Kongunadu College of Engineering and Technology (Autonomous)

Affiliated to Anna University, Chennai

B.Tech. – Artificial Intelligence and Data Science

Regulations: KNCET-UGR2024

Choice Based Credit System

I to VIII Semesters Curricula

(Applicable for the students Admitted from 2024-25 Onwards)

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.	24GE101	Computer Fundamentals and C Programming	ESC	3	0	0	3
7.	24TA101	தமிழர் மரபு / Heritage of Tamils	HSMC	1	0	0	1
Practical							
8.	24GE103L	C Programming Laboratory	ESC	0	0	3	1.5
9.	24EEC101L	Interpersonal Communication Laboratory	EEC	0	0	2	1
			Total	**16**	**1**	**9**	**21.5**

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.	24MA201	Vector Calculus and Complex Integration	BSC	3	1	0	4
3.	24MC002	Universal Human Values 2: Understanding Harmony	MC	2	1	0	3
4.	24CY201	Environmental Science	BSC	3	0	0	3
5.	24GE102	Engineering Graphics	BSC	3	0	2	4
6.	24AD201	Python Programming	ESC	3	0	0	3
7.	24TA201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	1
Practical							
8.	24AD202L	Python Programming Laboratory	ESC	0	0	3	1.5
9.	24GE104L	Engineering Practices Laboratory	ESC	0	0	4	2
10.	24EEC201L	Professional Communication Laboratory	EEC	0	0	2	1
			Total	**19**	**1**	**6**	**25.5**

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Semester – III							
S.No	Course Code	Course Title	Course Category	No. of Hours / Week			Credit
				L	T	P	
Theory							
1.	24MA301	Discrete Mathematics and Linear Programming	BSC	3	1	0	4
2.	24AD301	Foundations of Data Science	PCC	3	0	0	3
3.	24CS301	Data Structures	PCC	3	0	0	3
4.	24CS302	Object Oriented Programming using Java	PCC	3	0	2	4
5.	24CS303	Principles of Operating Systems	PCC	3	0	0	3
6.	24EC304	Digital Logic and Computer Organizations	PCC	3	0	0	3
Practical							
7.	24CS304L	Data Structures Laboratory	PCC	0	0	2	1
8.	24AD302L	Fundamentals of Data Science Laboratory	PCC	0	0	2	1
9.	24EEC301L	Soft Skills Development	EEC	0	0	2	1
			Total	**20**	**1**	**8**	**23**

Semester – IV							
S.No	Course Code	Course Title	Course Category	No. of Hours / Week			Credit
				L	T	P	
Theory							
1.	24MA403	Probability and Statistics	BSC	3	1	0	4
2.	24AD401	Artificial Intelligence	PCC	3	0	0	3
3.	24AD402	Big Data Analytics	PCC	3	0	0	3
4.	24CS401	Computer Networks	PCC	3	0	0	3
5.	24IT401	Database Design and Management	PCC	3	0	0	3
6.	24MC003	Constitution of India	MC	2	0	0	0
Practical							
7.	24AD403L	Big Data Analytics Laboratory	PCC	0	0	2	1
8.	24AD404L	Artificial Intelligence Laboratory	PCC	0	0	2	1
9.	24IT402L	Database Design and Management Laboratory	PCC	0	0	2	1
10.	24EEC401L	Life Skills and Personality Development	EEC	0	0	2	1
			Total	**20**	**1**	**8**	**20**

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Semester – V							
S.No	Course Code	Course Title	Course Category	No. of Hours / Week			Credit
				L	T	P	
Theory							
1.	24AD501	Business Analytics	PCC	3	0	0	3
2.	24AD502	Text Analytics	PCC	3	0	0	3
3.	24AD503	Machine Learning Techniques	PCC	3	0	0	3
4.	24IT501	Web Technology	PCC	3	0	2	4
5.		Professional Elective-I	PEC	3	0	0	3
6.		Open Elective-I	OEC	3	0	0	3
Practical							
7.	24AD504L	Machine Learning Laboratory	PCC	0	0	2	1
8.	24AD505L	Mini Project-I	EEC	0	0	2	1
9.	24EEC501L	Professional Skills Development	EEC	0	0	2	1
			Total	**15**	**0**	**8**	**22**

