

CHAIRMAN
(BoS / MECH)

6/2/2020

24AD101OE	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L T P C
	(COMMON TO AGE, BME, CIVIL, EEE, ECE AND MECH)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the concept of intelligent agents and their interaction with environments
- Explore local search approaches in continuous spaces
- Study knowledge engineering approaches within first-order logic
- Examine planning graphs and their role in efficient planning
- Apply the role of knowledge representation in the learning process

UNIT I	INTRODUCTION	9
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Intelligent Agents - Agents and environments - good behavior - The nature of environments - Structure of agents - Problem Solving - Problem solving agents - Uniformed search strategies - Avoiding repeated states-Searching with partial information.

UNIT II	SEARCHING TECHNIQUES	9
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Informed search and exploration - Informed search strategies - heuristic function - Local search algorithms and optimization problems - Local search in continuous spaces - Online search agents and unknown environments - Constraint satisfaction problems (CSP) - Backtracking search and Local search for CSP.

UNIT III	KNOWLEDGE REPRESENTATION	9
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First order logic - Representation revisited - Syntax and semantics for first order logic - Using first order logic - Knowledge engineering in first order logic - Inference in First order logic - Propositional versus first order logic - Unification and lifting - Forward chaining - Backward Chaining-Ontological Engineering.

UNIT IV	PLANNING	9
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Planning problem- Planning with state space search - Partial order planning - Planning graphs - Planning with proportional logic - Time, Schedules, and Resources - Hierarchical task Planning - Conditional Planning - Execution monitoring and re planning - Continuous planning.

UNIT V	LEARNING	9
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Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning - Logical formulation of learning - Explanation based learning - Learning using relevant information-Statistical Learning Methods - Case Study on AI-Assisted X-Ray Analysis.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AD)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the concept of problem-solving agents to real-world problem domains
- Implement local search algorithms to solve optimization
- Demonstrate knowledge engineering processes using FOL
- Utilize planning graphs to represent and solve planning tasks
- Analyze the role of knowledge in supporting effective learning

TEXT BOOKS:

1. Stuart J Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 4th Edition, 2023.
2. George F Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Pearson Education, 6th Edition, 2021.

REFERENCES:

1. Engene Charniak and Drew Mc Dermott, "Introduction to Artificial Intelligence", Addison Wesley, 2013.
2. Nils J Nilsson, "Principles of Artificial Intelligence", Narosa Publishing House, 2002.
3. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, Books 3rd Edition, 2000.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	3	1	-	2	2	2	2
CO2	3	2	2	2	3	1	-	1	1	2	2
CO3	3	3	2	2	3	1	-	2	1	2	2
CO4	3	2	3	2	3	1	-	1	2	2	2
CO5	3	2	2	3	3	1	-	2	2	3	3


CHAIRMAN
BoS (AD)

24AD102OE

INTRODUCTION TO DATA SCIENCE
(COMMON TO AGE, BME, CIVIL, EEE, ECE AND MECH)

L T P C

3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concepts of data science, its lifecycle, and applications
- Acquire, preprocess, and manage different types of data
- Apply probability and statistical techniques for analyzing data
- Develop predictive models using regression analysis
- Analyze networks and social data using graph theory

UNIT I	FUNDAMENTALS OF DATA SCIENCE	9
Introduction to Data Science - Data Science Lifecycle - Applications of Data Science in Various Domains - Types of Data: Structured, Unstructured, Semi-Structured - Characteristics of Big Data - Roles in Data Science - Challenges in Data Science - Data Ethics and Privacy Issues - Future Trends in Data Science.		
UNIT II	DATA COLLECTION AND PREPROCESSING	9
Sources of Data - Data Acquisition Methods - Data Integration and Transformation - Handling Missing Values - Identifying and Removing Duplicates - Data Normalization and Standardization - Outlier Detection and Handling - Exploratory Data Analysis (EDA) - Case Study Using EDA.		
UNIT III	PROBABILITY AND STATISTICS FOR DATA SCIENCE	9
Introduction to Probability - Probability Distributions - Random Variables - Sampling Methods - Central Limit Theorem - Hypothesis Testing - Confidence Intervals - Correlation and Regression - Statistical Significance - Applications of Statistics in Data Science		
UNIT IV	REGRESSION ANALYSIS	9
Regression Analysis, Regression: Linear Regression Simple Linear Regression, Multiple & Polynomial Regression, Sparse Model - Unsupervised Learning, Clustering, Similarity and Distances, Quality Measures of Clustering - Case Study.		
UNIT V	NETWORK ANALYSIS	9
Network Analysis - Graphs - Social Networks - Centrality - Drawing centrality of Graphs - PageRank - Ego-Networks - Community Detection.		

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AD)

OUTCOMES:

On Successful completion of this course, the students will be able to,

- Perform Exploratory Data Analysis to summarize data and gain insights
- Apply probability, statistical methods, and hypothesis testing to solve data-related problems
- Build and evaluate regression models for prediction and analysis
- Implement clustering techniques and evaluate clustering quality for unsupervised learning tasks
- Analyze complex networks and social graphs using centrality measures, PageRank, and community detection techniques

TEXT BOOK:

1. Foster Provost & Tom Fawcett, “Data Science for Business” 1st Edition, O’Reilly Media, 2013.

REFERENCES:

1. Wes McKinney “Python for Data Analysis” , 2nd Edition, O’Reilly, 2017.
2. Peter Bruce, Andrew Bruce “Practical Statistics for Data Scientists”, 2017.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining 2nd Edition, Pearson, 2019.
4. Albert-László Barabási, “Network Science” – Cambridge University Press, 2016.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	1	2	2	-	1	2	3
CO2	3	3	2	3	2	2	2	-	1	2	3
CO3	3	3	3	3	2	2	2	-	-	2	3
CO4	3	3	-	3	3	2	1	-	2	2	3
CO5	2	2	3	2	3	2	1	-	2	2	2


CHAIRMAN
BoS (AD)

28/10/25

24IT101OE

FUNDAMENTALS OF SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand various software engineering life cycle models to real-world projects.
- Perform software requirements analysis and develop clear, structured specifications.
- Acquire knowledge of system analysis and design concepts.
- Understand software testing strategies, maintenance approaches, and quality assurance practices.
- Explore project management techniques, including scheduling using modern tools.

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering - Software Process - Perspective and Specialized - Process Models - Introduction to Agility - Agile Process - Extreme Programming - XP Process.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Requirement Analysis and Specification - Requirements Gathering and Analysis - Software Requirement Specification - Formal System Specification - Finite State Machines - Petri Nets - Object Modeling using UML: Use Case Model - Class Diagrams - Interaction Diagrams - Activity Diagrams - State Chart Diagrams - Functional Modeling - Data Flow Diagram.

UNIT III SOFTWARE DESIGN 9

Software Design: Design Process - Design Concepts - Coupling - Cohesion - Functional Independence - Design Patterns: Model View Controller - Publish - Subscribe - Adapter - Command - Strategy - Observer - Proxy - Facade - Architectural Styles - Layered - Client Server - Tiered - Pipe and Filter- User Interface Design.

UNIT IV SOFTWARE TESTING AND MAINTENANCE 9

Testing: Unit Testing - Black box testing - White box Testing - Integration and System Testing - Regression Testing - Debugging: Program Analysis - Symbolic Execution - Model Checking - Case Study.


CHAIRMAN
BoS (IT)

UNIT V PROJECT MANAGEMENT

9

Software Project Management - Software Configuration Management - Project Scheduling - DevOps: Motivation - Cloud as a Platform - Operations - Deployment Pipeline: Overall Architecture Building and Testing - Deployment - Tools - Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Compare and select appropriate Software Development Lifecycle Models
- Evaluate project management approaches as well as cost and schedule estimation strategies.
- Perform formal analysis on software specification.
- Use UML diagrams effectively for system analysis and design.
- Design software systems using architectural styles and design patterns.

TEXT BOOKS:

1. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, 1st Edition, McGraw-Hill, 2014.
2. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering: Using UML, Patterns and Java. 3rd Edition, Pearson Education, 2009.

REFERENCES:

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd Edition, PHI Learning Pvt. Ltd., 2010.
2. Len Bass, Ingo Weber and Liming Zhu, - DevOps: A Software Architect's Perspective, Pearson Education, 2016.
3. Rajib Mall, Fundamentals of Software Engineering, 3rd Edition, PHI Learning Pvt. Ltd., 2009.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	1	2	2	-	-	-	1	1	2
2	3	3	2	3	2	-	-	-	2	3	2
3	3	3	2	2	1	-	-	-	2	3	2
4	2	3	2	1	3	-	-	-	2	3	2
5	2	3	1	1	2	-	-	-	-	-	1


CHAIRMAN
BoS (IT)

OBJECTIVES:

The Student should be made to:

- Understand the concepts of wireless sensor networks.
- Get exposure on WSN environment.
- Know the layered approach in sensor networks.
- Understand the use of suitable protocol for WSN.
- Explore knowledge on performance analysis of WSN.

UNIT I INTRODUCTION TO WIRELESS SENSOR NETWORKS 9

Data Communications - Networks - Networks Types - Network Models: TCP/IP Protocol suite - The OSI Model. Digital-to-Digital Conversion: Line coding - Line Coding Schemes - Transmission Modes - Transmission media: Guided - Unguided media.

UNIT II WSN ARCHITECTURE 9

Data Dissemination - Flooding and Gossiping - Data Gathering Sensor Network Scenarios - Optimization Goals and Figures of Merit - Design Principles for WSNs - Gateway Concepts - Need for Gateway - WSN and Internet Communication - WSN Tunneling.

UNIT III MEDIA ACCESS CONTROL 9

Fundamentals of MAC protocols - Low Duty Cycle Protocols and Wakeup Concepts - Contention Based Protocols - Schedule-based Protocols - SMAC - BMAC - Traffic - Adaptive Medium Access Protocol - IEEE 802.15.4 MAC Protocol.

UNIT IV TRANSPORT LAYER 9

Circuit Switching - Packet Switching - Concept of IPV4 - IPV6 - 6LOWPAN and IP - IP based WSN - 6LOWPAN based WSN - IOT.

UNIT V TOOLS FOR WSN 9

TinyOS: Introduction - NesC - Interfaces - Modules - Configuration - Programming in TinyOS using NesC - TOSSIM - Contiki - Structure - Communication Stack - Simulation environment - Cooja simulator - Programming.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explore the fundamentals of wireless sensor network models.
- Explore knowledge in devising layers in WSN.
- Able to design energy efficient WSNs.
- Design application dependent suitable for infrastructure-less networks.
- Implement various protocols in TinyOS and Contiki.

TEXT BOOKS:

1. Holger Karl, Andreas Willig, Protocols and Architectures for Wireless Sensor Networks. 1st Edition, John Wiley & Sons, New Jersey, 2011.
2. Jun Zheng, Abbas Jamalipour, Wireless Sensor Networks: A Networking Perspective. 1st Edition, Wiley-IEEE Press, 2014.

REFERENCES:

1. Waltenegus W. Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks: Theory and Practice. 1st Edition, John Wiley & Sons, 2014.
2. Ian F. Akyildiz, Mehmet Can Vuran, Wireless Sensor Networks. 1st Edition, John Wiley & Sons, 2011.
3. Zach Shelby, Carsten Bormann, 6LoWPAN: The Wireless Embedded Internet. 1st Edition, John Wiley & Sons, 2009.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	3	2	-	-	-	-	-	-	-
2	3	2	3	2	-	3	-	-	-	-	-
3	3	3	3	3	-	3	3	-	2	2	-
4	3	3	3	3	-	3	3	3	2	2	2
5	3	3	3	3	3	3	-	-	2	2	-


CHAIRMAN
BoS (IT)

OBJECTIVES:

The student should be made to:

- Understand the historical and cultural significance of food in human societies
- Compare traditional and modern food processing techniques
- Explore regional food patterns and their transformation
- Examine commercial production and marketing of traditional foods
- Assess the health and environmental impacts of traditional foods

UNIT I HISTORICAL AND CULTURAL PERSPECTIVES

9

Food production and accessibility - subsistence foraging, horticulture, agriculture and pastoralization, origin of agriculture, earliest crops grown. Food as source of physical sustenance, food as religious and cultural symbols: importance of food in understanding human culture - variability, diversity, from basic ingredients to food preparation: impact of customs and traditions on food habits, heterogeneity within cultures (social groups) and specific social contexts - festive occasions, specific religious festivals, mourning etc. Kosher, Halal foods; foods for religious and other fasts.

UNIT II TRADITIONAL METHODS OF FOOD PROCESSING

9

Traditional methods of milling grains – rice, wheat and corn – equipments and processes as compared to modern methods. Equipments and processes for edible oil extraction, paneer, butter and ghee manufacture – comparison of traditional and modern methods. Energy costs, efficiency, yield, shelf life and nutrient content comparisons. Traditional methods of food preservation – sundrying, osmotic drying, brining, pickling and smoking.

UNIT III TRADITIONAL FOOD PATTERNS

9

Typical breakfast, meal and snack foods of different regions of India. Regional foods that have gone Pan Indian / Global. Popular regional foods; Traditional fermented foods, pickles and preserves, beverages, snacks, desserts and sweets, street foods; IPR issues in traditional foods.

UNIT IV COMMERCIAL PRODUCTION OF TRADITIONAL FOODS

9

Commercial production of traditional breads, snacks, ready-to-eat foods and instant mixes, frozen foods – types marketed, turnover: role of SHGs, SMES industries, national and multinational companies; commercial production and packaging of traditional beverages such as tender coconut water, neera, lassi, buttermilk, dahi. Commercial production of intermediate foods – ginger and garlic pastes, tamarind pastes, masalas (spice mixes), idli and dosa batters.

UNIT V HEALTH ASPECTS OF TRADITIONAL FOODS

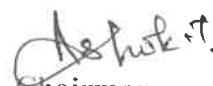
9

Comparison of traditional foods with typical fast foods / junk foods – cost, food safety, nutrient composition, bioactive components; energy and environmental costs of traditional foods; traditional foods used for specific ailments / illnesses.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the student will be able to,

- Describe the evolution of food production systems and explain the cultural symbolism of food across contexts
- Analyze traditional methods of milling, oil extraction, and preservation, and evaluate their efficiency
- Identify traditional food items from various Indian regions and assess their globalization and IPR concerns


Chairman
BoS/BME

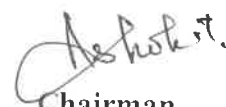
- Illustrate the role of SHGs, SMEs, and corporations in scaling traditional food products for mass markets
- Compare traditional and fast foods in terms of nutrition, safety, and sustainability; recommend healthier options

TEXT BOOKS:

1. Sen, Colleen Taylor "Food Culture in India" Greenwood Press, 2005.
2. Davidar, Ruth N. "Indian Food Science: A Health and Nutrition Guide to Traditional Recipes: East West Books, 2001.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	1	1	3	2	-	2	1	2
CO2	3	3	2	2	2	2	-	-	2	1	2
CO3	2	2	2	1	2	3	3	-	2	2	3
CO4	2	2	3	2	2	3	2	2	3	3	3
CO5	3	3	2	2	2	3	2	-	3	2	3


Chairman
BoS/BME

OBJECTIVES:

The student should be made to:

- Understand the structural and evolutionary aspects of cells and microorganisms
- Explore the molecular organization and functions of cellular organelles
- Examine membrane structure and transport mechanisms
- Investigate the cell cycle and mechanisms of cellular communication
- Apply the central dogma and scientific reporting techniques

UNIT I INTRODUCTION TO CELL

9

Cell, cell wall and Extracellular Matrix (ECM). composition, cellular dimensions, Evolution, Organisation, differentiation of prokaryotic and Eukaryotic cells, Virus, bacteria, cyanobacteria, mycoplasma and prions.

UNIT II CELL ORGANELLES

9

Molecular organisation, biogenesis and function Mitochondria, endoplasmic reticulum, Golgi apparatus, plastids, chloroplast, leucoplast, centrosome, lysosome, ribosome, peroxisome, Nucleus and nucleolus. Endo membrane system, concept of compartmentalisation.

UNIT III BIO-MEMBRANE TRANSPORT

9

Physiochemical properties of cell membranes. Molecular constitute of membranes, asymmetrical organisation of lipids and proteins. Solute transport across membrane's-fick's law. simple diffusion, passive-facilitated diffusion, active transport- primary and secondary, group translocation, transport ATPases, membrane transport in bacteria and animals. Transport mechanism- mobile carriers and pores mechanisms. Transport by vesicle formation, endocytosis, exocytosis, cell respiration.

UNIT IV CELL CYCLE

9

Cell cycle- Cell division by mitosis and meiosis. Comparison of meiosis and mitosis, regulation of cell cycle, cell lysis, Cytokinesis, Cell signalling, Cell communication, Cell adhesion and Cell junction, cell cycle checkpoints.

UNIT V CENTRAL DOGMA

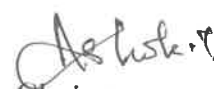
9

Overview of Central dogma DNA replication: Meselson & Stahl experiment, bi-directional Proof reading a report – Avoiding Typographical Errors – Bibliography in required Format – Font – Spacing – Checking Tables and Illustrations – Presenting a Report Orally – Techniques.

TOTAL:45 PERIODS**OUTCOMES:**

On successful completion of this course, the student will be able to,

- Differentiate between prokaryotic and eukaryotic cells and classify viruses, bacteria, and prions.
- Describe the biogenesis and roles of organelles and explain the concept of compartmentalization.
- Analyze membrane composition and compare various transport processes including diffusion and active transport.
- Illustrate stages of mitosis and meiosis, and explain cell signalling, adhesion, and checkpoint regulation.
- Explain DNA replication and demonstrate skills in scientific documentation and oral presentation


Chairman
BoS/BME

REFERENCES:

1. Gerson and Gerson - Technical Communication: Process and Product. 7th Edition, Prentice Hall (2012)
2. Virendra K. Pamecha - Guide to Project Reports, Project Appraisals and Project Finance (2012)
3. Daniel Riordan - Technical Report Writing Today (1998)
4. Darla-Jean Weatherford - Technical Writing for Engineering Professionals (2016) Penwell Publishers

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	1	2	2	2	-	-	2	1	2
CO2	3	2	2	2	2	2	-	-	2	1	2
CO3	3	3	2	2	3	2	-	-	2	1	2
CO4	3	3	2	3	2	2	-	-	2	1	2
CO5	3	2	2	2	2	2	-	-	3	2	3


Chairman
BoS/BME

24CE201OE	GLOBAL WARMING AND CLIMATE CHANGE	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand earth system and climate change impact.
- Infer basics of climate parameters and climate change causing elements
- Interpret atmosphere with its composition.
- Develop impact of climate change on various sectors.
- Make use of weather and climate parameters measuring instruments.

UNIT I CLIMATOLOGY 9

Introduction to earth system - Hydrosphere - lithosphere - cryosphere - atmosphere and biosphere - Climatology - Climate change impact in different sectors - Climate change mitigations and adaptations - Climate change negotiations - Earth system - hydrological cycle and carbon cycle - Paleoclimatology - Agriculture - Climate change Organization and programmes - Mitigation measures

UNIT II CLIMATOLOGY PROXIES 9

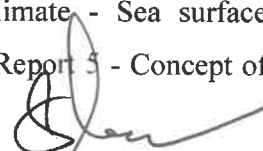
Earth system- cryosphere and biosphere - Climatology proxies - Forestry – IPCC - Intergovernmental Panel on Climate Change and assessment report highlights - Use of renewable resources- solar energy- Importance of earth system and climate - Indian climate system and their classification - Fishery - IPCC Assessment Report 1- Wind energy

UNIT III ATMOSPHERE AND ITS COMPOSITION 9

Atmosphere and its composition - Role of land and ocean to regulate climate- Socio economic impact – tourism - IPCC Assessment Report 2- different strata of atmosphere and temperature profile - Role of ice and wind to regulate climate - industries and business - IPCC Assessment Report

UNIT IV WEATHER AND CLIMATE 9

Weather and Climate - Causes of climate change - Milankovitch theory (change Natural cause) - Acid rain and human health impact - IPCC Assessment Report 4 - Climate parameter - temperature - atmospheric pressure - Milankovitch theory and climate - Sea surface temperature increases and aquatic organisms impact - IPC-Assessment Report 5 - Concept of sustainable development.


CHAIRMAN
BoS (CIVIL)

Atmospheric humidity and rainfall - Human induced climate change (anthropogenic causes) - Weather and climate parameters measuring instruments - UNEP - United Nations Environment Programme - Concept of Carbon sequestration - Wind circulation - Global radiance balance of climate system – thermometer - hygrometer or psychrometer WMO - World Meteorological Organization - Terrestrial sequestration.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain the importance of earth system and climate change adaptations mitigations
- Summarize climate parameters and their impact due to human activities.
- Demonstrate the impact of climate change in various sectors.
- Organize different protocol related to climate change with its causes and impact.
- Analyze projects related to atmospheric humidity and rainfall.

TEXT BOOKS:

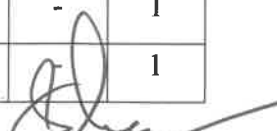
1. Dr. Zeena Flavia D Souza, Dr. Arpan Ray, Dr. Sayantan Dutta and Dr. Komala H.K., “Global Warming-Climate Change”, Kiwi International Publishing House, Madurai, 2025.
2. Dr. Md. Shahnawaz, “Global Warming and Climate Change Problem Policies and Politics”, Generic Publishing, 2017.

REFERENCES:

1. Wallace J.M and Hobbs P.V, “Atmospheric Science”, Elsevier, Academic Press, 2006.
2. Bates B.C, Kundzewicz Z.W, Wu S and Palutikof J.P, “Climate Change and Water Technical Paper of the Intergovernmental Panel on Climate Change”, IPCC Secretariat, 2008.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	2	-	-	-	-	1
CO2	2	-	-	-	-	2	-	-	-	-	1
CO3	2	-	-	-	-	3	2	-	-	-	1
CO4	2	-	-	-	-	3	3	-	-	-	1
CO5	2	-	-	-	2	2	2	-	-	-	1


CHAIRMAN
BoS (CIVIL)

24CE202OE

BUILDING SERVICES

L T P C

3 0 0 3

OBJECTIVES:**The student should be made to:**

- Understand comfortable and safe construction with the services designed and installed.
- Infer knowledge on basis of electrical wiring system and telecommunication.
- Summarize importance of principles of illumination in buildings.
- Develop awareness on various principles of refrigerant and heat recovery devices.
- Organize fire safety installation and electric alarm circuits.

UNIT I**MACHINERIES****9**

Introduction of lifts and Escalators – Special features required for lifting arrangement and installation – Travelators – Controls – Machine room and equipments.

UNIT II**ELECTRICAL SYSTEMS IN BUILDINGS****9**

Basics of electricity distribution – Earthing systems and bonding – Electrical wiring – Industrial installations – Lighting controls – Light sources, Lamps, Lighting design – Telecommunication installations.

UNIT III**PRINCIPLES OF ILLUMINATION****9**

Ventilation requirements – Mechanical ventilation – Fans and types – Boilers and types – Water treatments – Solar heating of water – Hot water storage cylinders.

UNIT IV**REFRIGERATION PRINCIPLES****9**

Heat emitters – Expansion facilities of heating system – Energy management system – Factors affecting fuels – Oil sand properties of natural gas – Air conditioning, principles and applications – Refrigerant and system characteristics – Heat recovery devices.


 CHAIRMAN
 BoS (CIVIL)

Fire prevention and control systems – Fire alarms – Electrical alarm circuits – Smoke extraction and ventilation – Gas extinguishers – Types of detectors – Gas installation and components.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Explain the special features in installation of lifts and escalators.
- Demonstrate electricity distribution earthing systems and bonding in buildings.
- Outline requirements of ventilation and principles of illumination.
- Utilize air conditioning and energy management system in buildings.
- Analyze need for fire detection and protection in working environment.

TEXT BOOKS:

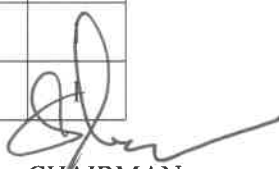
1. Roger Greeno and Fred Hall, “Building Services Handbook”, Elsevier Publishers 4th Edition, 2007.
2. Rao S and P Saluja H L, “Electrical Safety, Fire Safety Engineering and Safety Management”, Khanna Publishers, 1st Edition, 2016.

REFERENCES:

1. Steffy G, “Architectural Lighting Design”, John Wiley and Sons, 3rd Edition, 2008.
2. Killinger J and Killinger L, “Heating and Cooling Essentials”, Goodheart Wilcox Publishers, 2003.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	2	2	2	-	-	-	1
CO2	2	-	-	-	2	2	3	-	-	-	1
CO3	2	-	-	-	2	3	3	-	-	-	1
CO4	2	-	-	-	2	3	3	-	-	-	
CO5	2	-	-	-	2	2	2	-	-	-	


CHAIRMAN
BoS (CIVIL)

OBJECTIVES:**The Student should be made to:**

- Illustrate the fundamental concepts and functions of operating systems.
- Discuss the management of processes and threads.
- Examine process synchronization, inter-process communication, and deadlock situations.
- Implement memory management strategies, including virtual memory.
- Assess file systems, disk scheduling, and I/O management techniques.

UNIT I INTRODUCTION**9**

Introduction to Operating Systems - Operating System Operations - Resource Management - Operating System Services - Virtualization - User and Operating System Interface - System Calls - Operating System Structures - Building and Booting an Operating System.

UNIT II PROCESSES AND THREADS**9**

Process Concept - Process Scheduling - Operations on Processes - Interprocess Communication - IPC in Shared - Memory Systems - IPC in Message - Passing Systems - Examples of IPC Systems - Threads - Overview - Multithreading models - Pthreads

UNIT III PROCESS MANAGEMENT AND SYNCHRONIZATION**9**

Basic Concepts of CPU Scheduling - Scheduling Criteria - Scheduling Algorithms - The Critical - Section Problem - Peterson's Solution - Synchronization Hardware - Mutex Locks - Semaphores - Classic Problems of Synchronization - Monitors - Deadlocks - Prevention - Avoidance - Detection - Recovery

UNIT IV MEMORY MANAGEMENT**9**

Contiguous Memory Allocation - Paging - Structure of the Page Table - Segmentation - Swapping - Example Architectures - Demand Paging - Page Replacement - Allocation of Frames - Thrashing

UNIT V STORAGE MANAGEMENT**9**

File Concept - Access Methods - Directory Structure - Protection - Directory Implementation - Allocation Methods - Free - Space Management - Mass - Storage Structure - HDD Scheduling

TOTAL: 45 PERIODS


CHAIRMAN
BoS (CSE)

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OUTCOMES:

Upon completion of the course, the students will be able to

- Understand the structure, services, and basic functionalities of operating systems.
- Analyze process and thread creation, management, and inter-process communication.
- Design scheduling algorithms and apply synchronization and deadlock handling techniques.
- Evaluate and compare memory management schemes like paging and segmentation.
- Analyze file systems, disk scheduling, and I/O management in storage systems.

TEXT BOOKS:

1. Abraham Silberschatz, Greg Gagne and Peter B. Galvin. "Operating System Concepts", 10th Edition, John Wiley & Sons Inc., 2018.

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2. D. M. Dhamdhare. "Operating Systems: A Concept– Based Approach", 3rd Edition, Tata McGrawHill, 2017.
3. William Stallings. "Operating Systems: Internals and Design Principles", 9th Edition, Pearson, 2017.
4. Andrew S. Tanenbaum, Herbert Bos. "Modern Operating Systems", 5th Edition, Pearson, 2023.
5. Douglas Comer, "Operating System Design: The Xinu Approach", 2nd Edition, CRC Press, 2023.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	3	1	3	2	2	3	1	2	-	2	3
2	3	3	3	2	2	2	1	2	-	2	3
3	3	3	3	2	2	2	1	2	-	2	3
4	3	3	3	2	1	2	1	2	-	2	3
5	3	3	3	2	1	2	1	2	-	2	3


CHAIRMAN
BoS (CSE)

24CS202OE

INTRODUCTION TO DATABASE
(Common to AGE, CIVIL, BME, ECE, EEE &
MECH)

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Describe the fundamentals of database systems and conceptual data modeling.
- Use the principles of the relational model to construct SQL queries.
- Develop database applications and design relational schemas.
- Examine transaction processing, concurrency control, and recovery mechanisms.
- Assess the role of Distributed Databases and NoSQL systems in modern applications.

UNIT I INTRODUCTION TO DATABASE SYSTEMS 9

Introduction to Databases - File System Vs Database System - Data Models - Schemas and Instances - DBMS Architecture - Centralized - Client Server - Database Applications - ER Models - ER to Relational Mapping

UNIT II RELATIONAL MODELS 9

Relational Model - Constraints - Keys - Dependencies - Relational Algebra - Unary, Binary, Set and Extended Relational Algebra operations - SQL - Data Definition - Data Manipulation and Retrieval Queries - Nested Queries - Joins - Views - Cursors - Procedures - Functions - Triggers - Embedded and Dynamic SQL

UNIT III RELATIONAL DATABASE DESIGN 9

Database Design - Functional Dependencies - Normalization - 1 NF - 2 NF - 3 NF - BCNF - Multivalued Dependency (4 NF) - Join Dependency (PJNF)

UNIT IV TRANSACTIONS AND RECOVERY 9

Transaction processing concepts - Need for concurrency control and recovery - ACID Properties - Recoverability - Serializability - Concurrency Control - Two phase locking Techniques - Timestamp based protocol - Graph based protocol - Deadlock handling - Log based recovery - Two Phase Commit Protocol

UNIT V QUERY PROCESSING AND ADVANCED DATABASES 9

Indexing and Hashing Techniques - Query Processing and Optimization - Sorting and Joins - Database Tuning - Introduction to Spatial and Temporal Databases - OO Databases - NoSQL.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (CSE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the basic database concepts and construct ER models for simple applications.
- Formulate SQL queries to manage and retrieve data from relational databases.
- Apply programming and design techniques to enhance database structure through normalization.
- Implement transactions using concurrency control and recovery methods.
- Analyze and evaluate Distributed and NoSQL databases for varied application needs.

TEXT BOOKS:

1. Jagdish Chandra Patni, Hitesh Kumar Sharma, Ravi Tomar, Avita Katal, "Database Management System An Evolutionary Approach", 2022.

REFERENCES:

1. Narain Gehani and Melliya Annamalai, "The Database Book: Principles and Practice Using the Oracle Database System", Universities Press, 2012.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2014.
3. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson/Addison, Wesley, 2016.
4. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.
5. Andreas Meier, Michael Kaufmann, "SQL & NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management", First Edition 2019.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	3	3	3	2	-	2	-	1	3
2	3	3	3	3	3	2	-	2	-	1	2
3	3	3	3	3	2	2	-	3	-	1	3
4	3	3	3	3	3	2	-	1	-	1	2
5	3	3	3	2	3	2	-	2	-	1	3


CHAIRMAN
BoS (CSE)

OBJECTIVES:**The Students Should be made to**

- Introduce the concept and evolution of virtual instrumentation and its advantages over conventional systems.
- Familiarize students with the architecture, programming techniques, and data-flow concepts used in graphical programming environments.
- Enable students to understand various interfacing standards and data acquisition techniques for instrumentation systems.
- Develop skills to design and implement virtual instruments for real-time and embedded applications.
- Expose students to the available toolsets for signal processing, image processing, motion control, and control design.

UNIT I INTRODUCTION**9**

Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II PROGRAMMING TECHNIQUES**9**

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, mathscript.

UNIT III INTERFACE REQUIREMENTS**9**

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI, VISA and IVI, Data Acquisition Hardware.

UNIT IV APPLICATION OF VIRTUAL INSTRUMENTATION**9**

Application of Virtual Instrumentation: Instrument Control using RS-232C and IEEE488, Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, Active X programming, Publishing measurement data in the web.

UNIT V TOOLSETS**9**

Distributed I/O modules, Control Design and Simulation, Digital Signal processing tool kit, Image acquisition and processing, Motion control.

TOTAL:45 PERIODS


CHAIRMAN
BoS (ECE) 28/10/25

OUTCOMES:

On successful completion of this course, the students will be able to

- Explain the architecture and fundamental concepts of virtual instrumentation systems..
- Develop and debug virtual instruments using graphical programming techniques.
- Interface virtual instruments with hardware using standard communication and bus interfaces.
- Design real-time and embedded virtual instruments for industrial and research applications.
- Utilize advanced toolsets for control design, DSP, image processing, and motion control applications.

TEXT BOOK:

1. Gary Johnson. "LabVIEW Graphical Programming" 2nd edition, McGraw Hill, New York, 1997.
2. Lisa K. wells & Jeffrey Travis, "LabVIEW for everyone", Prentice Hall, New Jersey, 1997.

REFERENCES:

1. Kevin James, "PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control", Newnes, 2000.
2. Rick Bitter, "LabVIEW Advanced Programming Technique", 2nd Edition, CRC Press, 2005
3. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", 1st Edition, PHI, 2001.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	-	-	-	-	-	1	2
CO2	2	3	3	2	2	-	-	-	-	2	3
CO3	2	2	3	2	3	-	-	-	-	2	3
CO4	2	3	3	2	3	-	1	-	-	2	3
CO5	2	2	3	2	3	-	1	-	-	2	3


CHAIRMAN
BoS (ECE)

OBJECTIVES:**The Students Should be made to**

- Introduce the basic structure and functioning of telecommunication systems and networks.
- Provide an understanding of various types of connectivity, numbering, routing, and switching used in telecommunications.
- Explain the concept of Quality of Service (QoS) for voice, data, and image transmission and the factors affecting it.
- Describe the transmission aspects of voice telephony and video communication systems.
- Familiarize students with television and CATV systems, their evolution, transmission standards, and digital implementation.

UNIT I INTRODUCTORY TO TELECOMMUNICATIONS**9**

End-Users, Nodes, and Connectivities, Telephone Numbering and Routing, Use of Tandem Switches in a Local Area Connectivity, Introduction to the Busy Hour and Grade of Service, Simplex, Half-Duplex, and Full Duplex, One-Way and Two-Way Circuits, Network Topologies, Variations in Traffic Flow, Quality Of Service, Standardization in Telecommunications, The Organization of the PSTN in the United States, Points of Presence.

UNIT II QUALITY OF SERVICE**9**

Objective, Quality of Service: Voice, Data, and Image, Signal-to-Noise Ratio, Voice Transmission, Data Circuits, Video (Television), The Three Basic Impairments and How They Affect the End-User, Amplitude Distortion, Phase Distortion, Noise Level, Typical Levels, Echo and Singing.

UNIT III TRANSMISSION ASPECTS OF VOICE TELEPHONY**9**

Definition of the Voice Channel, Operation of the Telephone Subset, Subscriber Loop Design, Design of Local Area Wire-Pair Trunks (Junctions), VF Repeaters (Amplifiers).

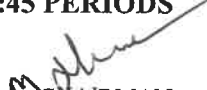
UNIT IV TELEVISION TRANSMISSION**9**

Background and Objectives, An Appreciation of Video Transmission, Critical Video Parameters, Video Transmission Standards (Criteria for Broadcasters), Methods of Program Channel Transmission, The Transmission of Video Over LOS Microwave, TV Transmission by Satellite Relay, Digital Television, Conference Television, Brief Overview of Frame Transport for Video Conferencing.

UNIT V COMMUNITY ANTENNA TELEVISION**9**

Objective and Scope, The Evolution of CATV, System Impairments and Performance Measures, Hybrid Fiber-Coax (HFC) Systems, Digital Transmission of CATV Signals, Two-Way CATV Systems, Two-Way Voice and Data over CATV Systems Based on the DOCSIS 2.0 Specification, Subsplit / Extended Subsplit Frequency Plan, Other General Information.

TOTAL:45 PERIODS


CHAIRMAN
BoS (ECE) 28/10/25

OUTCOMES:

On successful completion of this course, the students will be able to

- Explain the fundamental components and connectivity structures in telecommunication networks.
- Analyze the impact of Quality-of-Service parameters on voice, data, and image transmission.
- Illustrate the transmission aspects of voice telephony including subscriber loops, trunks, and repeaters.
- Describe the principles and standards used in television and video transmission systems.
- Evaluate the design and performance of CATV and digital cable transmission systems.

TEXT BOOK:

1. Roger L. Freeman, "Fundamentals of Telecommunications" 2nd Edition, John Wiley & Sons Publications 2005.
2. Annabel Z. Dodd, "The Essential Guide to Telecommunications", 5th Edition, Prentice Hall 2012.

REFERENCES:

1. Jyrki T. J. Penttinen, "The Telecommunications Handbook" John Wiley & Sons Publications 2015.
2. Prof. Dr. Muhammad EL-SABA, "Telecommunications systems and data networks", 3rd Edition 2015.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2	-	-	-	-	1	-
CO2	2	3	2	3	3	-	1	-	-	2	1
CO3	3	3	3	2	3	-	-	-	-	2	1
CO4	2	2	3	2	3	-	-	-	-	2	2
CO5	2	3	3	3	3	-	1	-	-	2	2


CHAIRMAN
BoS (ECE)

COURSE OBJECTIVES:

The Students should be made to:

- Understand the knowledge of energy basics, energy accounting and audit processes
- Learn strategies for energy management in electric motors and cogeneration systems
- Familiarize with lighting systems and their optimization for energy efficiency
- Describe the principles and techniques of metering for effective energy management in various electrical systems
- Apply economic analysis and modeling to justify energy management decisions

UNIT I INTRODUCTION 9

Basics of Energy – Need for energy management – Energy accounting – Energy monitoring, targeting and reporting – Energy audit process.

UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION 9

Energy management for electric motors – Transformer and reactors – Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility of cogeneration – Electrical interconnection.

UNIT III LIGHTING SYSTEMS 9

Energy management in lighting systems – Task and the working space – Light sources – Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect of harmonics, lighting and energy standards.

UNIT IV METERING FOR ENERGY MANAGEMENT 9

Metering for energy management – Units of measure – Utility meters – Demand meters – Paralleling of current transformers – Instrument transformer burdens – Multi tasking solid state meters, metering location versus requirements, metering techniques and practical examples.

UNIT V ECONOMIC ANALYSIS AND MODELS 9

Economic analysis – Economic models – Time value of money – Utility rate structures – Cost of electricity – Loss evaluation and load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economic justification.

TOTAL: 45 PERIODS


CHAIRMAN
BoS(EEE) 26/10/25

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the need for energy management, energy accounting and auditing techniques
- Apply energy management practices to motors, transformers and cogeneration systems
- Analyze lighting systems with respect to energy consumption, power factor and harmonics
- Interpret metering instruments, transformer burdens and metering techniques for energy management
- Develop and justify economic models for energy projects including demand-side management and HVAC systems

TEXT BOOK:

1. Barney L Capehart, Wayne C Turner and William J Kennedy, "Guide to Energy Management", Eighth Edition, River Publishers, 2016.

REFERENCES:

1. Stephen A Roosa, Steve Doty, Wayne Turner, "Energy Management Handbook", Ninth Edition, River Publishers, 2018.
2. Witte L C, "Industrial energy management and utilization", Washington: Hemisphere Publication Corporation. 2023.
3. Dale R Patrick, Stephen W Fardo, Ray E Richardson, Steven R Patrick, "Energy Conservation guide book", Second Edition, CRC Press, 2007.
4. Albert Thumann and William J Younger, "Handbook of Energy Audits", Ninth Edition, Fairmont Press, 2012.
5. Web/Digital resources: <https://beeindia.gov.in/content/energy-auditors>.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	–	–	–	–	–	–	–	1
CO2	3	3	2	–	–	–	–	–	–	–	1
CO3	3	3	2	–	–	–	–	–	–	–	2
CO4	3	2	2	–	–	–	–	–	–	–	2
CO5	3	3	3	–	–	–	–	–	–	–	2


CHAIRMAN
BoS(EEE)

COURSE OBJECTIVES:

The students should be made to:

- Identify the basic components, historical development and environmental impact of electric and hybrid vehicles
- Summarize the principles of vehicle motion, propulsion requirements and the mechanics of tire-road interaction
- Discuss the characteristics of various electric and hybrid vehicle architectures and transmission systems
- Interpret the configuration and control methods of electric motor drives used in hybrid and electric vehicles
- Explain different energy storage technologies and the process of selecting and sizing propulsion motors

UNIT I INTRODUCTION

9

Electric and Hybrid Electric Vehicles – Components – History of hybrid and electric vehicles – Social and environmental importance of hybrid and electric vehicles – Impact of modern drive-trains on energy supplies.

Conventional Vehicles: Basics of vehicle performance – Vehicle power source characterization – Transmission characteristics – Mathematical models to describe vehicle performance.

UNIT II VEHICLE MECHANICS

9

Roadway fundamentals – Vehicle kinetics – Dynamics of vehicle motion – Propulsion power – Velocity and acceleration: Constant F_{TR} level road, Non-constant F_{TR} general acceleration – Tire-road force mechanics – Propulsion system design.

UNIT III VEHICLE ARCHITECTURE

9

Electric Vehicle Architecture – Hybrid Electric Vehicle Architecture: Hybrids based on Architecture, Hybrids based on transmission assembly – Hybrids based on degree of hybridization – Plug in hybrid electric vehicle. Mountain bike – Motor cycle.

UNIT IV ELECTRIC PROPULSION UNIT

9

Introduction to electric components used in hybrid and electric vehicles – Configuration and control – DC motor drives, Induction motor drives, Permanent magnet drives and Switched reluctance drives.

UNIT V ENERGY STORAGE AND SIZING

9

Introduction to energy storage requirements in Hybrid and Electric vehicles, Energy storage and analysis – Battery, Fuel, Super Capacitor, Hybridization of different energy storage devices, Power electronic converter for battery charging. Sizing of propulsion motor.