Semester – VI							
S.No	Course Code	Course Title	Course Category	No. of Hours / Week			Credit
				L	T	P	
Theory							
1.	24AD601	Computer Vision	PCC	3	0	0	3
2.	24AD602	R Programming	PCC	3	0	2	4
3.	24AD603	Deep Learning	PCC	3	0	0	3
4.		Professional Elective-II	PEC	3	0	0	3
5.		Professional Elective-III	PEC	3	0	0	3
6.		Open Elective-II	OEC	3	0	0	3
Practical							
7.	24AD604L	Deep Learning Laboratory	PCC	0	0	2	1
8.	24AD605L	Mini Project-II	EEC	0	0	2	1
9.	24EEC601L	Employability Skills	EEC	0	0	2	1
			Total	**18**	**0**	**8**	**22**

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Semester – VII							
S.No	**Course Code**	**Course Title**	**Course Category**	**No. of Hours / Week**			**Credit**
				L	**T**	**P**	
Theory							
1.	24CS701	Cloud and Distributed Computing	PCC	3	0	0	3
2.	24IT701	Cryptography and Network Security	PCC	3	0	0	3
3.	24ME708PE	Principles of Management	HSMC	3	0	0	3
4.		Professional Elective-IV	PEC	3	0	0	3
5.		Professional Elective-V	PEC	3	0	0	3
Practical							
6.	24CS702L	Cloud Computing Laboratory	PCC	0	0	2	1
7.	24IT702L	Security Laboratory	PCC	0	0	2	1
			Total	**15**	**0**	**4**	**17**

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
Practical							
3.	24AD801L	Project Work	EEC	0	0	20	10
			Total	**6**	**0**	**20**	**16**

Total no. of credits: 167

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V	Vertical VI	Vertical VII
Intelligent Systems and Analytics	**Full Stack Development for IT**	**Cloud Computing and Data Center Technology**	**Cyber Security and Data Privacy**	**Creative Media**	**Emerging Technologies**	**Computational Intelligence**
Knowledge Representation and Reasoning	Mobile Application Development	Virtualization Techniques	Cyber Security	Augmented Reality / Virtual Reality	Robotics Process Automation	Optimization Techniques
Recommender Systems	User Interface Design	Data Warehousing	Cyber Security and Privacy	Computer Graphics and Multimedia	Neural Networks and Deep Learning	Reinforcement Learning
Natural Language Processing	Software Development with Python	Storage Technologies	Ethical Hacking	Video Creation and Editing	Quantum Computing	Game Theory
Health Care Analytics	Web Application Security	Cloud Services Management	Digital Forensics	Digital Marketing	3D Printing and Design	Ethics and AI
Advanced Data Science	DevOps	Security and Privacy in Cloud	Modern Cryptography	Multimedia Data Compression and Storage	Introduction to Internet of Things	Agile Methodologies
Predictive Analytics	XML and Web Services	Edge Computing	Blockchain Technology	Game Development	Prompt Engineering	Soft Computing
Generative AI	Human Computer Interaction	Information Retrieval Techniques	Network Security	Visual Effects	Social Network Analysis	Genetic Algorithms

Registration of Professional Elective Courses from Verticals:

- Professional Elective Courses will be registered in Semesters V and 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.
- 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 (PEC): VERTICALS

Vertical I: Intelligent Systems and Analytics

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24AD101PE	Knowledge Representation and Reasoning	PEC	3	0	0	3
2	24IT501PE	Recommender Systems	PEC	3	0	0	3
3	24AD102PE	Natural Language Processing	PEC	3	0	0	3
4	24AD103PE	Health Care Analytics	PEC	3	0	0	3
5	24CS102PE	Advanced Data Science	PEC	3	0	0	3
6	24AD104PE	Predictive Analytics	PEC	3	0	0	3
7	24AD105PE	Generative AI	PEC	3	0	0	3

Vertical II: Full Stack Development

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24IT203PE	App Development	PEC	3	0	0	3
2	24AD201PE	User Interface Design	PEC	3	0	0	3
3	24CS203PE	MERN Stack	PEC	3	0	0	3
4	24AD202PE	Web Application Security	PEC	3	0	0	3
5	24CS204PE	DevOps	PEC	3	0	0	3
6	24CS206PE	XML and Web Services	PEC	3	0	0	3
7	24IT703PE	Human Computer Interaction	PEC	3	0	0	3