TOTAL: 45 PERIODS



CHAIRMAN

BoS (EEE) 28/10/25

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the components, history and environmental significance of electric and hybrid vehicles
- Explain the fundamentals of vehicle motion, propulsion power and tire-road force mechanics
- Examine different electric and hybrid vehicle architectures and their transmission assemblies
- Summarize the configuration of various electric motor drives used in hybrid and electric vehicles
- Analyse various energy storage techniques and the sizing of propulsion motors for hybrid and electric vehicles

TEXT BOOKS:

1. Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", Second Edition, CRC Press, 2003.
2. Ali Emadi, "Advanced Electric Drive Vehicles", First Edition, CRC Press, 2017.

REFERENCES:

1. Mehrdad Ehsani, Yimi Gao, Sebastian E Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.
2. James Larminie and John Lowry, "Electric Vehicle Technology Explained", John Wiley and Sons, 2003.
3. Seth Leitman and Bob Brant, "Build Your Own Electric Vehicle", Third Edition, McGraw Hill, 2013.
4. Shashank Arora, Alireza Tashakori Abkenar, Shantha Gamini Jayasinghe and Kari Tammi, "Heavy-duty Electric Vehicles from Concept to Reality", Elsevier Science, 2021.
5. Rabiul Islam Md, Rakibuzzaman Shah Md and Hasan Ali Mohd, "Emerging Power Converters for Renewable Energy and Electric Vehicles: Modeling, Design and Control", First Edition, CRC Press, 2021.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	–	–	–	–	–	–	–	1
CO2	3	2	2	–	–	–	–	–	–	–	1
CO3	3	3	2	–	–	–	–	–	–	–	2
CO4	3	3	2	–	–	–	–	–	–	–	2
CO5	3	3	3	–	–	–	–	–	–	–	2


CHAIRMAN
BoS (EEE)

OBJECTIVES:**The student should be made to:**

- Provide knowledge on various engine components of automobiles.
- Explain the working principles of flywheel, Clutch, and Transmission systems
- Understanding the vehicle construction, body layouts and aerodynamics.
- Familiarize with steering, suspension, and braking systems, including modern technologies like ABS and power steering
- Know the concepts of hybrid vehicle technologies, their components, working, and comparative advantages over conventional vehicles

UNIT I ENGINE COMPONENTS**9**

Overview – Engine Components – Engine block, Crank shaft, Connecting rod, Cylinder Liners, Piston, Piston rings, Cylinder head – Camshaft, Valve, Rocker Arm, Spark Plug, Injector, Carburetor, Fuel pump.

UNIT II TRANSMISSION COMPONENTS**9**

Flywheel – Clutch – Friction plate, Clutch housing, Pressure plate. Gearbox – Propeller shaft – Differential – Conventional Differential, Rear axle.

UNIT III BODY COMPONENTS**9**

Types of automobiles – Vehicle construction and different layouts, chassis, Frame and body – Vehicle aerodynamics.

UNIT IV STEERING, SUSPENSION SYSTEMS AND BRAKES**9**

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS).

UNIT V IGNITION SYSTEMS AND HYBRID VEHICLE**9**

Ignition System – Battery and Magneto Ignition System – Principles of Combustion and detonation CI Engines. Lubrication and Cooling systems. Hybrid Vehicles: Components of hybrid vehicles - layout & working principle of hybrid vehicles - comparison with electric vehicles - advantages and disadvantages of hybrid vehicles.

TOTAL: 45 PERIODS


CHAIRMAN
(BoS / MECH)

28/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the construction, function, and operation of major engine components.
- Explain the working and application of transmission components such as clutch, gearbox, propeller shaft, and differential.
- Compare different automobile layouts, chassis designs, and evaluate their impact on vehicle aerodynamics
- Summarize the design and performance of steering systems, suspension arrangements, and braking mechanisms, including modern safety systems
- Develop the suitability of ignition systems, and explain the principles of hybrid vehicle.

TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering", Vol. 1 and 2, Seventh Edition, Standard Publishers, New Delhi, 14th Edition 2017.
2. Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill, 4th Edition, 2018.

REFERENCES:

1. Joseph Heitner, "Automotive Mechanics," East-West Press, Second Edition, 1999.
2. Jain K K and Asthana R B, "Automobile Engineering", Tata McGraw Hill Publishers, New Delhi, 2002.
3. Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals", The Good Heart-Will Cox Company Inc, USA, 1978.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	-	-	-	-	1
CO2	2	2	-	-	-	-	-	-	-	-	1
CO3	2	2	-	-	-	-	-	-	-	-	1
CO4	2	2	-	-	-	-	-	-	-	-	1
CO5	3	2	-	-	-	-	-	-	-	-	1

CHAIRMAN
(BoS / MECH)

OBJECTIVES:

The student should be made to:

- Understand the principles and applications of mechanical energy-based unconventional machining processes.
- Explain the working mechanisms of thermal and electrical energy-based machining processes.
- Familiarize with machining of chemical and electrochemical-based processes.
- Examine the capabilities and limitations of advanced nano-finishing processes.
- Outline the scope and trends of advanced non-traditional machining processes.

UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES 9

Unconventional machining Process – Need – classification - merits, demerits and applications. Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining – Ultrasonic Machining. (AJM, WJM, AWJM and USM). Working Principles–equipment used – Process parameters–MRR – Applications.

UNIT II THERMAL AND ELECTRICAL ENERGY BASED PROCESSES 9

Electric Discharge Machining (EDM) – Wirecut EDM - Working Principle – equipments – Process Parameters – Surface Finish and MRR - electrode /Tool - Power and control Circuits – Tool Wear – Dielectric – Flushing - Applications. Laser Beam machining and drilling (LBM) – plasma, Arc machining (PAM) and Electron Beam Machining (EBM) – Principles – Equipment - Types – Beam control techniques – Applications.

UNIT III CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 9

Chemical machining and Electro – Chemical machining (CHM and ECM) – Etchants – Maskant – techniques of applying maskants – Process Parameters – Surface finish and MRR – Applications. Principles of ECM – equipment's –Surface Roughness and MRR Electrical circuit–Process Parameters – ECG and ECH– Applications.

UNIT IV ADVANCED NANOFINISHING PROCESSES 9

Abrasive flow machining – chemo -mechanical polishing – magnetic abrasive finishing, magneto Rheological finishing – magneto rheological abrasive flow finishing - their working principles, equipments - effect of process parameters – applications - advantages and limitations.

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(BoS / MECH)

28/10/25

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES 9

Recent developments in non-traditional machining processes - their working principles - equipments, effect of process parameters – applications - advantages and limitations – Comparison of non-traditional machining processes.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Recognize the need for unconventional machining processes and their classification.
- Contrast various thermal energy and electrical energy based unconventional machining processes.
- Explain various chemical and electrochemical energy-based unconventional machining processes.
- Discuss various nano-abrasive-based unconventional machining processes.
- Differentiate various recent trends in unconventional machining processes.

TEXT BOOKS:

1. Vijay K Jain, “Advanced Machining Processes”, Allied Publishers Pvt. Ltd., New Delhi, 2007.
2. Pandey P C and Shan H S, “Modern Machining Processes”, Tata McGraw Hill, New Delhi, 2011.

REFERENCES:

1. Benedict GF, “Non traditional Manufacturing Processes”, Taylor and Francis Limited, 2019
2. Mc Geough, “Advanced Methods of Machining”, Chapman and Hall, London, 1988.
3. Ernest Paul De Garmo, Black J T and Ronald A Kohser, “Material and Processessing Manufacturing”, John Wiley and Sons, Inc., 13th Edition, 2020.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	-	-	-	-	1
CO2	2	2	-	-	-	-	-	-	-	-	1
CO3	2	2	-	-	-	-	-	-	-	-	1
CO4	3	2	-	-	-	-	-	-	-	-	1
CO5	3	2	-	-	-	-	-	-	-	-	1

CHAIRMAN
(BoS / MECH)

OBJECTIVES:

The student should be made to:

- Gain a comprehensive understanding of the core concepts in data visualization
- Learn the operational principles of different information visualization tools
- Identify and address common issues encountered in data representation
- Master the use of Tableau for effective data visualization
- Develop expertise in creating real-time, interactive visualization systems

UNIT I INTRODUCTION

9

Context of data visualization - Definition, Methodology, Visualization design objectives - Key Factors - Purpose, visualization function and tone, visualization design options - Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tool - Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs

UNIT II VISUALIZATION TECHNIQUES FOR TIME-SERIES, TREES & GRAPHS

9

Mapping - Time series - Connections and correlations - Indicator-Area chart - Pivot table - Scatter charts, Scatter maps - Tree maps, Space filling and non-space filling methods - Hierarchies and Recursion - Networks and Graphs - Displaying Arbitrary Graphs-node link graph - Matrix representation for graphs - Info graphics

UNIT III TEXT AND DOCUMENT VISUALIZATION

9

Acquiring data - Where to Find Data, Tools for Acquiring Data from the Internet, Locating Files for Use with Processing, Loading Text Data, Dealing with Files and Folders, Listing Files in a Folder, Asynchronous Image Downloads, Web Techniques, Parsing data - Levels of Effort, Tools for Gathering Clues, Text Markup Languages, Regular Expressions, Grammars and BNF Notation, Compressed Data, Vectors and Geometry, Binary Data Formats, Advanced Detective Work.

UNIT IV INTERACTIVE DATA VISUALIZATION

9

Drawing with data - Scales - Axes - Updates, Transition and Motion - Interactivity - Layouts - Geo-mapping - Exporting, Framework - D3.js, Tableau Dashboards.

UNIT V SECURITY IN DATA VISUALIZATION

9

Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization - Attacking and defending visualization systems - Creating secured visualization system.

TOTAL: 45 PERIODS

OUTCOMES:


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BoS (AD)

On successful completion of this course, the students will be able to,

- Apply mathematics and basic science knowledge for designing information visualizing System
- Collect data ethically and solve engineering problem in visualizing the information.
- Implement algorithms and techniques for interactive information visualization
- Conduct experiments by applying various modern visualization tool and solve the space layout problem
- Analyze and design system to visualize multidisciplinary multivariate Data individually or in teams

TEXT BOOKS:

1. Robert Spence, "Information Visualization an Introduction", Third Edition, Pearson Education, 2014.
2. Colin Ware, "Information Visualization Perception for Design", Third edition, Morgan Kaufmann Publishers, 2012.
3. Robert Spence, "Information Visualization Design for Interaction", Second Edition, Pearson Education, 2006.
4. Benjamin B. Bederson and Ben Shneiderman, "The Craft of Information Visualization", Morgan Kaufmann Publishers, 2003.

REFERENCES:

1. Thomas Strothotte, "Computational Visualization: Graphics, Abstraction and Interactivity", Springer, 1998.
2. Matthew O. Ward, George Grinstein, Daniel Keim, "Interactive Data Visualization: Foundation, Techniques and Applications", Second Edition, A. K. Peters/CRC Press, 2015.
3. Joerg Osarek, "Virtual Reality Analytics", Gordon's Arcade, 2016.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	2	3	1	-	1	2	2	2
CO2	2	3	3	2	3	3	-	2	2	3	2
CO3	3	3	3	3	3	2	-	1	2	2	2
CO4	3	3	3	3	3	2	-	2	2	1	3
CO5	3	3	2	2	3	2	-	3	3	2	3


CHAIRMAN
BoS (AD)

OBJECTIVES:

The Student should be made to:

- Understand mathematical foundations relevant to machine learning (linear algebra, statistics, VC dimension, PAC learning)
- Grasp different supervised learning algorithms, their assumptions, strengths, and weaknesses
- Learn how ensemble methods and unsupervised learning work and when they are useful
- Understand neural networks in depth: from basic architecture to deep learning practices, and the challenges involved
- Design, perform, and analyse machine learning experiments properly, including model evaluation and statistical comparison

UNIT I INTRODUCTION TO MACHINE LEARNING 9

Review of Linear Algebra for machine learning - Introduction and motivation for machine learning - Examples of machine learning applications - Vapnik-Chervonenkis (VC) dimension - Probably Approximately Correct (PAC) learning - Hypothesis spaces - Inductive bias - Generalization - Bias-variance trade-off.

UNIT II SUPERVISED LEARNING 9

Linear Regression Models - Least squares, single & multiple variables - Bayesian linear regression - gradient descent. Linear Classification Models: Discriminant function - Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model - Naive Bayes - Maximum margin classifier - Support vector machine - Decision Tree - Random Forests.

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING 9

Combining multiple learners - model combination schemes, voting - Ensemble Learning - bagging, boosting, stacking - Unsupervised learning: K-means; Instance Based Learning: KNN - Gaussian mixture models and Expectation maximization.

UNIT IV NEURAL NETWORKS 9

Multilayer perceptron - activation functions - network training - gradient descent optimization - stochastic gradient descent - error backpropagation from shallow networks to deep networks - Unit saturation (aka the vanishing gradient problem) - ReLU - hyperparameter tuning - batch normalization - regularization; dropout.


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UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 9

Guidelines for machine learning experiments; Cross Validation (CV) and resampling - K-fold CV, bootstrapping - measuring classifier performance - assessing a single classification algorithm and comparing two classification algorithms - t test, McNemar's test, K-fold CV paired t test.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the concepts of hypothesis spaces, inductive bias, generalization, and bias-variance trade-off in machine learning.
- Implement linear regression, logistic regression, SVM, decision trees, and random forests, and evaluate their performance.
- Apply unsupervised learning techniques like K-means and Gaussian mixture models and use ensemble methods (bagging, boosting, stacking).
- Design neural network models, tune hyperparameters, apply regularization methods, and handle training issues like vanishing gradients.
- Plan and conduct experiments using cross-validation, bootstrapping; compare classifier performance using statistical tests like t test and McNemar's test.

TEXT BOOK:

1. Tom M. Mitchell, "Machine Learning", First Edition, McGraw-Hill Education, Latest Reprint 2023.

REFERENCES:

1. Ethem Alpaydin, "Introduction to Machine Learning", Fourth Edition, MIT Press, 2020.
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", 2nd Edition, MIT Press, 2023.
3. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", Third Edition, O'Reilly Media, 2023.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Second Edition, Springer, 2023 (Corrected reprint).
5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, Latest Reprint 2024.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2	2	1	2	1	2	2
CO2	2	3	3	3	2	2	1	2	1	2	2
CO3	2	3	3	3	2	2	2	2	2	2	2
CO4	2	2	3	3	2	1	2	2	2	2	1
CO5	1	2	2	2	3	1	2	2	2	2	1


CHAIRMAN
BoS (AD)

28/10/20

24IT2010E

INTRODUCTION TO WEB DEVELOPMENT

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Learn the fundamentals of Internet, World Wide Web, protocols, browsers, and web servers.
- Understand design structured, interactive, and user-centric web pages using HTML, CSS, and JavaScript.
- Explore skills to manipulate the DOM and implement client-side scripting for dynamic web content.
- Familiarize with XML, PHP, and integration of PHP with databases using MySQL.
- Acquire knowledge to plan, implement, and publish complete web applications.

UNIT I WEB BASICS AND DESIGN 9

Introduction: Concept of WWW - Internet Vs. WWW - HTTP Protocol - Request and Response - Web Browsers and Web Servers - Features of Latest Version of Web. Web Design: Concepts of Effective Web Design - Browser Compatibility - Bandwidth - Cache - Display Resolution: Look and Feel of the Website - Page Layout - and Linking - User-centric Design: Sitemap - Planning and Publishing a Website.

UNIT II HTML AND CSS 9

HTML: Basics of HTML - Text Formatting - Fonts - Commenting Code - Colors - Hyperlinks - Lists - Tables - Images - Forms - XHTML - Meta Tags - Character Entities - Frames and Frame sets - Browser Architecture and Website Structure - Overview of Latest HTML version Features. CSS: Need - Introduction - Syntax and Structure - Backgrounds - Colors - Text Styling - Fonts - Borders - Boxes - Margins -Padding - Lists.

UNIT III JAVASCRIPT AND DHTML 9

JavaScript: Client-side scripting - Variables - Functions - Conditional Statements - Loops and Repetition - Pop-up boxes and alerts - Advanced JavaScript: Objects - JavaScript's Built-in Objects - DOM - Web Browser Environments - DOM manipulation - Forms - Validations.

UNIT IV XML AND PHP BASICS 9

XML: Introduction - Uses - Simple XML - Key Components - DTD and Schema - XML with applications - Transforming XML using XSL and XSLT.



CHAIRMAN
BoS (IT)

PHP: Introduction and basic syntax - Decision-making and looping - PHP and HTML integration - Arrays and Functions - Browser control and detection - Strings, - Form Processing - File Handling - Advanced features: Cookies and Sessions.

UNIT V PHP AND MYSQL

9

PHP - MySQL integration: Basic commands - Connection to server - Creating Databases and Tables - Selecting Databases - Listing Databases and Table Names - Insertion - Update - Delete data and Tables - Handling Database Errors - Database Management - Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Able to explain web fundamentals, protocols, browsers, and server concepts.
- Design structured, interactive, and user-centric web pages using HTML and CSS.
- Implement dynamic client-side functionality using JavaScript and DHTML.
- Develop server-side scripts using PHP and integrate them with XML and MySQL databases.
- Implement and publish functional web applications using PHP-MYSQL.

TEXT BOOKS:

1. HTML 5 Black Book - Web Technologies: HTML, XHTML, CSS, XML, JavaScript, AJAX, PHP and MySQL, 2nd Edition, Dreamtech Press, 2016.

REFERENCES:

1. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl, CGI, PHP, and MySQL, BPB Publications, 2020.
2. Achyut S. Godbole & Atul Kahate, Web Technologies: TCP/IP to Internet Application Architectures, McGraw Hill, 2018.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	1	-	1	-	-	-	-	-	2
2	2	2	3	-	2	1	-	1	2	-	2
3	2	2	3	-	3	-	-	1	2	-	2
4	3	3	3	2	3	1	-	1	2	1	3
5	3	3	3	2	3	1	1	2	3	2	3

CHAIRMAN
BoS (IT)

28/10/25

24IT202OE

PRINCIPLES OF MULTIMEDIA

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Provide an understanding of multimedia systems, applications, and underlying principles.
- Introduce various multimedia data types such as text, audio, image, video, and animation.
- Explain data compression techniques for efficient storage and transmission.
- Familiarize students with multimedia authoring tools, software, and design principles.
- Explore applications of multimedia in communication, education, entertainment, and the web.

UNIT I INTRODUCTION TO MULTIMEDIA 9

Multimedia: Introduction - Definitions - Components - Text - Audio - Video - Graphics and Animation - Multimedia Applications: Education, Entertainment - Training - Kiosks and Presentations - Multimedia System Architecture - Multimedia Hardware: Input/Output Devices - Storage Devices - Multimedia Software: Authoring Tools - Presentation Tools - Virtual Reality and Multimedia.

UNIT II TEXT, AUDIO AND IMAGE 9

Text: Types of Text - Unicode Standards - Text Compression Techniques - Audio: Acoustics - Digital Representation of Sound - Waveform and MIDI Audio - Audio Compression Techniques - Audio Standards - Image: Digital Image Representation - Color Models - Sampling and Quantization - Image Formats - Image Compression Standards.

UNIT III VIDEO AND ANIMATION 9

Video: Analog and Digital Video - Video Formats - Characteristics of Video Signals – Digitization - Video Compression Standards - Animation: Types of Animation - Principles of Animation - Animation Techniques - Morphing - Motion Capture - Animation Software Tools.

UNIT IV MULTIMEDIA DATA COMPRESSION 9

Need for compression - Lossless Compression Techniques: Run Length Encoding - Huffman Coding - Arithmetic Coding - Dictionary Based Compression - Lossy Compression Techniques: Transform coding - JPEG, MPEG Compression - Comparison of Compression Techniques and their Applications in Multimedia Systems.


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BoS (IT)

UNIT V MULTIMEDIA TOOLS AND APPLICATIONS**9**

Multimedia Authoring Tools: Authoring Metaphors - Card-Based - Timeline-Based - Icon-Based and Object-Oriented Authoring - Multimedia Databases - Multimedia Applications in Education - Business - Entertainment and the Web - Designing Multimedia Applications - Multimedia and the Internet - Future Trends in Multimedia Technology.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Describe the fundamentals, architecture, and applications of multimedia systems.
- Understand representation, storage, and processing of text, audio, and images.
- Explain video and animation concepts with related standards and techniques.
- Apply compression algorithms for efficient multimedia storage and transmission.
- Use authoring tools to design simple multimedia applications for real-world domains.

TEXT BOOKs:

1. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Springer, 2nd Edition, 2021.