Vertical III: Cloud Computing and Data Center Technology

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24AD301PE	Virtualization Techniques	PEC	3	0	0	3
2	24AD302PE	Data Warehousing and Data Mining	PEC	3	0	0	3
3	24AD303PE	Storage Technologies	PEC	3	0	0	3
4	24CS302PE	Cloud Services Management	PEC	3	0	0	3
5	24CS305PE	Security and Privacy in Cloud	PEC	3	0	0	3
6	24AD304PE	Edge Computing	PEC	3	0	0	3
7	24AD305PE	Information Retrieval Techniques	PEC	3	0	0	3

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Vertical IV: Cyber Security and Data Privacy

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24IT101PE	Cyber Security	PEC	3	0	0	3
2	24AD401PE	Cyber Security and Privacy	PEC	3	0	0	3
3	24IT103PE	Ethical Hacking	PEC	3	0	0	3
4	24AD402PE	Digital Forensics	PEC	3	0	0	3
5	24CS403PE	Modern Cryptography	PEC	3	0	0	3
6	24IT104PE	Blockchain Technology	PEC	3	0	0	3
7	24CS404PE	Network Security	PEC	3	0	0	3

Vertical V: Creative Media

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24CS601PE	Augmented Reality / Virtual Reality	PEC	3	0	0	3
2	24IT301PE	Computer Graphics and Multimedia	PEC	3	0	0	3
3	24CS503PE	Video Creation and Editing	PEC	3	0	0	3
4	24AD501PE	Digital Marketing	PEC	3	0	0	3
5	24AD502PE	Multimedia Data Compression and Storage	PEC	3	0	0	3
6	24AD503PE	Game Development	PEC	3	0	0	3
7	24IT303PE	Visual Effects	PEC	3	0	0	3

Vertical VI: Emerging Technologies

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24AD601PE	Robotics Process Automation	PEC	3	0	0	3
2	24CS602PE	Neural Networks and Deep Learning	PEC	3	0	0	3
3	24AD602PE	Quantum Computing	PEC	3	0	0	3
4	24AD603PE	3D Printing and Design	PEC	3	0	0	3
5	24EC609PE	Introduction to Internet of Things	PEC	3	0	0	3
6	24AD604PE	Prompt Engineering	PEC	3	0	0	3
7	24AD605PE	Social Network Analysis	PEC	3	0	0	3

Vertical VII: Computational Intelligence

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24CS703PE	Optimization Techniques	PEC	3	0	0	3
2	24AD701PE	Reinforcement Learning	PEC	3	0	0	3
3	24AD702PE	Game Theory	PEC	3	0	0	3
4	24AD703PE	Ethics and AI	PEC	3	0	0	3
5	24AD704PE	Agile Methodologies	PEC	3	0	0	3
6	24EE701PE	Soft Computing Techniques	PEC	3	0	0	3
7	24AD705PE	Genetic Algorithms	PEC	3	0	0	3

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Open Elective Courses (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)

Semester-V

Open Elective Course-I

S.No.	Course Code	Name of the Course	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.	24EC101OE	Principles of Signal Processing	OEC	3	0	0	3
6.	24EC102OE	Consumer Electronics	OEC	3	0	0	3
7.	24EE101OE	Power Generation Systems	OEC	3	0	0	3
8.	24EE102OE	Electrical Wiring and Lighting	OEC	3	0	0	3
9.	24ME101OE	Production Technology	OEC	3	0	0	3
10.	24ME102OE	Alternative Energy Fuels	OEC	3	0	0	3
11.	24AG101OE	Basics of Agriculture Engineering	OEC	3	0	0	3
12.	24AG102OE	Farm Machinery	OEC	3	0	0	3

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Semester-VI

Open Elective Course-II

S.No.	Course Code	Name of the Course	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.	24EC201OE	Basics of Virtual Instrumentation	OEC	3	0	0	3
6.	24EC202OE	Telecommunication for Society	OEC	3	0	0	3
7.	24EE201OE	Energy Audit and Management	OEC	3	0	0	3
8.	24EE202OE	Electrical Vehicles	OEC	3	0	0	3
9.	24ME201OE	Basics of Automotive Components	OEC	3	0	0	3
10.	24ME202OE	Unconventional Machine Process	OEC	3	0	0	3
11.	24AG201OE	Introduction to Organic Farming	OEC	3	0	0	3
12.	24AG202OE	Introduction to Green House Technology	OEC	3	0	0	3