REFERENCES:

1. Ralf Steinmetz and Klara Nahrstedt, Multimedia: Computing, Communications and Applications, Pearson Education, 2019.
2. Tay Vaughan, Multimedia: Making It Work, 9th Edition, McGraw Hill, 2018.
3. Prabhat K. Andleigh and Kiran Thakrar, Multimedia Systems Design, PHI, 2020.
4. Fred T. Hofstetter, Multimedia: Basics, Technology, and Future, Pearson, 2019.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	1	-	1	1	-	-	-	-	2
2	3	2	2	1	2	-	-	-	-	-	2
3	2	2	3	-	2	1	-	-	-	-	2
4	3	3	2	2	3	-	-	-	-	-	2
5	2	2	3	1	3	1	1	2	2	2	3


CHAIRMAN
BoS (IT)

28/10/25

24M101

FINANCIAL MANAGEMENT
(Common to all Branches)

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the knowledge of the decision areas in finance.
- Learn the various sources of Finance.
- Study about capital budgeting and cost of capital.
- Learn on how to construct a robust capital structure and dividend policy.
- Study about the tools on Working Capital Management.

UNIT I INTRODUCTION TO FINANCIAL MANGEMENT 9

Definition and Scope of Finance Functions - Objectives of Financial Management - Profit Maximization and Wealth Maximization - Time Value of money - Risk and Return Concepts.

UNIT II SOURCES OF FINANCE 9

Long Term Sources of Finance - Equity Shares - Debentures - Preferred Stock - Features - Merits and Demerits - Short Term Sources - Bank Sources - Trade Credit – Overdrafts - Commercial Papers - Certificate of Deposits - Money Market Mutual Funds.

UNIT III INVESTMENT DECISIONS 9

Investment Decisions: Capital Budgeting - Need and Importance - Techniques of Capital Budgeting - Payback - ARR - NPV - IRR - Profitability Index. Cost of Capital - Cost of Specific Sources of Capital - Equity - Preferred Stock - Debt - Reserves - Concept and Measurement of Cost of Capital - Weighted Average Cost of Capital.

UNIT IV FINANCING AND DIVIDEND DECISION 9

Operating Leverage and Financial Leverage - EBIT - EPS Analysis. Capital Structure - Determinants of Capital Structure - Designing an Optimum Capital Structure. Dividend Policy - Aspects of Dividend Policy - Practical Consideration - Forms of Dividend Policy - Determinants of Dividend Policy.

UNIT V WORKING CAPITAL DECISION 9

Working Capital Management: Working Capital Management - Concepts - Importance - Determinants of Working Capital - Cash Management: Motives for Holding Cash - Objectives and Strategies of Cash Management - Receivables Management: Objectives - Credit Policies.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain about the decision areas in finance.
- Discuss about the various sources of Finance.
- Work on capital budgeting and cost of capital.
- Construct a robust capital structure and dividend policy.
- Handle the tools on Working Capital Management.

TEXT BOOKS:

1. M.Y. Khan and P.K.Jain, Financial management, Text, Tata McGraw Hill, Ltd.
2. M. Pandey, Financial Management, Vikas Publishing House Pvt. Ltd.

REFERENCES:

1. James C. Vanhorne, Fundamentals of Financial Management, PHI Learning.
2. Srivatsava, Mishra, Financial Management, Oxford University Press, 2011.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	2	1	-	-	-	1	-	-	3	3	2
2	2	1	-	-	-	1	2	-	3	3	2
3	2	1	-	-	-	1	-	--	3	3	2
4	2	1	-	-	-	1	2	-	3	3	2
5	2	1	-	-	-	1	-	-	3	3	2


CHAIRMAN
BoS (IT)

28/10/24

24M102

FUNDAMENTALS OF INVESTMENT

(Common to all Branches)

L T P C

3 0 0 3

OBJECTIVES:

The Student should be made to:

- Study about the investment environment in which investment decisions are taken.
- Acquire knowledge on how to Value bonds and equities.
- Learn the various approaches to value securities.
- Study on how to create efficient portfolios through diversification.
- Learn the mechanism of investor protection in India.

UNIT I THE INVESTMENT ENVIRONMENT 9

Investment Decision Process - Types of Investments - Commodities - Real Estate and Financial Assets - Indian Securities Market - Market Participants and Trading of Securities - Security Market Indices - Sources of Financial Information - Concept of Return and Risk - Impact of Taxes and Inflation on Return.

UNIT II FIXED INCOME SECURITIES 9

Bond Features - Types of Bonds - Estimating Bond Yields - Bond Valuation Types of Bond Risks - Default Risk and Credit Rating.

UNIT III APPROACHES TO EQUITY ANALYSIS 9

Introduction to Fundamental Analysis - Technical Analysis and Efficient Market Hypothesis - Dividend Capitalization Models - Price-Earnings Multiple Approach to Equity Valuation.

UNIT IV PORTFOLIO ANALYSIS AND FINANCIAL DERIVATIVES 9

Portfolio and Diversification - Portfolio Risk and Return - Mutual Funds - Introduction to Financial Derivatives - Financial Derivatives Markets in India.

UNIT V INVESTOR PROTECTION 9

Investor Grievances and their Redressal System - Insider Trading - Investors' Awareness and Activism.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the investment environment in which investment decisions are taken.
- Explain how to Value bonds and equities.
- Explain the various approaches to value securities.
- Create efficient portfolios through diversification.
- Discuss the mechanism of investor protection in India.

TEXT BOOKs:

1. Charles P. Jones - Gerald R. Jensen, Investments: analysis and management. Wiley - 14th Edition - 2019.

REFERENCES:

1. Chandra, Prasanna, Investment analysis and portfolio management. McGraw-hill education, 5th Edition, 2017.
2. Rustagi R. P, Investment Management Theory and Practice. Sultan Chand & Sons - 2021.
3. ZviBodie, Alex Kane, Alan J Marcus , PitabusMohanty, Investments - McGraw Hill Education (India), 11th Edition, 2019.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	-	-	2	-	-	-	-	-	1
2	3	3	-	2	2	-	-	-	-	-	-
3	3	3	2	-	2	-	-	-	-	-	-
4	3	-	-	2	2	-	-	-	-	-	1
5	-	-	-	-	-	2	-	3	-	-	1


CHAIRMAN
BoS (IT)

28/10/20

24M103

BANKING, FINANCIAL SERVICES AND INSURANCE

L T P C

(Common to all Branches)

3 0 0 3

OBJECTIVES:

The Student should be made to:

- Study about the Banking system in India.
- Understand knowledge on how banks raise their sources and how they deploy it.
- Learn the development in banking technology.
- Study about the financial services in India.
- Acquire knowledge about the insurance Industry in India.

UNIT I INTRODUCTION TO INDIAN BANKING SYSTEM 9

Overview of Banking System - Structure - Functions - Banking System in India - Key Regulations in Indian Banking Sector - RBI - Relationship between Banker and Customer - Retail and Wholesale Banking - Types of Accounts - Opening and Operation of Accounts.

UNIT II MANAGING BANK FUNDS / PRODUCTS 9

Liquid Assets - Investment in Securities - Advances - Loans - Negotiable Instruments - Cheques - Bills of Exchange - Promissory Notes - Designing Deposit Schemes - Liability Management - NPA's - Current Issues on NPA's - M & A's of Banks into Securities Market.

UNIT III DEVELOPMENT IN BANKING TECHNOLOGY 9

Payment System in India - Paper Based - E-Payment - Electronic Banking - Plastic Money - E-Money - Forecasting of Cash Demand at ATM's - Information Technology Act, 2000 in India - RBI's Financial Sector Technology Vision Document - Security Threats in E-Banking - RBI's Initiative.

UNIT IV FINANCIAL SERVICES 9

Introduction - Need for Financial Services - Financial Services Market in India - NBFC - Leasing and Hire Purchase - Mutual Funds - Venture Capital Financing - Bill Discounting - Factoring - Merchant Banking.

UNIT V INSURANCE 9

Insurance - Concept - Need - History of Insurance Industry in India - Insurance Act, 1938 - IRDA - Regulations - Life Insurance - Annuities and Unit Linked Policies - Lapse of the Policy - Revival - Settlement of Claim.

TOTAL: 45 PERIODS


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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the Banking system in India.
- Discuss how banks raise their sources and how they deploy it.
- Explain the development in banking technology.
- Discuss about the financial services in India.
- Explain the insurance Industry in India.

TEXT BOOKS:

- Padmalatha Suresh and Justin Paul, Management of Banking and Financial Services, Pearson, Delhi, 2017.

REFERENCES:

1. Meera Sharma, Management of Financial Institutions - with emphasis on Bank and Risk Management, PHI Learning Pvt. Ltd., New Delhi, 2010.
2. Peter S. Rose and Sylvia C. and Hudgins, Bank Management and Financial Services, Tata McGraw Hill, New Delhi, 2017.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	1	-	-	2	-	-	-	1	-
2	2	3	-	-	-	-	-	-	-	3	-
3	3	3	2	-	-	-	-	-	-	-	-
4	2	3	2	3	-	-	-	-	-	-	3
5	3	2	-	-	3	2	-	-	-	-	-


CHAIRMAN
BoS (IT)

28/10/22

24M104	INTRODUCTION TO BLOCKCHAIN AND ITS APPLICATIONS	L	T	P	C
	(Common to all Branches)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Study about the introduction of blockchain technology.
- Acquire knowledge on the usage of Cryptocurrency.
- Learn about the concept of Ethereum technology.
- Study about the Web3 and Hyperledger concepts .
- Acquire knowledge about the emerging trends related to blockchain technology.

UNIT I INTRODUCTION TO BLOCKCHAIN 9

Blockchain: Growth of Blockchain Technology - Distributed Systems - History of Blockchain and Bitcoin - Features of a Blockchain - Types - Consensus: Consensus Mechanism - Types - Consensus in Blockchain - Decentralization: Decentralization using Blockchain - Methods of Decentralization - Routes to Decentralization - Blockchain and Full Ecosystem Decentralization - Smart Contracts - Decentralized Organizations - Platforms for Decentralization.

UNIT II INTRODUCTION TO CRYPTOCURRENCY 9

Bitcoin - Digital Keys and Addresses - Transactions - Mining - Bitcoin Networks and Payments - Wallets - Alternative Coins - Theoretical Limitations - Bitcoin Limitations - Name Coin - Prime Coin - Zcash - Smart Contracts - Ricardian Contracts - Deploying Smart Contracts on a Blockchain.

UNIT III ETHEREUM 9

Introduction - Ethereum Network - Components of the Ethereum Ecosystem - Transactions and Messages - Ether Cryptocurrency / Tokens - Ethereum Virtual Machine - Ethereum Development Environment: Test Networks - Setting up a Private Net - Starting up the Private Network.

UNIT IV WEB3 AND HYPERLEDGER 9

Introduction to Web3 - Contract Deployment - POST Requests - Development Frameworks - Hyperledger as a Protocol - Reference Architecture - Hyperledger Fabric - Distributed Ledger - Corda.


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UNIT V EMERGING TRENDS**9**

Kadena - Ripple - Rootstock - Quorum - Tendermint - Scalability - Privacy - Other Challenges - Blockchain Research - Notable Projects - Miscellaneous Tools.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Explain about the introduction of blockchain technology.
- Discuss about the usage of Cryptocurrency.
- Elaborate about the concept of Ethereum technology.
- Discuss about the Web3 and Hyperledger concepts.
- Discuss about the emerging trends related to blockchain technology.

TEXT BOOKs:

1. Imran. Bashi, Mastering block chain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained, Packet Publishing, 2nd Edition, 2018.

REFERENCES:

1. Peter Borovykh , Blockchain Application in Finance, Blockchain Driven, 2nd Edition, 2018
2. ArshdeepBahga, Vijay Madiseti, Blockchain Applications: A Hands On Approach, VPT, 2017.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	1	1	2	1	1	1	1	–	2
2	3	3	2	2	2	2	1	1	2	1	2
3	3	3	3	3	3	1	1	2	2	2	3
4	2	2	3	3	3	2	2	2	3	3	3
5	2	3	3	3	3	3	2	3	3	3	3


CHAIRMAN
BoS (IT)

28/10/25

24M105	FINTECH PERSONAL FINANCE AND PAYMENTS	L	T	P	C
	(Common to all Branches)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Study about the currency exchange and payment
- Acquire knowledge on the concept of digital finance and alternative finance.
- Learn about the concept of insurtech.
- Study about the process of peer to peer lending
- Acquire knowledge about the various regulatory issues related to finance.

UNIT I CURRENCY EXCHANGE AND PAYMENT 9

Understand the Concept of Crypto Currency - Bitcoin and Applications - Cryptocurrencies and Digital Crypto Wallets - Types of Cryptocurrencies - Applications - Block Chain - Artificial Intelligence - Machine Learning - Fintech Users - Individual Payments - RTGS Systems - Immediate Page 54 of 90 Payment Service (IMPS) - Unified Payments Interface - Legal and Regulatory Implications of Cryptocurrencies - Payment Systems and their Regulations - Digital Payments Smart Cards - Stored-Value Cards - EC Micropayments - Payment Gateways - Mobile Payments - Digital and Virtual Currencies - Security - Ethical - Legal - Privacy - Technology Issues.

UNIT II DIGITAL FINANCE AND ALTERNATIVE FINANCE 9

History of Financial Innovation - Digitization of Financial Services - Crowd funding - Charity and Equity - Introduction to the Concept of Initial Coin Offering.

UNIT III INSURETECH 9

InsurTech Introduction - Business Model Disruption AI/ML in InsurTech - IoT and InsurTech - Risk Modeling - Fraud Detection Processing Claims - Underwriting Innovations in Insurance Services.

UNIT IV PEER TO PEER LENDING 9

P2P - Marketplace Lending - New Models - New Products in Market Place Lending P2P Infrastructure - Technologies - Concept of Crowdfunding - Architecture and Technology - Crowdfunding Unicorns and Business Models - SME/MSME Lending: Unique Opportunities and Challenges - Solutions and Innovations.


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UNIT V REGULATORY ISSUES**9**

FinTech Regulations: Global Regulations - Domestic Regulations - Evolution of RegTech - RegTech Ecosystem: Financial Institutions - RegTech Ecosystem: Startups RegTech - Startups: Challenges - RegTech Ecosystem: Regulators - Use of AI in Regulation - Fraud Detection.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Explain about the currency exchange and payment.
- Discuss on the concept of digital finance and alternative finance.
- Elaborate about the concept of insurtech.
- Discuss about the process of peer to peer lending.
- Explain about the various regulatory issues related to finance.

TEXT BOOKS:

- Swanson Seth, Fintech for Beginners: Understanding and utilizing the power of technology, Createspace Independent Publishing Platform, 2016.

REFERENCES:

- Models AuTanda, Fintech Bigtech And Banks Digitalization and Its Impact On Banking Business, Springer, 2019.
- Henning Diedrich, Ethereum: Blockchains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations, Wildfire Publishing, 2016.
- Jacob William, FinTech:TheBeginner's Guide to Financial Technology, Createspace Independent Publishing Platform, 2016.
- IIBF, Digital Banking, Taxmann Publication, 2016.
- Jacob William, Financial Technology, Create space Independent Pub, 2016.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	2	2	3	2	1	2	1	2	1
2	3	3	3	2	2	2	2	2	1	2	1
3	3	3	3	3	3	2	2	2	2	2	1
4	3	3	3	3	3	3	2	2	2	2	1
5	3	3	2	3	2	3	3	3	2	2	2


CHAIRMAN
BoS (IT)

28/10/25

24M106

INTRODUCTION TO FINTECH
(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Learn about history, importance and evolution of Fintech.
- Acquire the knowledge of Fintech in payment industry.
- Acquire the knowledge of Fintech in insurance industry.
- Learn the Fintech developments around the world.
- Study about the future of Fintech.

UNIT I INTRODUCTION TO FINTECH 9

Fintech - Definition - History - Concept - Meaning - Architecture - Significance - Goals - Key Areas in Fintech - Importance of Fintech - Role of Fintech in Economic Development - Opportunities and Challenges in Fintech - Evolution of Fintech in Different Sectors of the Industry - Infrastructure - Banking Industry - Startups and Emerging Markets.

UNIT II PAYMENT INDUSTRY 9

Fintech in Payment Industry - Multichannel Digital Wallets - Applications Supporting Wallets - Onboarding and KYC Application - Fintech in Lending Industry - Formal Lending - Informal Lending - P2P Lending - POS Lending - Online Lending.

UNIT III INSURANCE INDUSTRY 9

Fintech in Wealth Management Industry - Financial Advice - Automated Investing - Socially Responsible Investing - Fractional Investing - Social Investing - Fintech in Insurance Industry - P2P Insurance - On-Demand Insurance - Consultation - Customer Engagement through Quote to Sell - Policy Servicing - Claims Management - Investment Linked Health Insurance.

UNIT IV FINTECH AROUND THE GLOBE 9

Fintech Developments - US - Europe - UK - Germany - Sweden - France - China - India - Regulatory and Policy Assessment for Growth of Fintech - Fintech as Disruptors - Financial Institutions Collaborating with Fintech Companies - New Financial World.

UNIT V FUTURE OF FINTECH 9

How Emerging Technologies Will Change Financial Services - Future of Financial Services - Banking on Innovation through Data - Why Fintech Banks will Rule the World - Fintech Supermarket - Banks Partnering with Fintech Start-Ups - Rise of Banktech - Fintech Impact on Retail Banking - Future without Money - Ethics in Fintech.


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TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain about history, importance and evolution of Fintech.
- Discuss about the process of Fintech in payment industry.
- Discuss about the process of Fintech in insurance industry.
- Handle the process of the various Fintech around the world.
- Discuss about the future of Fintech.

TEXT BOOKs:

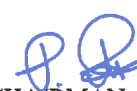
- Arner D., Barbers J., Buckley R, The evolution of FinTech: a new post crisis paradigm, University of New South Wales Research Series, 2015

REFERENCES:

- Susanne Chishti, Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, Wiley Publications, 2016.
- Richard Hayen, FinTech: The Impact and Influence of Financial Technology on Banking and the Finance Industry, 2016.
- Parag Y Arjunwadkar, FinTech: The Technology Driving Disruption in the financial service industry CRC Press, 2018.
- Sanjay Phadke, Fintech Future : The Digital DNA of Finance Paperback .Sage Publications, 2020.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	2	2	2	2	1	2	1	2	1
2	3	3	3	3	3	2	2	2	1	2	1
3	3	3	3	3	3	3	2	2	2	2	1
4	3	3	3	3	3	3	3	3	2	3	2
5	3	3	2	3	3	3	3	3	2	3	2


CHAIRMAN
BoS (IT)

OBJECTIVES:

The student should be made to:

- Understand the concepts, skills, traits, and factors influencing entrepreneurship.
- Integrate the concepts of business ownership, environmental factors, and functional areas of management for effective business decision-making.
- Study the concepts, principles, and characteristics of technopreneurship along with its societal, economic, and employment impacts.
- Explore technology-driven entrepreneurship, intrapreneurship, and global practices with focus on launching and managing tech-based ventures.
- Know effective business management strategies across diverse entrepreneurial forms and emerging trends at local, national, and global levels.

UNIT I INTRODUCTION TO ENTREPRENEURSHIP**9**

Entrepreneurship- Definition, Need, Scope - Entrepreneurial Skill & Traits - Entrepreneur vs. Intrapreneur; Classification of entrepreneurs, Types of entrepreneurs -Factors affecting entrepreneurial development – Achievement Motivation – Contributions of Entrepreneurship to Economic Development

UNIT II BUSINESS OWNERSHIP & ENVIRONMENT**9**

Types of Business Ownership – Business Environmental Factors – Political-Economic-Sociological-Technological-Environmental-Legal aspects – Human Resources. Mobilisation-Basics of Managing Finance- Essentials of Marketing Management - Production and Operations Planning – Systems Management and Administration.

UNIT III FUNDAMENTALS OF TECHNOPRENEURSHIP**9**

Introduction to Technopreneurship - Definition, Need, Scope- Emerging Concepts- Principles - Characteristics of a technopreneur - Impacts of Technopreneurship on Society – Economy- Job Opportunities in Technopreneurship - Recent trends

UNIT IV APPLICATIONS OF TECHNOPRENEURSHIP**9**

Technology Entrepreneurship - Local, National and Global practices - Intrapreneurship and Technology interactions, Networking of entrepreneurial activities – Launching - Managing Technology based Product / Service entrepreneurship - Success Stories of Technopreneurs - Case Studies.

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UNIT V EMERGING TRENDS IN ENTREPRENEURSHIP

9

Effective Business Management Strategies for Franchising - Sub-Contracting - Leasing- Technopreneurs – Agripreneurs - Netpreneurs- Portfolio entrepreneurship - NGO Entrepreneurship – Recent Entrepreneurial Developments - Local – National – Global perspectives.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the different types of entrepreneurs and assess the contribution of entrepreneurship to economic development.
- Choose business environments, management principles in HR, finance, marketing, and production systems for efficient administration.
- Solve the emerging trends in technopreneurship and its role in creating innovations, job opportunities, and economic growth.
- Apply entrepreneurial practices in technology ventures, and assess success stories and case studies of technopreneurs.
- Analyze franchising, subcontracting, leasing, and new entrepreneurial models and assess their impact on recent entrepreneurial developments.

TEXT BOOKS:

1. Khanka S S, “Entrepreneurial Development”, S.Chand & Co. Ltd., New Delhi, 2021.
2. Donal F Kuratko, “Entrepreneurship Theory, Process, Practice” Cengage Learning, 11th Edition, 2022.

REFERENCES:

1. Daniel Mankani, “Technopreneurship: The successful Entrepreneur in the new Economy”, Prentice Hall, 2003.
2. Edward Elgar, “Entrepreneurship, Cooperation and the Firm: The Emergence and Survival of High-Technology Ventures in Europe”, Wiley Publications, 2014.
3. Dennis Posadas, “JumpStart: A Technopreneurship Fable”, Pearson Prentice Hall, 2009.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	-	-	-	-	-	2	-
CO2	2	2	1	-	-	1	1	1	1	2	-
CO3	2	2	1	-	-	1	1	1	1	2	-
CO4	2	2	1	-	1	1	1	1	1	2	1
CO5	2	2	1	-	1	2	1	1	1	2	1

CHAIRMAN
(BoS / MECH)

24M202

**TEAM BUILDING AND LEADERSHIP
MANAGEMENT FOR BUSINESS**

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made to:

- Describe the concepts of team dynamics, formation, and development.
- Integrate the leadership roles and strategies for building effective, high-performance teams.
- Interpret the attributes, traits, and power dimensions of effective leadership.
- Compare various leadership theories, models, and styles within organisational contexts.
- Know the behavioural aspects of leadership and challenges like conflict, negotiations

UNIT I INTRODUCTION TO MANAGING TEAMS

9

Introduction to Team - Team Dynamics - Team Formation – Stages of Team Development - Enhancing teamwork within a group - Team Coaching - Team Decision Making - Virtual Teams - Self Directed Work Teams (SDWTs) -Multicultural Teams

UNIT II MANAGING AND DEVELOPING EFFECTIVE TEAMS

9

Team-based Organisations- Leadership roles in team-based organisations - Offsite training and team development - Experiential Learning - Coaching and Mentoring in team building - Building High-Performance Teams - Building Credibility and Trust - Skills for Developing Others - Team Building at the Top - Leadership in Teamwork Effectiveness.

UNIT III INTRODUCTION TO LEADERSHIP

9

Introduction to Leadership - Leadership Myths – Characteristics of Leader, Follower and Situation - Leadership Attributes - Personality Traits and Leadership- Intelligence Types and Leadership - Power and Leadership - Delegation and Empowerment.

UNIT IV LEADERSHIP IN ORGANISATIONS

9

Leadership Styles – LMX Theory- Leadership Theory and Normative Decision Model - Situational Leadership Model - Contingency Model and Path Goal Theory – Transactional and Transformational Leadership - Charismatic Leadership - Role of Ethics and Values in Organisational Leadership.

UNIT V LEADERSHIP EFFECTIVENESS

9

Leadership Behaviour - Assessment of Leadership Behaviours - Destructive Leadership - Motivation and Leadership - Managerial Incompetence and Derailment Conflict Management - Negotiation and Leadership - Culture and Leadership - Global Leadership – Recent Trends in Leadership.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Differentiate the various types of teams and teamwork practices.
- Apply mentoring, coaching, and trust-building techniques in team development.
- Solve the interrelationship between leader, follower, and situational factors.
- Apply ethical and value-based approaches to leadership practice.
- Analyze the strategies for effective leadership in global and multicultural environments.

TEXT BOOKS:

1. Hughes R L, Ginnett R C, and Curphy G J, "Leadership: Enhancing the Lessons of Experience", McGraw Hill Education, India, 9th Edition, 2019.
2. Katzenback J R and Smith D K, "The Wisdom of Teams: Creating the High Performance Organizations", Harvard Business Review Press, 2015.

REFERENCES:

1. Haldar U K, "Leadership and Team Building", Oxford University Press, 2010.
2. Daft R L, "The Leadership Experience", Cengage, 2023.
3. Daniel Levi, "Group Dynamics for Teams", Sage Publications, 4th Edition, 2014.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	-	-	-	-	1	2	2	-
CO2	2	1	-	-	2	2	-	1	2	2	2
CO3	2	1	-	-	-	-	-	1	2	2	-
CO4	2	2	1	1	2	2	-	1	3	2	2
CO5	2	1	1	1	2	2	-	1	3	2	2


CHAIRMAN
(BoS/ MECH)

24M203

**CREATIVITY AND INNOVATION
IN ENTREPRENEURSHIP**

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the concepts, forms, and qualities of creativity along with the role of environment and personality.
- Know the concepts of traits, training methods, and barriers associated with creative intelligence.
- Study levels, types, and sectoral characteristics of innovation.
- Learn the concepts of innovation and entrepreneurship
- Explore entrepreneurial mindset, motivation, and opportunity analysis.

UNIT I CREATIVITY

9

Creativity: Definition- Forms of Creativity-Essence, Elaborative and Expressive Creativities- Quality of Creativity-Existential, Entrepreneurial and Empowerment Creativities – Creative Environment-Creative Technology- - Creative Personality and Motivation.

UNIT II CREATIVE INTELLIGENCE

9

Creative Intelligence: Convergent thinking ability – Traits Congenial to creativity – Creativity Training- Criteria for evaluating Creativity-Credible Evaluation- Improving the quality of our creativity – Creative Tools and Techniques - Blocks to creativity- fears and Disabilities- Strategies for Unblocking- Designing Creativity Enabling Environment.

UNIT III INNOVATION

9

Innovation: Definition- Levels of Innovation- Incremental vs Radical Innovation-Product Innovation and Process- Technological, Organizational Innovation – Indicators- Characteristics of Innovation in Different Sectors. Theories in Innovation and Creativity- Design Thinking and Innovation- Innovation as Collective Change-Innovation as a system.

UNIT IV INNOVATION AND ENTREPRENEURSHIP

9

Innovation and Entrepreneurship: Entrepreneurial Mindset, Motivations and Behaviours- Opportunity Analysis and Decision Making- Industry Understanding - Entrepreneurial Opportunities- Entrepreneurial Strategies – Technology Pull/Market Push – Product -Market fit.


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UNIT V INNOVATIVE BUSINESS MODELS

9

Innovative Business Models: Customer Discovery-Customer Segments-Prospect Theory and Developing Value Propositions- Developing Business Models: Elements of Business Models – Innovative Business Models: Elements, Designing Innovative Business Models- Responsible Innovation and Creativity.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the differentiate between various forms of creativity and factors influencing creative performance.
- Apply creative tools, strategies, and techniques to overcome blocks to creativity.
- Solve theories of innovation and design thinking for practical application.
- Formulate the applications of innovation in building successful ventures
- Design responsible and sustainable business models for entrepreneurship.

TEXT BOOKS:

1. Khanka S S., “Creativity and Innovation in Entrepreneurship”, Sultan Chand & Sons, 2021.
2. Pradip N Khandwalla, “Lifelong Creativity, An Unending Quest”, Tata Mc Graw Hill, 2004.

REFERENCES:

1. Paul Trott, “Innovation Management and New Product Development”, 4th Edition, Pearson, 2018.
2. Vinnie Jauhari and Sudanshu Bhushan, “Innovation Management”, Oxford Higher Education, 2014.
3. Krishnamacharyulu C S G and Lalitha R, “Innovation Management”., Himalaya Publishing House, 2017.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	2	2	-	-	-	-	-
CO2	2	2	-	-	2	2	-	-	-	-	-
CO3	2	2	-	-	2	2	-	-	-	-	-
CO4	2	2	1	-	2	2	2	2	2	2	-
CO5	2	2	1	-	2	2		2	2	2	3

CHAIRMAN
(BoS / MECH)

24M204

**PRINCIPLES OF MARKETING MANAGEMENT
FOR BUSINESS**

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Realise the functions and orientations of marketing along with the traditional and modern marketing mix.
- Recognize the techniques of environmental scanning and the role of marketing research and information systems.
- Know the product life cycle strategies, product mix decisions, and branding practices.
- Investigate integrated marketing communication tools, personal selling process, and distribution channels.
- Learn modern practices like CRM, e-marketing, and services marketing in business contexts.

UNIT I INTRODUCTION TO MARKETING MANAGEMENT

9

Introduction - Market and Marketing – Concepts- Functions of Marketing - Importance of Marketing
- Marketing Orientations - Marketing Mix-The Traditional 4Ps - The Modern Components of the Mix
- The Additional 3Ps - Developing an Effective Marketing Mix.

UNIT II MARKETING ENVIRONMENT

9

Introduction - Environmental Scanning - Analysing the Organisation's Micro Environment and Macro Environment - Differences between Micro and Macro Environment – Techniques of Environment Scanning - Marketing organization - Marketing Research and the Marketing Information System, Types and Components.

UNIT III PRODUCT AND PRICING MANAGEMENT

9

Product- Meaning, Classification, Levels of Products – Product Life Cycle (PLC) - Product Strategies
- Product Mix - Packaging and Labelling - New Product Development - Brand and Branding - Advantages and disadvantages of branding Pricing - Factors Affecting Price Decisions - Cost Based Pricing - Value Based and Competition Based Pricing - Pricing Strategies - National and Global Pricing.

UNIT IV PROMOTION AND DISTRIBUTION MANAGEMENT

9

Introduction to Promotion – Marketing Channels- Integrated Marketing Communications (IMC) - Introduction to Advertising and Sales Promotion – Basics of Public Relations and Publicity - Personal Selling - Process - Direct Marketing - Segmentation, Targeting and Positioning (STP)-Logistics Management- Introduction to Retailing and Wholesaling.


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UNIT V CONTEMPORARY ISSUES IN MARKETING MANAGEMENT**9**

Introduction - Relationship Marketing Vs. Relationship Management - Customer Relationship Management (CRM) - Forms of Relationship Management - CRM practices - Managing Customer Loyalty and Development – Buyer-Seller Relationships- Buying Situations in Industrial / Business Market - Buying Roles in Industrial Marketing - Factors that Influence Business - Services Marketing - E-Marketing or Online Marketing.

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Illustrate the application in developing an effective marketing strategy.
- Compare micro and macro environment factors affecting marketing decisions.
- Formulate suitable pricing strategies for national and global markets.
- Explain the effective promotion and distribution strategies for various market segments..
- Apply strategies for managing customer loyalty, buyer–seller relationships, and online marketing initiatives.

TEXT BOOKS:

1. Sherlekar S A, “Marketing Management”, Himalaya Publishing House, 2016.
2. Philip Kotler and Kevin Lane Keller, “Marketing Management”, 15th Edition, Pearson, 2015.

REFERENCES:

1. Vijay Prakash Anand, “Marketing Management: An Indian Perspective”, Biztantra, 2nd Edition, 2016.
2. Ramaswamy V S and Namakumari S, “Marketing Management: Global Perspective, Indian Context”, Macmillan Publishers India, 5th Edition, 2015.
3. Dr. Gupta C B and Dr. Rajan Nair N, “Marketing Management: Text and Cases”, 17th Edition, 2016.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	1	-	-	-	3	-	-
CO2	2	1	-	-	2	-	-	2	3	-	-
CO3	2	1	-	-	2	-	-	2	3	3	2
CO4	2	1	-	-	2	-	-	2	3	3	2
CO5	2	1	-	-	2	-	-	2	3	3	2

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24M205

**HUMAN RESOURCE MANAGEMENT
FOR ENTREPRENEURS**

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Describe the concepts, scope, and evolution of HRM along with the roles and challenges of HR managers.
- Understand the tools, methods, and recent trends in human resource planning and career management.
- Know the different sources, techniques, and processes of recruitment and selection in domestic and global contexts.
- Discover training types, compensation practices, and sustainable HR initiatives like Green HRM.
- Evaluate performance appraisal systems, grievance redressal methods, and employee relations practices.

UNIT I INTRODUCTION TO HRM

9

Concept, Definition, Objectives- Nature and Scope of HRM - Evolution of HRM - HR Manager Roles- Skills - Personnel Management Vs. HRM - Human Resource Policies - HR Accounting - HR Audit - Challenges in HRM.

UNIT II HUMAN RESOURCE PLANNING

9

HR Planning - Definition - Factors- Tools - Methods and Techniques - Job analysis- Job rotation- Job Description - Career Planning - Succession Planning - HRIS - Computer Applications in HR - Recent Trends

UNIT III RECRUITMENT AND SELECTION

9

Sources of recruitment- Internal Vs. External - Domestic Vs. Global Sources -eRecruitment - Selection Process- Selection techniques -eSelection- Interview Types- Employee Engagement.

UNIT IV TRAINING AND EMPLOYEE DEVELOPMENT

9

Types of Training - On-The-Job, Off-The-Job - Training Needs Analysis – Induction and Socialisation Process - Employee Compensation - Wages and Salary Administration – Health and Social Security Measures- Green HRM Practices.

UNIT V CONTROLLING HUMAN RESOURCES

9

Performance Appraisal – Types - Methods - Collective Bargaining - Grievances Redressal Methods – Employee Discipline – Promotion – Demotion - Transfer – Dismissal - Retrenchment - Union Management Relationship - Recent Trends.

TOTAL: 45 PERIODS

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(BoS / MECH)

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the Evolution of HRM and Challenges faced by HR Managers
- Apply HRIS and computer-based approaches in HR planning.
- Interpret employee engagement practices in relation to recruitment and selection.
- Apply effective training and development programs to enhance employee performance.
- Formulate HR strategies for conflict resolution, promotion, and union–management relations.

TEXT BOOKS:

1. Gary Dessler and Biju Varkkey, “Human Resource Management”, Pearson, 16th Edition, 2020.
2. Mathis and Jackson, “Human Resource Management”, Cengage Learning, 15th Edition, 2017.

REFERENCES:

1. David A Decenzo, Stephen P Robbins, and Susan L Verhulst, “Human Resource Management”, Wiley, International Student Edition, 2014.
2. Aswathappa K, Sadhna Dash, “Human Resource Management - Text and Cases”, McGraw Hill, 10th Edition, 2023.
3. Luis R Gomez-Mejia, David B Balkin, Robert L Cardy, “Managing Human Resource”, PHI Learning, 2012

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	-	-	2	-	-	2	-
CO2	2	2	-	-	2	-	2	-	-	2	-
CO3	2	2	-	-	2	-	2	2	2	2	3
CO4	2	2	1	1	2	-	2	2	2	2	3
CO5	2	2	1	1	2	-	2	3	2	3	3

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OBJECTIVES:**The student should be made to:**

- Understand the requirements, scope, and institutional support for setting up new ventures.
- Study the concepts, types, and challenges of venture financing
- Discuss the instruments and credit facilities involved in debt financing.
- Summarize the various equity-based funding options such as subsidies, angel investment, and venture capital.
- Explain the investor decision-making process and criteria for fund raising.

UNIT I ESSENTIALS OF NEW BUSINESS VENTURE**9**

Setting up new Business Ventures – Need - Scope - Franchising - Location Strategy, Registration Process - State Directorate of Industries- Financing for New Ventures - Central and State Government Agencies - Types of loans – Financial Institutions - SFC, IDBI, NSIC and SIDCO.

UNIT II INTRODUCTION TO VENTURE FINANCING**9**

Venture Finance – Definition – Historic Background - Funding New Ventures- Need – Scope – Types - Cost of Project - Means of Financing - Estimation of Working Capital - Requirement of funds – Mix of Debt and Equity - Challenges and Opportunities.

UNIT III SOURCES OF DEBT FINANCING**9**

Fund for Capital Assets - Term Loans - Leasing and Hire-Purchase - Money Market instruments – Bonds, Corporate Papers – Preference Capital- Working Capital Management- Fund based Credit Facilities - Cash Credit - Over Draft.

UNIT IV SOURCES OF EQUITY FINANCING**9**

Own Capital, Unsecured Loan - Government Subsidies, Margin Money- Equity Funding - Private Equity Fund- Schemes of Commercial banks - Angel Funding – Crowd funding- Venture Capital.

UNIT V METHODS OF FUND RAISING FOR NEW VENTURES**9**

Investor Decision Process - Identifying the appropriate investors- Targeting investors- Developing Relationships with investors - Investor Selection Criteria- Company Creation- Raising Funds - Seed Funding- VC Selection Criteria – Process- Methods- Recent Trends.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify different types of financing agencies and loan facilities available.
- Calculate project cost, working capital, and mix of debt–equity for financing..
- Select appropriate debt sources to manage capital and working capital needs.
- Construct financing plans using equity-based funding alternatives.
- Develop strategies for approaching and negotiating with potential investors.

TEXT BOOKS:

1. Brealey and Myers., “Principles of Corporate Finance”, McGraw Hill Education (India) Private Limited, 12th Edition, 2018.
2. Prasanna Chandra, “Projects: Planning, Analysis, Selection, Financing, Implementation and Review”, McGraw Hill Education India Pvt Ltd, New Delhi, 2019.

REFERENCES:

1. Brad Feld and Jason Mendelson., “Venture Deals”, John Wiley & Sons, Inc., 3rd Edition, 2016.
2. Josh Lerner, Ann Leamon, and Felda Hardyman, “Venture Capital, Private Equity, and The Financing of Entrepreneurship”, 2023.
3. Thomas Byers, “Technology Ventures: From Idea to Enterprise”, McGraw Hill Higher Education, 2025.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	-	-	-	1	1	1
CO2	2	-	-	-	-	-	-	1	2	2	2
CO3	2	2	-	-	1	1	2	1	2	2	2
CO4	2	2	-	-	1	1	2	1	2	2	2
CO5	2	2	1	1	1	1	2	1	2	2	2

CHAIRMAN
(BoS / MECH)

**24M301 PRINCIPLES OF PUBLIC ADMINISTRATION
(COMMON TO ALL BRANCHES)**

**L T P C
3 0 0 3**

OBJECTIVES:

The Student should be made to:

Understand the nature of public administration.

- Learn the different functions of administration.
- Learn the different relationships and approaches.
- Understand the Bureaucratic and ecological approaches.
- Know about the leadership approaches, communication types and decision making process

UNIT-I INTRODUCTION TO PUBLIC ADMINISTRATION 9

1. Meaning, Nature and Scope of Public Administration
2. Importance of Public Administration
3. Evolution of Public Administration as a discipline
4. Public Administration and Governance

UNIT-II ADMINISTRATIVE THEORIES AND APPROACHES 9

1. Classical Approach – Henry Fayol, Luther Gulick
2. Scientific Management Approach – F.W. Taylor
3. Human Relations Approach – Elton Mayo
4. Bureaucratic Approach – Max Weber

UNIT-III RELATIONSHIP AND CONTEXT 9

1. Relationship of Public Administration with Political Science, History, Sociology, and Economics
2. Ecological Approach – F.W. Riggs
3. Comparative Public Administration
4. Role of Public Administration in Developing Countries

UNIT-IV NEW TRENDS IN PUBLIC ADMINISTRATION 9

1. New Public Administration (NPA)
2. New Public Management (NPM)
3. Governance and E-Governance
4. Public and Private Administration – Comparative Study

UNIT-V LEADERSHIP, COMMUNICATION AND DECISION MAKING 9

1. Leadership – Meaning, Styles and Theories
2. Communication – Types, Process, Barriers, Effective Communication in Administration
3. Decision Making – Concepts, Techniques and Models (Simon's Model, Rational and Participative Approaches)

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the nature, scope, and importance of public administration.
- Illustrate the evolution and various approaches to public administration.
- Analyze relationships of administration with other social sciences.
- Interpret the principles of leadership, communication, and decision making.
- Assess the new trends in public administration and their practical implications.

TEXT BOOKS:

1. Avasthi, A. and Maheshwari, S.R., "Public Administration." Lakshmi Narain Agarwal, 18th Edition, 2022.
2. Nicholas Henry, "Public Administration and Public Affairs." Routledge, 14th Edition, 2023.
3. M.P. Sharma and B.L. Sadana, "Public Administration in Theory and Practice." Kitab Mahal, 2021.

REFERENCES:

1. Avasthi and Maheswari: Public Administration in India. Agra: Lakshmi Narain Agarwal, 2013.
2. Ramesh K Arora: Indian Public Administration, New Delhi: Wishwa Prakashan, 2012.
3. R.B. Jain: Public Administration in India, 21st Century Challenges for Good Governance, New Delhi: Deep and Deep, 2002.
4. Rumki Basu: Public Administration: Concept and Theories, New Delhi: Sterling, 2013.
5. R. Tyagi, Public Administration, Atma Ram & Sons, New Delhi, 1983.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	—	—	-	2	2	2	-	2	2
CO2	2	3	2	—	—	2	2	3	-	3	3
CO3	2	2	—	—	—	3	2	2	-	2	3
CO4	2	3	3	3	3	3	3	3	2	3	3
CO5	3	2	2	—	—	3	3	3	2	3	3


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BOS/EC

24M302

**ELEMENTS OF PUBLIC ADMINISTRATION
(COMMON TO ALL BRANCHES)**

L T P C

3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the nature and role of public administration and the principles of good governance.
- Explore the interdisciplinary nature of public administration and key administrative approaches.
- Learn the foundational principles of organizational structure and administration.
- Understand administrative processes, leadership, and factors affecting organizational performance.
- Introduce personnel administration and the role of civil services in governance.

UNIT I ADMINISTRATION IN MODERN SOCIETY

9

Administration in Modern Society; Public and Private administration; Evolution of the study of Public Administration. Concept of good governance.