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SUMMARY

S.No.	Course Category	Credits as per Semester								Total Credit	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1.	**HSMC**	4	4	-	-	-	-	3	-	**11**	**6.58**
2.	**BSC**	12	11	4	4	-	-	-	-	**31**	**18.56**
3.	**ESC**	4.5	6.5	-	-	-	-	-	-	**11**	**6.58**
4.	**EEC**	1	1	1	1	2	2	-	10	**18**	**10.78**
5.	**PCC**	-	-	18	15	14	11	8	-	**66**	**39.53**
6.	**PEC**	-	-	-	-	3	6	6	6	**21**	**12.58**
7.	**OEC**	-	-	-	-	3	3	-	-	**6**	**3.59**
8.	**MC**	-	3	-	-	-	-	-	-	**3**	**1.80**
Total		**21.5**	**25.5**	**23**	**20**	**22**	**22**	**17**	**16**	**167**	**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 I	Vertical II	Vertical III	Vertical IV	Vertical V
Domain Name				
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 I: 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 II: 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 III: 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 IV: 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 V: 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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24MC001	INDUCTION PROGRAMME	L T P C - - - 0

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 dont'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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24EN101	COMMUNICATIVE ENGLISH (Common to All Branches)	L T P C 3 0 0 3

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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24MA101	MATRICES AND CALCULUS (Common to All Branches)	L T P C 3 1 0 4

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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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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24CY101	ENGINEERING CHEMISTRY (Common to All Branches)	L T P C 3 0 2 4

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

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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", S 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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24GE101 COMPUTER FUNDAMENTALS AND C PROGRAMMING

(Common to All Branches)

L	T	P	C
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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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

N. Ramesh

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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 Thinai 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, Yazh 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 Thinai 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. பொருநை -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.Subatanianian, 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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24TA101	தமிழர் மரபு (அனைத்து துறைகளுக்கும் பொதுவானது)	L T P C 1 0 0 1

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 சமண 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, ஒயிலாட்டம், 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 அறக்கோட்பபாடு - 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, கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு 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. பொருநை -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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24GE103L	C PROGRAMMING LABORATORY (Common to All Branches)	L	T	P	C
		0	0	3	1.5

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

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24EEC101L INTERPERSONAL COMMUNICATION LABORATORY L T P C
(Common to All Branches) 0 0 2 1

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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24EN201	TECHNICAL ENGLISH (Common to All Branches)	L T P C 3 0 0 3

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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24MA201	VECTOR CALCULUS AND COMPLEX INTEGRATION (Common to CSE, ADS and IT)	L T P C 3 1 0 4

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.
- Examine the Contour integration using a variety of complex analysis techniques.
- Compute the inverse Laplace transform and interpret its significance in the time domain.

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 (excluding proofs) 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 COMPLEX INTEGRATION **9+3**

Taylors and Laurent's series expansions - Singular points - Residues - Cauchy's residue theorem (excluding proof) - Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

UNIT V LAPLACE TRANSFORM **9+3**

Transforms of elementary functions - Basic properties - Shifting theorems - Initial and final value theorems - Transform of periodic functions - Inverse transforms + Convolution theorem - Solution of linear second order ordinary differential equations with constant coefficients.

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.
- Interpret the suitable techniques for solving second and higher-order differential equations.
- Utilize conformal mapping and analytic functions to transform complex functions between different domains.
- Recognize the significance of singularities and residues in evaluating complex integrals.
- Evaluate the Laplace transform as an inverse transform for simple functions and analyze its properties.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2018.

REFERENCES:

1. Bali.N.P, and Manish Goyal " A Text Book of Engineering Mathematics", laxmi Publications(P) Ltd., 9th Edition, 2014.
2. Ramana B V "Higher Engineering Mathematics", New Delhi Tata McGraw- Hill Education India Private Limited., 2021.
3. Srimanta Pal and Subodh C Bhunia "Engineering Mathematics", Oxford. 2015.
4. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

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	2	2	1	1	1	-	-	-	-	1
CO5	3	3	2	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 1 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 HumanValues)" 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", OxfordUniversity 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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24CY201	ENVIRONMENTAL SCIENCES (Common to All Branches)	L T P C 3 0 0 3

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 Preshyterian, "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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24GE102	ENGINEERING GRAPHICS (Common to All Branches)	L T P C 3 0 2 4

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.

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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

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(BoS / MECH)

24AD201	PYTHON PROGRAMMING (Common to ADS, CSE, IT and BME)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Acquire knowledge about the fundamentals of Python language
- Learn to solve problems using Python conditionals , loops and use functions to solve problems
- Apply Python data structures - lists, tuples and dictionaries to represent complex data
- Enhance the knowledge in GUI Programming
- Build application that handles files and exceptions

UNIT I INTRODUCTION TO PYTHON 9

Programming Languages - Python History - Getting Started with Python - Writing a Simple program - Reading input from console - Identifiers - Variables - Simultaneous Assignments - Constants - Data Types and Operators - Operator Precedence - Evaluating expressions - Augmented Assignment operators - Type conversion - Common Python Functions - Strings and Characters - Formatting Numbers and Strings.

UNIT II CONTROL STATEMENTS AND FUNCTIONS 9

Selections: if - Two way if-else - Nested if and multi-way if-elif-else Statements - Loops: while - for - Nested Loops - break and continue - Function: Definition - Calling and Returning values - Positional and keyword arguments - Passing arguments by reference values - Scope of variables - Default Arguments - Recursion.

UNIT III DATA STRUCTURES IN PYTHON 9

List Basics - List Methods - Passing List to Functions - Returning a List from function - Tuples - Sets - Comparing Sets and Lists - Dictionaries.

UNIT IV GUI PROGRAMMING USING PYTHON 9

Introduction - Getting started with TKinter - Processing Events - The widget Classes - Canvas - The Geometry Managers. Combo Boxes - Menus - Pop-up menus - Mouse, key, Events and Bindings. Case Study: Bouncing Balls - Scrollbars - Standard Dialog Boxes.

UNIT V FILES AND EXCEPTION HANDLING 9

Introduction - Text Input and Output - File Dialogs - Retrieving Data from the Web - Exception Handling - Raising Exceptions - Processing Exception using Exception Objects.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the basics of python programming languages
- Apply basic Python programs that solve issues by utilizing loops and conditionals
- Demonstrate compound data using Python lists, tuples and dictionaries etc
- Implement solutions using GUI Programming in Python
- Develop programs by using files and exception handling for the given scenario

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TEXT BOOKS:

1. Y.Daniel Liang, "Introduction to Python Programming and Data Structures", 3rd Edition Pearson Education, 2023.

REFERENCES:

1. Timothy A. Budd, "Exploring Python", McGraw Hill Education (India) Private Ltd, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016. (http://greenteapress.com/wp/think-python/)
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
4. Mark Lutz, "Learning python", O'Reilly Publication, 5th Edition, 2013.
5. Guido Van Rossum and Fred L. Drake Jr, "An Introduction to Python", Revised and Updated for Python 3.2, Network Theory Ltd., 2011.

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	3	3	3	3	-	-	-	-	2	-
CO3	3	2	3	-	-	-	-	2	-	-	2
CO4	3	2	3	-	2	-	-	2	-	-	3
CO5	3	2	3	-	-	-	-	2	-	-	2

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BoS (AD)

24TA201	TAMILS AND TECHNOLOGY (Common to All Branches)	L T P C 1 0 0 1

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 -Sheil beads/ bone beats - 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. பொருநை -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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24TA201	தமிழரும் தொழில்நுட்பமும் (அனைத்து துறைகளுக்கும் பொதுவானது)	L T P C 1 0 0 1

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 காலதது 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.

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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. பொருநை -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.

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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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24AD202L	PYTHON PROGRAMMING LABORATORY (Common to ADS, CSE, IT and BME)	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

The Student should be made to:

- Use control statements and operators in Python programs
- Create python programs using functions and strings
- Represent compound data using Python lists, dictionary and set
- Build python GUI Application with Tkinter
- Design python applications to handles files and exceptions

LIST OF EXPERIMENTS:

1. Python Program to constructs conditional statements.
2. Python Program to implement operators and built in functions.
3. Python Program to performing string operations.
4. Python Program to find the factorial of a number by using functions.
5. Python Program to manipulating the elements on list.
6. Python Program to develop a fundamental data structures in programming using dictionary and set.
7. Python program to Controlling Layout with Geometry Managers.
8. Python Program to display the calendar of the year with GUI using Tkinter.
9. Python Program to perform count the number of words in a file.
10. Python Program to implement exception handling.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Solve the problems using control statements and operators in python
- Construct python program using strings and functions
- Design Python lists, dictionary and set to represent compound data
- Apply Tkinter to develop GUI Application
- Develop python programs using file and exception handling

List of Equipment for a Batch of 30 Students:

Standalone desktops with Python 3 interpreter for Windows/Linux 30 Nos.