UNIT II PUBLIC ADMINISTRATION AS A SOCIAL SCIENCE

9

Public Administration as a social science; Relationship with other Social Sciences: Political Science, Economics, Sociology, Law and Psychology. Approaches to the study of Public Administration : Classical and Human Relation

UNIT III PRINCIPLES OF ORGANIZATION

9

Principles of Organisations : Hierarchy, Unity of command, Span of control, Coordination, Centralisation, Decentralisation, Authority and Responsibility; Formal and Informal Organisation.

UNIT IV ADMINISTRATIVE PROCESSES

9

Chief Executive, Line and Staff, Supervision, Delegation, Leadership, Communication, Decision making , Morale and Motivation .

UNIT V PERSONNEL ADMINISTRATION

9

Personnel Administration : Meaning and nature of Bureaucracy; Civil Services and their role in a developing society; Classification. Recruitment. Training, Promotion, Disciplinary action, code of conduct..

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Differentiate between public and private administration.
- Analyze the interdisciplinary aspects of public administration.
- Apply principles of organization in administrative systems.
- Evaluate administrative processes including leadership, communication, and decision-making.
- Explain personnel administration, civil services, and ethical responsibilities.


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BOS/ECE

28/10/20

TEXT BOOKS

1. Avasthi. A. and Maheshwari. S.R., "Public Administration," Lakshmi Narain Agarwal, 18th Edition, 2022.
2. M.P. Sharma and B.L. Sadana, "Public Administration in Theory and Practice," Kitab Mahal, 2021.
3. Nicholas Henry, "Public Administration and Public Affairs," Routledge, 14th Edition, 2023.

REFERENCES:

1. F.W. Riggs, "Ecology of Public Administration," Asia Publishing House, 2021.
- Peter Self, "Administrative Theories and Politics," Routledge, 2nd Edition, 2019.
2. Dwivedi, O.P. and Gow, J.I., "From Bureaucracy to Public Management," Broadview Press, 2020.
3. L.D. White, "Introduction to the Study of Public Administration," Macmillan, Reprint Edition, 2020.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	2	—	—	-	2	2	2	-	2	2
C02	2	3	2	—	—	2	2	3	-	3	3
C03	2	2	—	—	—	3	2	2	-	2	3
C04	2	3	3	3	3	3	3	3	2	3	3
C05	3	2	2	—	—	3	3	3	2	3	3


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BOS/ECE

24M303

**PUBLIC PERSONNEL ADMINISTRATION
(COMMON TO ALL BRANCHES)**

**L T P C
3 0 0 3**

OBJECTIVES:

The Student should be made to:

- Understand the concept, scope, and significance of personnel administration in public administration.
- Learn the structure and functioning of civil services and bureaucracy.
- Study recruitment, training, promotion, and disciplinary mechanisms in public service.
- Understand the role of ethics, code of conduct, and accountability in personnel administration.
- Examine contemporary issues, challenges, and reforms in personnel management in government.

UNIT-I INTRODUCTION TO PUBLIC PERSONNEL ADMINISTRATION 9

1. Meaning, Nature, and Scope of Personnel Administration
2. Importance and Functions of Personnel Administration
3. Relationship between Personnel Administration and Public Administration
4. Principles of Effective Personnel Management

UNIT-II BUREAUCRACY AND CIVIL SERVICES 9

1. Bureaucracy: Meaning, Nature, and Features
2. Role of Civil Services in Governance and Development
3. Classification of Civil Services: Central and State Services
4. Functions and Responsibilities of Civil Servants

UNIT-III RECRUITMENT AND TRAINING 9

1. Recruitment: Methods and Procedures in Public Services
2. Selection Process and Entry-Level Requirements
3. Training and Development Programs for Civil Servants
4. Performance Appraisal and Career Development

UNIT-IV PROMOTION, DISCIPLINE AND ACCOUNTABILITY 9

1. Promotion Policies and Procedures in Public Services
2. Disciplinary Action: Principles and Procedures
3. Code of Conduct for Civil Servants
4. Accountability and Transparency in Public Personnel Administration

UNIT-V CONTEMPORARY ISSUES AND REFORMS 9

1. Challenges in Public Personnel Administration
2. Recruitment Reforms and Modernization of Civil Services
3. E-Governance and Digitalization in Personnel Management
4. International Best Practices and Comparative Perspectives

TOTAL: 45 PERIODS


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OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the nature, scope, and functions of public personnel administration
- Describe the role of bureaucracy and civil services in governance
- Analyze recruitment, training, and career development processes
- Evaluate promotion, disciplinary measures, and accountability mechanisms
- Assess contemporary challenges, reforms, and digitalization in personnel administration

TEXT BOOKS

- 1.M.P. Sharma and B.L. Sadana. "Public Administration in Theory and Practice," Kitab Mahal, 2021.
- 2.Avasthi, A. and Maheshwari, S.R.. "Public Administration," Lakshmi Narain Agarwal, 18th Edition, 2022.
3. Nicholas Henry, "Public Administration and Public Affairs," Routledge, 14th Edition, 2023.

REFERENCES:

- 1.F.W. Riggs, "Ecology of Public Administration," Asia Publishing House, 2021.
- 2.Peter Self, "Administrative Theories and Politics," Routledge, 2nd Edition, 2019.
- 3.Dwivedi, O.P., "Bureaucracy and Civil Services in India," Sterling Publishers, 2020.
- 4.L.D. White, "Introduction to the Study of Public Administration," Macmillan, Reprint Edition, 2020.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	—	—	-	2	2	2	-	2	2
CO2	3	2	-	—	—	2	2	2	-	2	3
CO3	2	3	2	—	—	3	2	3	-	3	3
CO4	2	3	3	3	3	3	3	3	2	3	3
CO5	3	2	2	2	3	3	3	3	2	3	3


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24M304

**ADMINISTRATIVE THEORIES
(COMMON TO ALL BRANCHES)**

**L T P C
3 0 0 3**

OBJECTIVES:

The Student should be made to:

- Understand the historical development and evolution of administrative thought.
- Learn classical, behavioral, and modern approaches to administration.
- Examine the contributions of key theorists in administrative theory.
- Understand organizational principles, processes, and structures.
- Analyze contemporary trends and emerging theories in public administration.

UNIT I INTRODUCTION TO ADMINISTRATIVE THEORIES 9

Meaning, Scope and significance of Public Administration, Evolution of Public Administration as a discipline and Identity of Public Administration

UNIT II CLASSICAL APPROACHES 9

Theories of Organization: Scientific Management Theory, Classical Model, Human Relations Theory

UNIT III BEHAVIORAL APPROACHES 9

Organization goals and Behaviour, Groups in organization and group dynamics, Organizational Design.

UNIT IV MODERN AND CONTEMPORARY APPROACHES 9

Systems Theory, Contingency Approach, Total Quality Management (TQM), New Public Administration (NPA) and New Public Management (NPM)

UNIT V ORGANIZATIONAL THEORY AND EMERGING TRENDS 9

Organizational Culture and Climate, Network Governance and E-Governance, Knowledge Management in Administration, Comparative Public Administration and Global Practices.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the evolution and significance of administrative theories
- Compare classical administrative approaches and their relevance


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- Evaluate behavioral approaches including human relations and decision-making
- Analyze modern administrative theories and management techniques
- Assess organizational theories, emerging trends, and global practices

TEXT BOOKS:

1. M.P. Sharma and B.L. Sadana, "Public Administration in Theory and Practice," Kitab Mahal, 2021.
2. Avasthi, A. and Maheshwari, S.R., "Public Administration," Lakshmi Narain Agarwal, 18th Edition, 2022.
3. Nicholas Henry, "Public Administration and Public Affairs," Routledge, 14th Edition, 2023.

REFERENCES:

- 1.F.W. Riggs, "Ecology of Public Administration," Asia Publishing House, 2021.
- 2.Peter Self, "Administrative Theories and Politics," Routledge, 2nd Edition, 2019.
- 3.Dwivedi, O.P., "Bureaucracy and Civil Services in India," Sterling Publishers, 2020.
4. L.D. White, "Introduction to the Study of Public Administration," Macmillan, Reprint Edition, 2020.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	—	—	-	2	2	2	-	2	2
CO2	2	2	2	—	—	2	2	3	-	3	3
CO3	2	3	2	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	3	3	3	2	3	3
CO5	3	2	2	2	3	3	3	3	2	3	3


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24M305

**INDIAN ADMINISTRATIVE SYSTEM
(COMMON TO ALL BRANCHES)**

L T P C

3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the structure, functions, and evolution of the Indian Administrative System.
- Learn about the Union and State governments, their institutions, and functioning.
- Understand the roles, powers, and responsibilities of civil servants in India.
- Examine administrative processes, decision-making, and accountability mechanisms in governance.
- Explore reforms, contemporary issues, and challenges in Indian administration.

UNIT I INTRODUCTION TO INDIAN ADMINISTRATIVE SYSTEM

9

Evolution and Constitutional Context of Indian Administration, Constitutional Authorities: Finance Commission, Union Public Services Commission, Election Commission, Comptroller and Auditor General of India, Attorney General of India

UNIT II UNION GOVERNMENT AND ADMINISTRATION

9

Structure and Functions of the Union Government, President, Prime Minister, Council of Ministers: Powers and Responsibilities, Parliament and its Role in Administration, Ministries and Departments: Functions and Coordination

UNIT III STATE GOVERNMENT AND ADMINISTRATION

9

Structure and Functions of State Governments, Governor, Chief Minister, State Council of Ministers: Powers and Responsibilities, State Legislature and Administrative Machinery, Local Self-Government: Panchayati Raj and Urban Local Bodies

UNIT IV CIVIL SERVICES IN INDIA

9

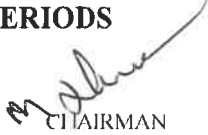
Bureaucracy: Meaning, Features, and Role in Governance, Union and State Civil Services: IAS, IPS, and Other Services, Recruitment, Training, Promotion, and Performance Evaluation, Accountability, Ethics, and Conduct of Civil Servants.

UNIT V REFORMS AND CONTEMPORARY ISSUES

9

Administrative Reforms: Recommendations and Implementation, E-Governance, Digital India, and Transparency Initiatives, Challenges in Indian Administration: Corruption, Red-Tapism, and Policy Implementation, Comparative Administrative Practices and Global Perspectives

TOTAL: 45 PERIODS


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OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the evolution and constitutional basis of Indian administration
- Describe the structure, roles, and responsibilities of Union Government institutions
- Analyze state government structures and local self-governance mechanisms
- Explain the role, recruitment, and accountability of civil services in India
- Evaluate administrative reforms, e-governance, and contemporary challenges

TEXT BOOKS

- 1.M.P. Sharma and B.L. Sadana, "Public Administration in Theory and Practice," Kitab Mahal, 2021.
- 2.Avasthi, A. and Maheshwari. S.R., "Public Administration," Lakshmi Narain Agarwal, 18th Edition, 2022.
- 3.Laxmikanth, M., "Public Administration," McGraw-Hill, 2022.

REFERENCES:

- 1.Subhash Kashyap, "Indian Administration," National Book Trust, 2020.
- 2.Peter Self, "Administrative Theories and Politics," Routledge, 2nd Edition, 2019.
- 3.F.W. Riggs, "Ecology of Public Administration," Asia Publishing House, 2021.
- 4.Vig, N., "Indian Civil Services and Governance," Sage Publications, 2021.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	—	—	-	2	2	2	-	2	2
CO2	3	2	-	—	—	2	2	2	-	2	2
CO3	2	3	2	-	-	3	2	3	2	3	3
CO4	3	2	2	-	-	3	3	3	2	3	3
CO5	3	2	2	2	3	3	3	3	2	3	3


CHAIRMAN
BOS/ECE

OBJECTIVES:**The Student should be made to:**

- Understand the concepts, nature, and scope of public policy and its role in governance.
- Learn the stages of policy formulation, implementation, and evaluation.
- Examine the role of institutions, bureaucracy, and leadership in policy-making.
- Analyze the tools and techniques for effective policy implementation.
- Evaluate contemporary policy issues, reforms, and challenges in governance

UNIT-I INTRODUCTION TO PUBLIC POLICY**9**

Meaning and Definition of Public Policy - Nature, Scope and Importance of public policy – Public policy relationship with social sciences especially with political science and Public Administration.

UNIT-II POLICY FORMULATION**9**

Actors in Policy-Making: Government, Bureaucracy, Interest Groups, and Media- Stages of Policy Formulation: Agenda Setting, Policy Design, and Decision Making- Tools and Techniques for Policy Formulation- Challenges in Policy Formulation

UNIT-III POLICY IMPLEMENTATION**9**

Bureaucracy and Policy Implementation- Administrative Structures and Coordination- Leadership and Decision-Making in Implementation- Obstacles to Effective Implementation: Red-Tapism, Corruption, and Resource Constraints

UNIT-IV POLICY EVALUATION AND CONTROL**9**

Methods and Techniques of Policy Evaluation- Performance Measurement and Monitoring- Feedback Mechanisms and Policy Adjustments- Role of Legislative, Judicial, and Executive Oversight

UNIT-V CONTEMPORARY ISSUES IN PUBLIC POLICY**9**

Social Policy: Health, Education, and Welfare Programs- Economic Policy: Fiscal, Monetary, and Industrial Policies- Environmental Policy and Sustainable Development- Policy Reforms, E-Governance, and Global Best Practices

TOTAL: 45 PERIODS


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28/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the nature, scope, and significance of public policy
- Analyze the stages and actors in policy formulation
- Describe policy implementation mechanisms and challenges
- Evaluate policy outcomes using methods and feedback mechanisms
- Assess contemporary policy issues, reforms, and best practices

TEXT BOOKS:

1. Thomas R. Dye, "Understanding Public Policy," Pearson, 15th Edition, 2020.
2. DeLeon, Public Policy: Theory and Practice, Routledge, 2nd Edition, 2019.
3. M.P. Sharma and B.L. Sadana, "Public Administration in Theory and Practice," Kitab Mahal, 2021.

REFERENCES:

1. James E. Anderson, "Public Policy: An Introduction to the Theory and Practice," Cengage, 9th Edition, 2021.
2. Subhash Kashyap, "Public Policy and Governance in India," National Book Trust, 2020.
3. Peter Hupe and Michael Hill, "Implementing Public Policy," Sage Publications, 2019.
4. F.W. Riggs, "Ecology of Public Administration," Asia Publishing House, 2021.

MAPPING OF COs WITH POs

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	–	–	-	2	2	2	-	2	2
CO2	2	3	2	–	–	2	2	3	-	3	3
CO3	3	2	2	-	-	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	2	3	3
CO5	3	2	2	2	3	3	3	3	2	3	3


CHAIRMAN
BOS/ECE

OBJECTIVES:

The Student should be made to:

- Understand basic probability and common types of distributions
- Learn how to take samples and estimate values for a population
- Use statistical tests like z-test, t-test, and ANOVA to test idea
- Know about different tests for analytics
- Find and explain relationships between two or more variable

UNIT I INTRODUCTION 9

Basic definitions and rules for probability, Baye's theorem and random variables, Probability distributions: Binomial, Poisson, Uniform and Normal distributions.

UNIT II SAMPLING DISTRIBUTION AND ESTIMATION 9

Introduction to sampling distributions, Central limit theorem and applications, sampling techniques, Point and Interval estimates of population parameters.

UNIT III TESTING OF HYPOTHESIS - PARAMETIRC TESTS 9

Hypothesis testing: one sample and two sample tests for means of large samples (z-test), one sample and two sample tests for means of small samples (t-test), ANOVA one way.

UNIT IV NON-PARAMETRIC TESTS 9

Chi-square tests for independence of attributes and goodness of fit, Kolmogorov-Smirnov - test for goodness of fit, Mann - Whitney U test and Kruskal Wallis test.

UNIT V CORRELATION AND REGRESSION 9

Correlation - Rank Correlation - Regression - Estimation of Regression line - Method of Least Squares - Standard Error of estimate.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Facilitate objective solutions in distribution techniques
- Estimate population values from samples
- Test hypotheses using parametric methods
- Develop skill-set that is in demand in both the research and business environments
- Measure correlation and build regression lines

TEXT BOOKS:

1. Richard I Levin, David S Rubin, Masood H Siddiqui, Sanjay Rastogi, "Statistics for Management", Pearson Education, 8th Edition, 2017.
2. Ken Black, "Applied Business Statistics", 7th Edition, Wiley India Edition, 2012.

REFERENCES:

1. Prem S Mann, "Introductory Statistics", Wiley Publications, 9th Edition, 2015.
2. Srivastava T N and Shailaja Rego, "Statistics for Management", Tata McGraw Hill, 3rd Edition 2017.
3. David R Anderson, Dennis J Sweeney, Thomas A Williams, Jeffrey D Camm, James J Cochran, "Statistics for business and economics", 13th Edition, Thomson (South – Western) Asia, Singapore, 2016.
4. Vohra N D, "Business Statistics", Tata McGraw Hill, 2017.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	2	2	2	-	2	2
CO2	2	2	2	-	-	2	1	1	-	2	2
CO3	2	2	1	-	-	2	-	2	-	2	2
CO4	2	2	2	-	-	1	1	1	-	2	2
CO5	2	2	2	-		1	-	2	-	1	2


CHAIRMAN
BoS (AD)

OBJECTIVES:

The Student should be made to:

- Understand the basics of data mining and warehousing
- Learn different data mining processes and models
- Explore data visualization and time series methods
- Study techniques to group and classify data
- Understand key AI techniques used in data mining

UNIT I INTRODUCTION 9

Data mining, Text mining, Web mining, Data ware house.

UNIT II DATA MINING PROCESS 9

Data mining process - KDD, CRISP-DM, SEMMA Prediction performance measures.

UNIT III PREDICTION TECHNIQUES 9

Data visualization, Time series - ARIMA, Winter Holts,

UNIT IV CLASSIFICATION AND CLUSTERING TECHNIQUES 9

Classification, Association, Clustering.

UNIT V MACHINE LEARNING AND AI 9

Genetic algorithms, Neural network, Fuzzy logic, Ant Colony optimization, Particle Swarm Optimization

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the uses of data mining, text mining, web mining, and data warehouses
- Describe KDD, CRISP-DM, and SEMMA with prediction performance measures
- Apply ARIMA and Winter's method for time-based predictions
- Use classification, association, and clustering methods in data analysis
- Develop and implement machine learning algorithms


CHAIRMAN
BoS (AD) 23/10/25

TEXT BOOKS:

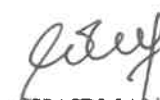
1. Ralph Kimball and Richard Merz, "The data warehouse toolkit", John Wiley, 3rd Edition, 2013.
2. Galit Shmueli, Nitin R Patel and Peter C Bruce, "Data Mining for Business Intelligence-Concepts, Techniques and Applications", Wiley, India, 2010.

REFERENCES:

1. Jaiwei Ham and Micheline Kamber, "Data Mining concepts and techniques", Kauffmann Publishers 2006
2. Efraim Turban, Ramesh Sharda, Jay E. Aronson and David King, "Business Intelligence", Prentice Hall, 2008.
3. Inmon W H, "Building the Data Warehouse", fourth Edition Wiley India Pvt. Ltd. 2005.
4. Michel Berry and Gordon Linoff, "Mastering Data mining", John Wiley and Sons Inc, 2nd Edition, 2011.
5. Michel Berry and Gordon Linoff, "Data mining techniques for Marketing", Sales and Customer support, John Wiley, 2011.
6. Gupta G K, "Introduction to Data mining with Case Studies", Prentice hall of India, 2011
7. Giudici, "Applied Data mining – Statistical Methods for Business and Industry", John Wiley, 2009.
8. Elizabeth Vitt, Michael Luckevich Stacia Misner, "Business Intelligence", Microsoft, 2011.
9. Michalewicz Z, Schmidt M Michalewicz M and Chiriac C, "Adaptive Business Intelligence", Springer Verlag, 2007.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	3	2	-	2	2	2	2
CO2	3	2	2	2	3	1	-	1	1	2	2
CO3	3	2	2	2	3	2	-	2	1	2	2
CO4	3	2	1	2	3	1	-	1	2	2	2
CO5	3	2	1	1	3	1	-	2	2	1	2


CHAIRMAN
BoS (AD)

OBJECTIVES:

The Student should be made to:

- Understand the role of people analytics and HR metrics in business impact
- Learn key recruitment metrics and their use in hiring analysis
- Understand how to measure and evaluate training effectiveness
- Study analytics for employee engagement and internal career movement
- Explore metrics for workforce diversity and structure analysis

UNIT I INTRODUCTION TO HR ANALYTICS 9

People Analytics - stages of maturity - Human Capital in the Value Chain: impact on business - HR metrics and KPIs.

UNIT II HR ANALYTICS I: RECRUITMENT 9

Recruitment Metrics: Fill-up ratio - Time to hire - Cost per hire - Early turnover - Employee referral hires - Agency hires - Lateral hires - Fulfillment ratio - Quality of hire.