Mapping of COs with POs

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

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BoS (AD) 26/11

24GE104L	ENGINEERING PRACTICES LABORATORY (Common to All Branches)	L T P C 0 0 4 2

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
	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
	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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24GE104L **ENGINEERING PRACTICES LABORATORY (GROUP – B)**

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

24EEC201L PROFESSIONAL COMMUNICATION LABORATORY L T P C
(Common to All Branches) 0 0 2 1

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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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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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

24MA301 DISCRETE MATHEMATICS AND LINEAR PROGRAMMING L T P C
(Common to ADS, CSE and IT) 3 1 0 4

OBJECTIVES:

The Student should be made to:

- Understand logic, its varied applications in computer program development, and its principles
- Remember the methods of proof in predicate calculus to verify the validity of arguments
- Apply the ideas of combinatorics and be able to do related calculations
- Analyze the characteristics of different types of lattices
- Evaluate the simplex algorithm to solve linear programs

UNIT I PROPOSITIONAL CALCULUS 9+3

Propositional Logic - Propositional equivalences - Predicates and Quantifiers - Nested Quantifiers - Rules of inference - Introduction to proofs - Proof methods and strategy.

UNIT II PREDICATE CALCULUS 9+3

Predicates-Statement Function - Variables-free and bound variables - Quantifiers-Universe of discourse-Logical equivalences and implications for quantified statements- Theory of inference-The rules of universal specification and generalization-Validity of arguments

UNIT III COMBINATORICS 9+3

Basics of Counting - Counting arguments - Pigeonhole Principle - Permutations and Combinations Recursion and recurrence relations-Generating Functions- Mathematical Induction-Inclusion – Exclusion.

UNIT IV LATTICES AND BOOLEAN ALGEBRA 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems –Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

UNIT V LINEAR PROGRAMMING 9+3

Linear programming modeling – Solution techniques – Graphical method, Simplex method, Big M method, Two Phase method.

TOTAL: (45+15) PERIODS

OUTCOMES:

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

- Have knowledge of developing mathematical arguments using logical connectives
- Apply the rules of inference and methods of proof in predicate calculus
- Aware of solving recurrence relations
- Analyze and optimize the Routing and Network Design using Lattices
- Develop mathematical models to solve problems in linear programming

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BoS (S&H) 14/10

TEXT BOOKS:

1. Rosen K. H., "Discrete Mathematics and its Applications", Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 7th Edition, 2014.
2. Taha H. A., "Operations Research: an Introduction", Noida Pearson India Education Services Private Limited, 10th Edition, 2022.

REFERENCES:

1. Koshy T., "Discrete Mathematics with Applications", Elsevier Publishing (India) Private Limited, 1st Edition, 2018.
2. Grimaldi R. P., "Discrete and Combinatorial Mathematics: an Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013.
3. Gupta P.K, and Hira D.S., "Operations Research", S.Chand and Company Ltd, 7th Revised Edition, 2014.
4. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

Mapping of COs with POs

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

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BoS (S&H) 14/10

24AD301	FOUNDATIONS OF DATA SCIENCE	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the basics of data science and its process.
- Describe types of data and methods for summarizing data with tables, graphs, and statistical measures.
- Apply statistical methods like correlation and regression to analyze data.
- Utilize Python libraries to perform data analysis and create various visualizations like histograms and scatter plots.
- Apply data science techniques to real-world problems.

UNIT I INTRODUCTION TO DATA SCIENCE 9

Need for data science - benefits and uses - facets of data - data science process - setting the research goal - retrieving data - cleaning, integrating, and transforming data - exploratory data analysis - build the models - presenting and building applications - Frequency distributions - Outliers - relative frequency distributions - cumulative frequency distributions - frequency distributions for nominal data - interpreting distributions.