UNIT III HR ANALYTICS - TRAINING AND DEVELOPMENT 9

Training & Development Metrics: Percentage of employees trained- Internally and externally trained-Training hours and cost per employee - ROI.

UNIT IV HR ANALYTICS EMPLOYEE ENGAGEMENT AND CAREER PROGRESSION 9

Employee Engagement Metrics: Talent Retention index - Voluntary and involuntary turnover - grades, performance, and service tenure - Internal hired index Career Progression Metrics: Promotion index- Rotation index - Career path index.

UNIT V HR ANALYTICS IV: WORKFORCE DIVERSITY AND DEVELOPMENT 9

Workforce Diversity and Development Metrics: Employees per manager - Workforce age profiling - Workforce service profiling - Churn over index - Workforce diversity index - Gender mix

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain stages of HR analytics maturity and identify key HR KPIs
- Calculate and interpret metrics like time to hire, cost per hire, and quality of hire
- Apply training metrics such as training hours, cost per employee, and ROI
- Use metrics like retention index, promotion index, and career path index
- Analyze diversity using gender mix, churn rate, and age/service profile

TEXT BOOKS:

1. Edwards M R., & Edwards K, "Predictive HR Analytics: Mastering the HR Metric". London: Kogan Page, 2016.
2. Dipak Kumar Bhattacharyya, "HR Analytics Understanding Theories and Applications". SAGE Publications India, 2017.

REFERENCES:

1. Jac Fitzenz, "The New HR Analytics". AMACOM, 2010.
2. "Human Resources kit for Dummies", 3rd Edition, Max Messmer, 2003.
3. Sesil J C, "Applying advanced analytics to HR management decisions: Methods for selection, developing incentives, and improving collaboration. Upper Saddle River". New Jersey: Pearson Education, 2014.
4. Pease G. & Beresford B, "Developing Human Capital: Using Analytics to Plan and Optimize Your Learning and Development Investments". Wiley, 2014.
5. Phillips J, & Phillips P P, "Making Human Capital Analytics Work: Measuring the ROI of Human Capital Processes and OUTCOME". McGraw-Hill, 2014.
6. "HR Scorecard and Metrics". HBR, 2001.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	1	2	-	1	2	2	2	2
CO2	2	2	2	2	1	-	1	1	1	2	2
CO3	2	1	2	1	1	-	1	2	1	2	2
CO4	2	1	1	2	1	-	1	1	2	2	2
CO5	2	1	2	1	1	-	1	2	2	1	2


CHAIRMAN
BoS (AD)

OBJECTIVES:

The Student should be made to:

- Understand key marketing performance metrics and data analysis tools
- Learn how social media evolved and how it supports community engagement
- Understand social media ethics, privacy, and tracking methods
- Explore tools and methods for analyzing web data and business KPIs
- Study techniques to analyze and optimize online search and user behavior

UNIT I MARKETING ANALYTICS 9

Marketing Budget and Marketing Performance Measure, Marketing - Geographical Mapping, Data Exploration, Market Basket Analysis

UNIT II COMMUNITY BUILDING AND MANAGEMENT 9

History and Evolution of Social Media - Understanding Science of Social Media - Goals for using Social Media - Social Media Audience and Influencers - Digital PR- Promoting Social Media Pages - Linking Social Media Accounts-The Viral Impact of Social Media.

UNIT III SOCIAL MEDIA POLICIES AND MEASUREMENTS 9

Social Media Policies - Etiquette, Privacy - ethical problems posed by emerging social media technologies - The Basics of Tracking Social Media.

UNIT IV WEB ANALYTICS 9

Data Collection, Overview of Qualitative Analysis, Business Analysis, KPI and Planning, Critical Components of a Successful Web Analytics Strategy, Proposals & Reports, Web Data Analysis.

UNIT V SEARCH ANALYTICS 9

Search engine optimization (SEO), user engagement, user-generated content, web traffic analysis, online security, online ethics, data visualization.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Use techniques like market basket analysis and geo-mapping to interpret marketing data
- Identify social media goals, audiences, influencers, and promotional strategies
- Apply social media policies and measure platform performance responsibly
- Collect, interpret, and report web data to support digital strategy decisions
- Apply SEO, traffic analysis, and data visualization to improve online performance

TEXT BOOKS:

1. Takeshi Moriguchi, "Web Analytics Consultant Official Textbook". 7th Edition, 2016.
2. Christian Fuchs, "Social Media a critical introduction", SAGE Publications Ltd, 2014.

REFERENCES:

1. Shrivastava K M. "Social Media in Business and Governance". Sterling Publishers Private Limited, 2013.
2. Bittu Kumar. "Social Networking". V & S Publishers, 2013.
3. Avinash Kaushik. "Web Analytics An Hour a Day". Wiley Publishing, 2007.
4. Ric T Peterson. "Web Analytics Demystified". Celilo Group Media and Café Press 2004.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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CO2	3	2	2	2	2	1	-	1	1	1	1
CO3	3	3	2	2	2	1	-	2	1	2	2
CO4	3	2	3	2	2	1	-	1	2	2	2
CO5	3	2	2	1	2	1	-	2	2	1	1


CHAIRMAN
BoS (AD)

OBJECTIVES:**The Student should be made to:**

- Understand types of analytics and their role in supply chains
- Learn models and methods for warehouse location and layout
- Study inventory models and risk management in supply chains
- Explore optimization algorithms for transportation and scheduling
- Understand multi-criteria decision-making techniques

UNIT I INTRODUCTION 9

Descriptive, predictive and prescriptive analytics, Data Driven Supply Chains - Basics, transforming supply chains.

UNIT II WAREHOUSING DECISIONS 9

P-Median Methods - Guided LP Approach, Greedy Drop Heuristics, Dynamic Location Models, Space Determination and Layout Methods.

UNIT III INVENTORY MANAGEMENT 9

Dynamic Lot sizing Methods, Multi-Echelon Inventory models, Aggregate Inventory system and LIMIT, Risk Analysis in Supply Chain, Risk pooling strategies.

UNIT IV TRANSPORTATION NETWORK MODELS 9

Minimal Spanning Tree, Shortest Path Algorithms, Maximal Flow Problems, Transportation Problems, Set covering and Set Partitioning Problems, Travelling Salesman Problem, Scheduling Algorithms.

UNIT V MCDM MODELS 9

Analytic Hierarchy Process (AHP), Data Envelopment Analysis (DEA), Fuzzy Logic and Techniques, the analytical network process (ANP), TOPSIS.

TOTAL: 45 PERIODS


CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain descriptive, predictive, and prescriptive analytics and their application in supply chain transformation
- Apply P-Median, LP, and heuristic approaches for warehouse space and layout decisions
- Implement lot sizing, multi-echelon inventory, and risk pooling strategies
- Solve problems using shortest path, maximal flow, traveling salesman, and scheduling algorithms
- Apply AHP, DEA, Fuzzy Logic, ANP, and TOPSIS in supply chain decisions

TEXT BOOKS:

1. Gerhard J Plenert, "Supply Chain Optimization through Segmentation and Analytics", CRC Press, Taylor & Francis Group, 2014.
2. Muthu Mathirajan, Chandrasekharan Rajendran, Sowmyanarayanan Sadagopan, Arunachalam Ravindran, Parasuram Balasubramanian, "Analytics in Operations/Supply Chain Management", I.K. International Publishing House Pvt. Ltd., 2016.

REFERENCES:

1. Nada R Sanders, "Big data driven supply chain management: A framework for implementing analytics and turning information into intelligence", Pearson Education, 2014.
2. Michael Watson, Sara Lewis, Peter Cacioppi, Jay Jayaraman, "Supply Chain Network Design: Applying Optimization and Analytics to the Global Supply Chain", Pearson Education, 2013.
3. Anna Nagurney, Min Yu, Amir H Masoumi, Ladimer S Nagurney, "Networks Against Time: Supply Chain Analytics for Perishable Products", Springer, 2013.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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CO3	2	2	1	2	-	-	-	1	1	2	1
CO4	2	2	1	2	-	-	-	1	1	1	1
CO5	2	2	1	1	-	-	-	1	1	1	1


CHAIRMAN
BoS (AD)

OBJECTIVES:

The Student should be made to:

- Understand financial modeling and capital budgeting techniques
- Learn risk and return estimation using time series models
- Explore portfolio management and option pricing models
- Use charting and indicators to predict stock prices
- Understand credit risk evaluation techniques

UNIT I CORPORATE FINANCE ANALYSIS 9

Basic corporate financial predictive modeling - Project analysis - cash flow analysis - cost of capital, Financial Break even modelling, Capital Budget model - Payback, NPV, IRR.

UNIT II FINANCIAL MARKET ANALYSIS 9

Estimation and prediction of risk and return (bond investment and stock investment) - Time series examining nature of data, Value at risk, ARMA, ARCH and GARCH.

UNIT III PORTFOLIO ANALYSIS 9

Portfolio Analysis - capital asset pricing model, Sharpe ratio, Option pricing models - binomial model for options, Black Scholes model and Option implied volatility.

UNIT IV TECHNICAL ANALYSIS 9

Prediction using charts and fundamentals - RSI, ROC, MACD, moving average and candle charts, simulating trading strategies. Prediction of share prices.

UNIT V CREDIT RISK ANALYSIS 9

Credit Risk analysis - Data processing, Decision trees, logistic regression and evaluating credit risk model.

TOTAL: 45 PERIODS


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BoS (AD) 16/10/25

OUTCOMES:

On successful completion of this course, the students will be able to,

- Perform cash flow analysis and apply payback, NPV, and IRR methods
- Analyze bond and stock investments using ARMA, ARCH, GARCH models and Value at Risk
- Apply CAPM, Sharpe ratio, binomial and Black-Scholes models in portfolio analysis
- Analyze share prices using RSI, MACD, moving averages, and simulate trading strategies
- Build and evaluate credit risk models using decision trees and logistic regression

TEXT BOOKS:

1. Yuxing Yan, "Python for Finance", Paperback - Import, 30 Jun 2017.
2. James Ma Weiming "Mastering Python for Finance Paperback", Import, 29 Apr 2015.

REFERENCES:

1. Mark J Bennett, Dirk L Hugen, "Financial analytics with R", Cambridge University Press.
2. Pavel Ryzhov, "Haskell Financial Data Modeling and Predictive Analytics", Paperback – Import, 25 Oct 2013.
3. Edward E Williams, John A Dobelman "Quantitative Financial Analytics: The Path to Investment Profits Paperback", Import, 11 Sep 2017.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	2	-	-	-	2	2	1	2
CO2	2	2	2	2	-	-	-	1	1	2	2
CO3	2	2	2	1	-	-	-	2	1	1	1
CO4	2	2	1	1	-	-	-	1	2	1	2
CO5	2	1	2	2	-	-	-	2	2	1	1


CHAIRMAN
BoS (AD)

24M501	SUSTAINABLE INFRASTRUCTURE DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge on sustainable development goals and practices.
- Understand the concepts involved in sustainable infrastructure planning.
- Acquire knowledge on design, construction practices and techniques in construction.
- Explore the construction materials required for sustainable construction.
- Assess various measures for sustainable maintenance of infrastructure projects.

UNIT I SUSTAINABLE DEVELOPMENT GOALS 9

Definitions, principles and history of Sustainable Development - Sustainable development goals (SDG): global and Indian – Infrastructure Demand and Supply - Environment and Development linkages - societal and cultural demands – Sustainability indicators - Performance indicators of sustainability and Assessment mechanism - Policy frameworks and practices: global and Indian – Infrastructure Project finance – Infrastructure project life cycle - Constraints and barriers for sustainable development - future directions.

UNIT II SUSTAINABLE INFRASTRUCTURE PLANNING 9

Overview of Infrastructure projects: Housing sector, Power sector, Water supply, road, rail and port transportation sector, rural and urban infrastructure. Environmental Impact Assessment (EIA), Land acquisition -Legal aspects, Resettlement & Rehabilitation and Development - Cost effectiveness Analysis - Risk Management Framework for Infrastructure Projects, Economic, demand, political, socio-environmental and cultural risks. Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Negotiating with multiple Stakeholders on Infrastructure Projects. Use of ICT tools in planning – Integrated planning - Clash detection in construction - BIM (Building Information Modelling).

UNIT III SUSTAINABLE CONSTRUCTION PRACTICES AND TECHNIQUES 9

Sustainability through lean construction approach - Enabling lean through information technology – Lean in planning and design - IPD (Integrated Project Delivery) - Location Based Management System - Geospatial Technologies for machine control, site management, precision control and real time progress monitoring - Role of logistics in achieving sustainable construction – Data management for integrated supply chains in construction - Resource efficiency benefits of effective logistics –


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BoS (CIVIL)

Sustainability in geotechnical practice – Design considerations, Design Parameters and Procedures – Quality control and Assurance - Use of sustainable construction techniques: Precast concrete technology, Pre-engineered buildings

UNIT IV SUSTAINABLE CONSTRUCTION MATERIALS

9

Construction materials: Concrete, steel, glass, aluminium, timber and FRP - No/Low cement concrete - Recycled and manufactured aggregate - Role of QC and durability - Sustainable consumption – Eco-efficiency - green consumerism - product stewardship and green engineering - Extended producer responsibility – Design for Environment Strategies, Practices, Guidelines, Methods, And Tools. Eco-design strategies –Design for Disassembly - Dematerialization, rematerialization, transmaterialization – Green procurement and green distribution - Analysis framework for reuse and recycling – Typical constraints on reuse and recycling - Communication of Life Cycle Information - Indian Eco mark scheme - Environmental product declarations – Environmental marketing- Life cycle Analysis (LCA), Advances in LCA: Hybrid LCA, Thermodynamic LCA - Extending LCA - economic dimension, social dimension - Life cycle costing (LCC) - Combining LCA and LCC – Case studies

UNIT V SUSTAINABLE MAINTENANCE OF INFRASTRUCTURE PROJECTS

9

Case Studies - Sustainable projects in developed countries and developing nations - An Integrated Framework for Successful Infrastructure Planning and Management - Information Technology and Systems for Successful Infrastructure Management, - Structural Health Monitoring for Infrastructure projects - Innovative Design and Maintenance of Infrastructure Facilities - Capacity Building and Improving the Governments Role in Infrastructure Implementation, Infrastructure Management Systems and Future Directions. – Use of Emerging Technologies – IoT, Big Data Analytics and Cloud Computing, Artificial Intelligences, Machine and Deep Learning, Fifth Generation (5G) Network services for maintenance

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the environment sustainability goals at global and Indian scenario.
- Recognize risks in development of projects and suggest mitigation measures.
- Apply lean techniques, LBMS and new construction techniques to achieve sustainability in infrastructure construction projects.
- Explain Life cycle analysis and life cycle cost of sustainable construction materials.
- Explore the new technologies adopted for maintenance of infrastructure projects.



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REFERENCES:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016.
3. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
4. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2016.
5. New Building Materials and Construction World magazine.
6. Sharma, "Sustainable Smart Cities In India: Challenges And Future Perspectives", SPRINGER, 2022.
7. Ralph Horne, Tim Grant, Karli Verghese, Life Cycle Assessment: Principles, Practice and Prospects, Csiro Publishing, 2009.
8. European Commission - Joint Research Centre - Institute for Environment and Sustainability: International Reference Life Cycle Data System (ILCD) Handbook - General guide for Life Cycle Assessment - Detailed guidance. Luxembourg. European Union; 2010.
9. Greger Lundesjö, Supply Chain Management and Logistics in Construction: Delivering Tomorrow's Built Environment, Kogan Page Publishers, 2015.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	2	-	-	-	-	-
CO2	2	-	-	-	-	2	-	-	-	-	-
CO3	2	-	-	-	-	2	-	-	-	-	-
CO4	2	-	2	-	-	2	-	-	-	-	-
CO5	2	-	-	-	-	2	-	-	-	2	-



CHAIRMAN
BoS (CIVIL)

24M502

**SUSTAINABLE AGRICULTURE AND
ENVIRONMENTAL MANAGEMENT**

L	T	P	C
3	0	0	3

OBJECTIVES:**The student should be made to:**

- Understand the issues of sustainability in agro ecology, agro ecosystem.
- Study soil health, soil erosion, control measures and suggest the management practices to improve soil nutrition.
- Explore the techniques needed for water management which leads to efficient storage system.
- Identify types and sources of agricultural wastes and suggest the suitable technologies for its sustainable management.
- Evaluate proper techniques adopted for sustainable food production.

UNIT I AGROECOLOGY, AGROECOSYSTEM AND SUSTAINABLE AGRICULTURE CONCEPTS **9**

Ecosystem definition - Biotic Vs. abiotic factors in an ecosystem - Ecosystem processes - Ecological services and agriculture - Problems associated with industrial agriculture/food systems - Defining sustainability - Characteristics of sustainable agriculture - Difference between regenerative and sustainable agriculture systems

UNIT II SOIL HEALTH, NUTRIENT AND PEST MANAGEMENT **9**

Soil health definition - Factors to consider (physical, chemical and biological) - Composition of healthy soils - Soil erosion and possible control measures - Techniques to build healthy soil - Management practices for improving soil nutrient - Ecologically sustainable strategies for pest and disease control

UNIT III WATER MANAGEMENT **9**

Soil water storage and availability - Plant yield response to water - Reducing evaporation in agriculture - Earthworks and tanks for rainwater harvesting - Options for improving the productivity of water - Localized irrigation - Irrigation scheduling - Fertigation - Advanced irrigation systems and agricultural practices for sustainable water use


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UNIT IV ENERGY AND WASTE MANAGEMENT**9**

Types and sources of agricultural wastes - Composition of agricultural wastes - Sustainable technologies for the management of agricultural wastes - Useful and high value materials produced using different processes from agricultural wastes - Renewable energy for sustainable agriculture

UNIT V EVALUATING SUSTAINABILITY IN AGROECOSYSTEMS**9**

Indicators of sustainability in agriculture - On-farm evaluation of agroecosystem sustainability - Alternative agriculture approaches/ farming techniques for sustainable food production - Goals and components of a community food system - Case studies

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Explore the knowledge about the concepts, principles and advantages of sustainable agriculture.
- Discuss the sustainable ways in managing soil health, nutrients, pests and diseases.
- Suggest the ways to optimize the use of water in agriculture to promote an ecological use of resources.
- Develop energy and waste management plans for promoting sustainable agriculture in non-sustainable farming areas.
- Assess an ecosystem for its level of sustainability and prescribe ways of converting to a sustainable system through the redesign of a conventional agroecosystem.

REFERENCES:

1. Approaches to Sustainable Agriculture – Exploring the Pathways Towards the Future of Farming, Oberc, B.P. & Arroyo Schnell, A., IUCN, Belgium, 2020
2. Natural bioactive products in sustainable agriculture, Singh, J. & Yadav, A.N., Springer, 2020
3. Organic Farming for Sustainable Agriculture, Nandwani, D., Springer, 2016
4. Principles of Agronomy for Sustainable Agriculture, Villalobos, F.J. & Fereres, E., Springer, 2016
5. Sustainable Agriculture for Food Security: A Global Perspective, Balkrishna, A., CRC Press, 2021
6. Sustainable Energy Solutions in Agriculture, Bundschuh, J. & Chen, G., CRC Press, 2014

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	3	-	-	-	-	-
CO2	2	-	-	-	-	3	-	-	-	1	-
CO3	2	-	-	-	-	3	-	-	-	1	-
CO4	2	-	-	-	-	3	-	-	-	1	-
CO5	2	-	-	-	-	3	-	-	-	-	-



CHAIRMAN
BoS (CIVIL)

24M503

SUSTAINABLE BIO MATERIALS

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on biomaterials and their properties.
- Recognize the fundamentals aspects, types of biopolymers and its applications.
- Learn about the properties of bio ceramics and bio composites.
- Discuss biomedical metals, with its types, properties and applications.
- Understand the significance of bionanomaterials and its applications.

UNIT I INTRODUCTION TO BIOMATERIALS 9

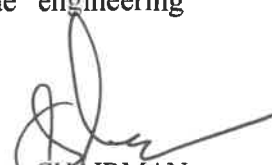
Introduction: Definition of biomaterials, requirements & classification of biomaterials- Types of Biomaterials- Degradable and resorbable biomaterials- engineered natural materials- Biocompatibility-Hydrogels-pyrolitic carbon for long term medical implants-textured and porous materials-Bonding types- crystal structure-imperfection in crystalline structure- surface properties and adhesion of materials –strength of biological tissues-performance of implants-tissue response to implants- Impact and Future of Biomaterials

UNIT II BIO POLYMERS 9

Molecular structure of polymers -Molecular weight - Types of polymerization techniques- Types of polymerization reactions- Physical states of polymers- Common polymeric biomaterials - Polyethylene -Polymethylmethacrylate (PMMA-Polylactic acid (PLA) and polyglycolic acid (PGA) - Polycaprolactone (PCL) - Other biodegradable polymers – Polyurethan- reactions polymers for medical purposes - Collagens- Elastin- Cellulose and derivatives-Synthetic polymeric membranes and their biological applications.

UNIT III BIO CERAMICS AND BIOCOMPOSITES 9

General properties- Bio ceramics -Silicate glass - Alumina (Al_2O_3) -Zirconia (ZrO_2)-Carbon- Calcium phosphates (CaP)- Resorbable Ceramics- surface reactive ceramics- Biomedical Composites- Polymer Matrix Composite (PMC)-Ceramic Matrix Composite(CMC)-Metal Matrix Composite (MMC)– glass ceramics - Orthopedic implants-Tissue engineering scaffolds


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UNIT IV METALS AS BIOMATERIALS

9

Biomedical metals-types and properties-stainless steel-Cobalt chromium alloys-Titanium alloys- Tantalum-Nickel titanium alloy (Nitinol)- magnesium-based biodegradable alloys-surface properties of metal implants for osteointegration-medical application-corrosion of metallic implants – biological tolerance of implant metals

UNIT V NANOBIMATERIALS

9

Meatllc nanobiomaterials– Nanopolymers –Nanoceramics - Nanocomposites -Carbon based nanobiomaterials - transport of nanoparticles- release rate-positive and negative effect of nanosize- nanofibres -Nano and micro features and their importance in implant performance- Nanosurface and coats-Applications nanoantibiotics - Nanomedicines- Biochips – Biomimetics - BioNEMs -Biosensor- Bioimaging/Molecular Imaging - challenges and future perspective.

TOTAL : 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Impart knowledge on surface properties, adhesion and performance of biomaterials.
- Analyze an overview of polymerization techniques, reactions of various biopolymers.
- Enhance the importance and properties of different bio ceramics and bio composite materials.
- Acquire knowledge on metals as biomaterials.
- Apply nano biomaterials in biomedical and other applications.

REFERENCES:

1. Devarajan Thangadurai, Jeyabalan Sangeetha, Ram Prasad “Functional Bionanomaterials” springer, 2020.
2. C. Mauli Agrawal, Joo L. Ong, Mark R. Appleford, Gopinath Mani “Introduction to Biomaterials Basic Theory with Engineering Applications” Cambridge University Press, 2014.
3. Donglu shi “Introduction to Biomaterials” Tsinghua University press, 2006.
4. Joon Park, R.S.Lakes “Biomaterials An Introduction” third edition, Springer 2007.
5. M.Jaffe,W.Hammond, P.Tolias and T.Arinzeh “Characterization of Biomaterials” Wood head publishing, 2013.
6. Buddy D.Ratner and Allan S.Hoffman Biomaterials Science “An Introduction to Material in Medicine” Third Edition, 2013.
7. Leopoido Javier Rios Gonzalez. “Handbook of Research on Bioenergy and Biomaterials: Consolidated and green process” Apple academic press, 2021.
8. Sujata.V.Bhat Biomaterials; Narosa Publishing house, 2002.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	3	-	-	-	-	-
CO2	3	-	-	-	-	3	-	-	-	-	-
CO3	3	-	-	-	2	3	-	-	-	-	-
CO4	3	-	-	-	2	3	-	-	-	-	-
CO5	3	-	-	-	2	3	-	-	-	-	-


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24M504

MATERIALS FOR ENERGY SUSTAINABILITY

L T P C

3 0 0 3

OBJECTIVES:**The student should be made to:**

- Understand the challenges and demands of sustainable energy sources.
- Gain fundamental knowledge about electrochemical devices and materials.
- Classify the various types of fuel cells.
- Illustrate the novel materials and their usage in photovoltaic application.
- Identify the basic principles of various types of supercapacitors and types of nano composites used in SC electrodes.

UNIT I SUSTAINABLE ENERGY SOURCES**9**

Introduction to energy demand and challenges ahead – sustainable source of energy (wind, solar etc.) – electrochemical energy systems for energy harvesting and storage – materials for sustainable electrochemical systems building – India centric solutions based on locally available materials – Economics of wind and solar power generators vs. conventional coal plants – Nuclear energy

UNIT II ELECTROCHEMICAL DEVICES**9**

Electrochemical Energy – Difference between primary and secondary batteries – Secondary battery (Li-ion battery, Sodium-ion battery, Li-S battery, Li-O₂ battery, Nickel Cadmium, Nickel Metal Hydride) – Primary battery (Alkaline battery, Zinc-Carbon battery) – Materials for battery (Anode materials – Lithiated graphite, Sodioted hard carbon, Silicon doped graphene, Lithium Titanate) (Cathode Materials – S, LiCoO₂, LiFePO₄, LiMn₂O₄) – Electrolytes for Lithium-ion battery (ethylene carbonate and propylene carbonate based).

UNIT III FUEL CELLS**9**

Principle of operation of fuel cells – types of fuel cells (Proton exchange membrane fuel cells, alkaline fuel cell, direct methanol fuel cells, direct borohydride fuel cells, phosphoric acid fuel cells, solid oxide fuel cells, and molten carbonate fuel cells) – Thermodynamics of fuel cell – Fuel utilization – electrolyte membrane (proton conducting and anion conducting)– Catalysts (Platinum, Platinum alloys, carbon supported platinum systems and metal oxide supported platinum catalysts) – Anatomy of fuel cells (gas diffusion layer, catalyst layer, flowfield plate, current conductors, bipolar plates and monopolar plates).


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UNIT IV PHOTOVOLTAICS

9

Physics of the solar cell – Theoretical limits of photovoltaic conversion – bulk crystal growth of Si and wafering for photovoltaic application - Crystalline silicon solar cells – thin film silicon solar cells – multijunction solar cells – amorphous silicon based solar cells – photovoltaic concentrators – Cu(InGa)Se₂ solar cells – Cadmium Telluride solar cells – dye sensitized solar cells – Perovskite solar cells – Measurement and characterization of solar cells - Materials used in solar cells (metallic oxides, CNT films, graphene, OD fullerenes, single-multi walled carbon nanotubes, two-dimensional Graphene, organic or Small molecule-based solar cells materials - copper-phthalocyanine and perylenetetracarboxylicbis -benzine – fullerenes - boron subphthalocyanine- tin (II) phthalocyanine).

UNIT V SUPERCAPACITORS

9

Supercapacitor –types of supercapacitors (electrostatic double-layer capacitors, pseudo capacitors and hybrid capacitors) - design of supercapacitor-three and two electrode cell- parameters of supercapacitor- Faradaic and non - Faradaic capacitance – electrode materials (transition metal oxides (MO), mixed metal oxides, conducting polymers (CP), Mxenes, nanocarbons, non-noble metal, chalcogenides, hydroxides and 1D-3D metal-organic frame work (MOF), activated carbon fibres (ACF)- Hydroxides-Based Materials - Polyaniline (PANI), a ternary hybrid composite-conductive polypyrrole hydrogels – Different types of nanocomposites for the SC electrodes (carbon–carbon composites, carbon-MOs composites, carbon-CPs composites and MOs-CPs composites) - Two-Dimensional (2D) Electrode Materials - 2D transition metal carbides, carbonitrides, and nitrides.

TOTAL : 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire knowledge about various sources of energy sustainability.
- Understand the principles of different electrochemical devices.
- Examine the working principle of fuel cells and their applications.
- Summarize the various photovoltaic applications and the materials used.
- Gain knowledge on different types of supercapacitors and the performance of various materials.



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REFERENCES:

1. Electrode Materials for Supercapacitors: A Review of Recent Advances, Parnia Forouzandeh, Vignesh Kumaravel and Suresh C. Pillai, catalysts 2020.
2. Recent advances, practical challenges, and perspectives of intermediate temperature solid oxide fuel cell cathodes Amanda Ndubuisi, Sara Abouali, Kalpana Singh and Venkataraman Thangadurai, J. Mater. Chem. A, 2022.
3. Functional materials for sustainable energy applications; John A. Kilner, Stephen J. Skinner, Stuart J. C. Irvine and Peter P. Edwards.
4. Hand Book of Fuel Cells: Fuel Cell Technology and Applications, Wolf Vielstich, Arnold Lamm, Hubert Andreas Gasteiger, Harumi Yokokawa, Wiley, London 2003.
5. B.E. Conway, Electrochemical supercapacitors: scientific fundamentals and technological applications, Kluwer Academic / Plenum publishers, New York, 1999.
6. T.R. Crompton, Batteries reference book, Newners, 3rd Edition, 2002.
7. Materials for Supercapacitor applications; B.Viswanathan. M.Aulice Scibioh
8. Review of next generation photovoltaic solar cell technology and comparative materialistic development Neeraj Kant, Pushpendra Singh, Materials Today: Proceedings, 2022.

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	1	3	-	-	-	-	-
CO2	3	-	-	-	1	2	-	-	-	-	-
CO3	3	-	-	-	1	2	-	-	-	-	-
CO4	3	-	-	-	1	2	-	-	-	-	-
CO5	3	-	-	-	1	2	-	-	-	-	-



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24M505

GREEN TECHNOLOGY

L	T	P	C
3	0	0	3

OBJECTIVES:**The student should be made to:**

- Acquire knowledge on green chemistry and its applications.
- Identify the types of pollution and its sources.
- Classify solvents, green reagents and study the design process of chemical and microwave methods.
- Interpret the real time analysis for prevention of pollution and to provide green engineering solutions to reduce carbon foot print.
- Infer knowledge on nano materials and green nano technology.

UNIT I PRINCIPLES OF GREEN CHEMISTRY 9

Historical Perspectives and Basic Concepts. The twelve Principles of Green Chemistry and green engineering. Green chemistry metrics- atom economy, E factor, reaction mass efficiency, and other green chemistry metrics, application of green metrics analysis to synthetic plans.

UNIT II POLLUTION TYPES 9

Pollution – types, causes, effects, and abatement. Waste – sources of waste, different types of waste, chemical, physical and biochemical methods of waste minimization and recycling.

UNIT III GREEN REAGENTS AND GREEN SYNTHESIS 9

Environmentally benign processes- alternate solvents- supercritical solvents, ionic liquids, water as a reaction medium, energy-efficient design of processes- photo, electro and sono chemical methods, microwave-assisted reactions

UNIT IV DESIGNING GREEN PROCESSES 9

Safe design, process intensification, in process monitoring. Safe product and process design – Design for degradation, Real-time Analysis for pollution prevention, inherently safer chemistry for accident prevention.


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UNIT V GREEN NANOTECHNOLOGY

9

Nanomaterials for water treatment, nanotechnology for renewable energy, nanotechnology for environmental remediation and waste management, nanotechnology products as potential substitutes for harmful chemicals, environmental concerns with nanotechnology

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principles of green engineering and technology.
- Learn different types of waste, chemical, physical and biochemical methods of waste minimization.
- Modify processes and products to make them green and safe through green synthesis and green reagents.
- Design safe products through green process to prevent pollution using green technology.
- Apply advanced green nanotechnology in green synthesis to reduce environmental impacts.

TEXT BOOKS:

1. Green technology and design for the environment, Samir B. Billatos, Nadia A. Basaly, Taylor & Francis, Washington, DC, 1997
2. Green Chemistry – An introductory text - M. Lancaster, RSC, 2016.
3. Green chemistry metrics - Alexi Lapkin and david Constable (Eds) ,Wiley publications,2008

REFERENCES:

1. Environmental chemistry, Stanley E Manahan, Taylor and Francis, 2017

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	3	-	-	-	-	-
CO2	3	-	-	-	-	3	-	-	-	-	-
CO3	3	-	-	-	-	3	-	-	-	-	-
CO4	3	-	-	-	-	3	-	-	-	-	-
CO5	3	-	-	-	2	3	-	-	-	-	-


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24M506

**ENVIRONMENTAL QUALITY MONITORING
AND ANALYSIS**

L	T	P	C
3	0	0	3

OBJECTIVES:**The student should be made to:**

- Understand the concepts of environmental monitoring and standards.
- Study the complexity of the environmental parameters through monitoring programme.
- Analyze the organic pollutants and quality through environmental analysis and monitoring by proper methods.
- Evaluate environmental monitoring programme and risk assessment.
- Identify the automated data acquisition for process monitoring and control.

UNIT I ENVIRONMENTAL MONITORING AND STANDARDS 9

Introduction- Environmental Standards- Classification of Environmental Standards- Global Environmental Standards- Environmental Standards in India- Ambient air quality standards- water quality standard- Environmental Monitoring-Need for environmental monitoring- Concepts of environmental monitoring- Techniques of Environmental Monitoring.

UNIT II MONITORING OF ENVIRONMENTAL PARAMETERS 9

Current Environmental Issues- Global Environmental monitoring programme-International conventions- Application of Environmental Monitoring- Atmospheric Monitoring - screening parameters – Significance of environmental sampling- sampling methods – water sampling - sampling of ambient air-sampling of flue gas.

UNIT III ANALYTICAL METHODS FOR ENVIRONMENTAL MONITORING 9

Classification of Instrumental Method- Analysis of Organic Pollutants by Spectrophotometric methods -Determination of nitrogen, phosphorus and, chemical oxygen demand (COD) in sewage; Biochemical oxygen demand (BOD)- Sampling techniques for air pollution measurements; analysis of particulates and air pollutants like oxides of nitrogen, oxides of sulphur, carbon monoxide, hydrocarbon; Introduction to advanced instruments for environmental analysis


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UNIT IV ENVIRONMENTAL MONITORING PROGRAMME (EMP) & RISK ASSESSMENT

9

Water quality monitoring programme- national water quality monitoring- Parameters for National Water Quality Monitoring- monitoring protocol - Process of risk assessment- hazard identification-exposure assessment- dose-response assessment - risk characterization.

UNIT V AUTOMATED DATA ACQUISITION AND PROCESSING

9

Data Acquisition for Process Monitoring and Control - The Data Acquisition System - Online Data Acquisition, Monitoring, and Control - Implementation of a Data Management System - Review of Observational Networks -Sensors and transducers- classification of transducers- data acquisition system- types of data acquisition systems- data management and quality control - regulatory overview.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand environmental quality standards in India.
- Analyze current environmental issues, sampling methods and monitoring techniques.
- Identify the various instrumental methods and their principles for environmental monitoring.
- Enrich the significance of environmental standards through environmental monitoring programme.
- Study types and systems of data acquisition systems and processing.

TEXTBOOKS:

1. Environmental monitoring Handbook, Frank R. Burden, 2002 by The McGraw-Hill Companies, Inc.
2. Handbook of environmental analysis: chemical pollutants in the air, water, soil, and solid wastes / Pradyot Patnaik, 1997 by CRC Press, Inc

REFERENCES:

1. Environmental monitoring / edited by G. Bruce Wiersma, © 2004 by CRC Press LLC.
2. H. H. Willard, L. L. Merit, J. A. Dean and F. A. Settle, Instrumental Methods of Analysis, CBP Publishers and Distributors, New Delhi, 1988.
3. Heaslip, G. (1975) Environmental Data Handling. John Wiley & Sons. New York.

Mapping of COs with POs

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CO1	2	-	-	-	-	2	2	-	-	-	-
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CO3	2	-	-	-	1	2	-	-	-	-	-
CO4	2	-	-	-	-	2	-	-	-	-	-
CO5	2	2	-	-	-	2	-	-	-	-	-


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24M507	INTEGRATED ENERGY PLANNING FOR	L	T	P	C
	SUSTAINABLE DEVELOPMENT	3	0	0	3

OBJECTIVES:

The student should be made to:

- Create awareness on the energy scenario of India with respect to world.
- Understand the fundamentals of energy sources, energy efficiency and environmental standards.
- Familiarization on the concept of sustainable development goal and its benefits.
- Recognize the potential of renewable energy sources and its conversion technologies for attaining sustainable development.
- Identify the suitable energy policies for sustainable development.

UNIT I ENERGY SCENARIO 9

Comparison of energy scenario – India and World (energy sources, generation mix, consumption pattern, T&D losses, energy demand, per capita energy consumption) – energy pricing – Energy security

UNIT II ENERGY AND ENVIRONMENT 9

Conventional Energy Sources - Emissions from fuels – Air, Water and Land pollution – Environmental standards - measurement and controls

UNIT III REMEDIAL OPTIONS 9

Sustainable Development: Concepts and Stakeholders, Sustainable Development Goal (SDG)
-Social development: Poverty, conceptual issues and measures, impact of poverty.
Globalization and Economic growth - Economic development: Economic inequalities, Income and growth.

UNIT IV RENEWABLE ENERGY TECHNOLOGY 9

Renewable Energy – Sources and Potential – Technologies for harnessing from Solar, Wind, Hydro, Biomass and Oceans – Principle of operation, relative merits and demerits.


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UNIT V ENERGY PLANNING FOR SUSTAINABLE DEVELOPMENT**9**

National & State Energy Policy - National solar mission - Framework of Central Electricity Authority- National Hydrogen Mission - Energy and climate policy - State Energy Action Plan, RE integration, Road map for ethanol blending, Energy Efficiency and Energy Mix

TOTAL: 45 PERIODS**OUTCOMES:**

On successful completion of this course, the students will be able to,

- Understand the world and Indian energy scenario.
- Analyse energy projects, its impact on environment and suggest control strategies.
- Recognise the need of sustainable development and its impact on human resource development
- Apply renewable energy technologies for sustainable development.
- Categorize energy policies and planning for sustainable development.

REFERENCES:

1. Energy Manager Training Manual (4Volumes) available at <http://www.emea.org/gbook1.asp>, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India.2004
2. Robert Ristirer and Jack P. Kraushaar, "Energy and the environment", Willey, 2005.
3. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 2012
4. Twidell, J.W. & Weir A., "Renewable Energy Resources", EFNSpon Ltd., UK, 2015.
5. Dhandapani Alagiri, Energy Security in India Current Scenario, The ICFAI University Press,2006.
6. M.H. Fulekar, Bhawana Pathak,R K Kale, "Environment and Sustainable Development" Springer,2016
7. <https://www.niti.gov.in/verticals/energy>

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	2	-	-	-	-	-
CO2	2	-	-	-	-	2	-	-	-	-	-
CO3	2	-	-	-	-	2	-	-	-	-	-
CO4	2	-	-	-	2	2	-	-	-	-	-
CO5	2	-	-	-	-	2	2	-	-	-	-



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OBJECTIVES:

The student should be made to:

- Understand the types of energy sources, energy efficiency and environmental implications of energy utilization.
- Create awareness on energy audit and its impacts.
- Categorize the techniques adopted for performance evaluation of energy efficiency in thermal utilities.
- Familiarize on the procedures adopted for energy conservation in electrical utilities.
- Identify the concepts of attaining sustainable development and social development goals.

UNIT I ENERGY AND ENVIRONMENT 9

Primary energy sources - Coal, Oil, Gas – India Vs World with respect to energy production and consumption, Climate Change, Global Warming, Ozone Depletion, UNFCCC, COP

UNIT II ENERGY AUDITING 9

Need and types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments

UNIT III ENERGY EFFICIENCY IN THERMAL UTILITIES 9

Energy conservation avenues in steam generation and utilization, furnaces, Thermic Fluid Heaters. Insulation and Refractories - Commercial waste heat recovery devices: recuperator, regenerator, heat pipe, heat exchangers (Plate, Shell & Tube), heat pumps, and thermo compression.

UNIT IV ENERGY CONSERVATION IN ELECTRICAL UTILITIES 9

Demand side management - Power factor improvement – Energy efficient transformers – Energy conservation avenues in Motors, HVAC, fans, blowers, pumps, air compressors, illumination systems and cooling towers

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Sustainable Development: Concepts and Stakeholders, Sustainable Development Goal (SDG). Globalization and Economic growth. Economic development: Economic inequalities, Income and growth. Social development: Poverty, conceptual issues and measures, impact of poverty.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on the prevailing energy scenario.
- Familiarise on energy audits and its relevance.
- Apply the concept of energy efficiency on thermal utilities.
- Identify the energy efficient conservation techniques in various electrical utilities.
- Explore sustainable development and its impact on human resource development.

REFERENCES:

1. Energy Manager Training Manual (4 Volumes) available at <http://www.emea.org/gbook1.asp>, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India. 2004
2. Robert A. Ristinen, Jack J. Kraushaar, Jeffrey T. Brack, "Energy and the Environment", 4th Edition, Wiley, 2022
3. Eastop. T.D & Croft D.R, "Energy Efficiency for Engineers and Technologists", Logman Scientific & Technical, ISBN-0-582-03184, 1990
4. W.R. Murphy and G. McKay "Energy Management" Butterworths, London 1987
5. Pratap Bhattacharyya, "Climate Change and Greenhouse Gas Emission", New India Publishing Agency- Nipa, 2020
6. Matthew John Franchetti, Defne Apul "Carbon Footprint Analysis: Concepts, Methods, Implementation, and Case Studies" CRC Press, 2012
7. M.H. Fulekar, Bhawana Pathak, R K Kale, "Environment and Sustainable Development" Springer, 2016
8. Sustainable development in India: Stocktaking in the run up to Rio+20: Report prepared by TERI for MoEF, 2011.

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CO3	3	-	-	-	-	2	-	-	-	-	-
CO4	3	-	-	-	-	2	-	-	-	-	-
CO5	3	-	-	-	-	2	-	-	-	-	-


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