UNIT II DESCRIBING DATA 9

Types of Data - Types of Variables -Describing Data with Tables and Graphs -Describing Data with Averages - Describing variability - range - variance - standard deviation - degrees of freedom - interquartile range - variability for qualitative and ranked data-Normal distribution and Standard (Z) Scores.

UNIT III STATISTICAL FOUNDATIONS OF DATA SCIENCE 9

Correlation - scatter plots - correlation coefficient for quantitative data - computational formula for correlation coefficient - regression - regression line - least squares regression line - standard error of estimate - interpretation of r2 - Multiple and Nonparametric Regression - multiple regression equations - regression toward the mean.

UNIT IV DATA ANALYTICS AND VISUALIZATION WITH PYTHON 9

Essential Data Libraries for data analytics: Pandas, NumPy, SciPy. Plotting and visualization with python: Introduction to Matplotlib, Basic Plotting with Matplotlib, Create Histogram, Bar Chart, Pie chart, Box Plot, violin plot using Matplotlib.Introduction to seaborn Library, Multiple Plots, Regression plot, regplot.

UNIT V APPLICATIONS AND CASE STUDIES 9

Crawling the Web: Sentiment Analysis with Twitter Data - Unsupervised Learning: Customer Segmentation in Retail Industry-Breast cancer prediction - Dynamic Plots: Visualizing Piketty's Capital - Fraud Detection via Graph Analysis: Enron Email Dataset - Character Recognition from Images - Analyzing Marketing Campaigns with pandas.

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TOTAL: 45 PERIODS

OUTCOMES:

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

- Use the data science process to analyze data.
- Use statistical measures like mean, variance, and standard deviation to describe and analyze data.
- Assess the effectiveness of regression models and interpret their results.
- Develop visualizations that clearly present data insights.
- Complete projects that apply data science methods to solve practical problems and present findings effectively.

TEXT BOOKS

1. Wes McKinney," Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter", O'Reilly Media, 3rd Edition, 2022.
2. David S Moore, George P. McCabe, and Bruce A. Craig,"Introduction to the Practice of Statistics", W H Freeman and Company, 10th Edition, 2021.
3. Jake Vanderplas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCES

1. Robert S Witte and John S Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
2. Davy Cielen, Arno D B Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
3. Allen B Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

CO - PO Mapping:

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	0	2	0	0	0	0	0	0	0	3	2
2	3	2	3	0	0	3	0	0	0	2	0	3	2
3	3	2	2	0	0	0	0	0	0	0	0	3	2
4	3	2	0	2	2	0	0	0	2	0	0	3	2
5	2	1	0	0	0	2	0	0	0	3	3	3	2
Average	2.8	2	2.5	2	2	2.5	0	0	2	2.5	3	3	2

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BoS (AD)

24CS301	DATA STRUCTURES	L	T	P	C
	(Common to AD, CSE & IT)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the concepts of abstract data types (ADTs) and implement them using Python.
- Design and implement linear data structures, including lists, stacks, and queues.
- Analyze and implement sorting, searching, and hashing algorithms.
- Formulate problems using tree structures and solve them using Python.
- Devise problems utilizing graph data structures and perform traversal using Python.

UNIT I ABSTRACT DATA TYPES **9**

Abstract Data Types (ADTs) – ADTs and classes – Introduction to OOP – Classes in Python – Inheritance – namespaces – shallow and deep copying. Introduction to analysis of algorithms – Asymptotic notations – Recursion – Analyzing recursive algorithms.

UNIT II LINEAR STRUCTURES **9**

List ADT – Array-based implementations – Linked list implementations – Singly linked lists – Circularly linked lists – Doubly linked lists – Applications of lists – Stack ADT – Queue ADT – Double ended queues.

UNIT III SORTING AND SEARCHING **9**

Bubble sort – selection sort – insertion sort – merge sort – quick sort – linear search – binary search – hashing – hash functions – collision handling – load factors and efficiency – rehashing

UNIT IV TREE STRUCTURES **9**

Tree ADT – Binary Tree ADT – Tree traversals – Binary search trees – AVL trees – Heaps – Multi-way search trees.

UNIT V GRAPH STRUCTURES **9**

Graph ADT – Representations of graph – Graph traversals – DAG – Topological ordering – Shortest paths – Minimum spanning trees – Disjoint sets.

TOTAL: 45 PERIODS

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BoS (CSE) 07/10

OUTCOMES:

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

- Construct abstract data types (ADTs) using Python classes.
- Develop, implement, and evaluate linear data structures, including lists, queues, and stacks, tailored to various application needs.
- Create, implement, and assess sorting, searching, and indexing techniques.
- Design, implement, and evaluate efficient tree structures for purposes such as searching, indexing, and sorting.
- Represent problems as graph problems and implement effective graph algorithms to address them.

TEXT BOOKs:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", John Wiley & Sons Inc., 2013.

REFERENCES:

1. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition, 2015.
2. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.
3. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
5. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014.

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	3	-	-	-	-	-	-	-	-	3	2
2	3	3	3	2	-	-	-	-	-	3	-	3	2
3	3	3	3	2	-	-	-	-	-	3	2	3	2
4	3	3	3	2	-	-	-	-	-	3	2	3	2
5	3	3	3	2	-	-	-	-	-	-	3	3	2
Average	3	3	3	2	-	-	-	-	-	3	2.33	3	2

CHAIRMAN
BoS (CSE)

24CS302	OBJECT ORIENTED PROGRAMMING USING JAVA	L	T	P	C
		3	0	2	4

(Common to AD, CSE, EEE & IT)

OBJECTIVES:

The Student should be made to:

- Understand the basic concepts of oops and java
- Illustrate the concepts of overloading and inheritance.
- Know the principles of packages, interfaces and exceptions.
- Teach the concepts of networking and i/o systems
- Develop an interactive applications using event driven programming

UNIT I OOPS AND JAVA FUNDAMENTALS 9

Programming Language types and paradigms - Object Oriented Programming Concepts- History of Java - Java buzzwords- Data Types –variables – Operators - Control Statements in Java- Type Conversion and Casting-Array. Introducing Classes: Class Fundamentals – Declaring Objects – Methods –Constructors – Garbage Collection – this keyword.

UNIT II METHOD OVERLOADING AND INHERITANCE 9

Method overloading -Object as parameters – Returning Objects – Recusrion – Access Control – Static– Final- Constructor Overloading.

Inheritance Basis – Using super- Types: Single – Multilevel - Hierarchical - The Cosmic Superclass – Method Overriding - Abstract Class - Final with Inheritance.

UNIT III PACKAGES, INTERFACES AND EXCEPTION HANDLING 9

Packages – Importing packages- Interfaces – Static, Default and Private Methods. Exception-Handling Fundamentals-Exception Types – Uncaught Exceptions – Using Try and Catch– Built-in Exceptions - User defined exceptions. String: String Methods and Operations

UNIT IV MULTITHREAD PROGRAMMING AND INPUT / OUTPUT STREAMS 9

Multithreaded Programming – Thread Model – Thread Creation – Life Cycle – Thread Priorities - Synchronization of Threads – Inter thread Communication – Suspending, Resuming and Stopping Threads.

I/O Basics – Streams – Byte streams and Character streams – Reading and Writing Console – The PrintWriter Class- Reading and Writing Files –Scanner Class.

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UNIT V EVENT DIRVEN PROGRAMMING AND NETWORK PROGRAMMING **9**

Event Driven Programming: Event Listeners- Delegation event model: Handling mouse and keyboard events, Adapter classes. Swing: Introduction- MVC Architecture - Components and containers - Exploring Swing Components: JLabel and Image icon, JTextField- The swing Buttons: JScrollPane, JList, JComboBox - Handling menus.

Networking Basics – classes and interfaces. InetAddress: TCP/IP Client – Cookies - TCP/IP Server Sockets and Datagrams.

THEORY: 45 PERIODS

LIST OF EXPERIMENTS:

1. Implement a simple Java class with attributes and methods to illustrate the concept of classes and objects.
2. Create a Java program to demonstrate the use of control structures (if-else, switch, loops).
3. Write a Java program to demonstrate method overloading by creating multiple methods with the same name but different parameter lists.
4. Create a Java program to demonstrate multilevel and hierarchical inheritance.
5. Create an interface with some method declarations and write classes that implement these interfaces to demonstrate the use of abstraction in Java.
6. Write a Java program to demonstrate exception handling using try-catch blocks, finally clauses.
7. Implement a Java program to demonstrate inter-thread communication using methods like wait(), notify(), and notifyAll().
8. Write a Java program to read from and write to files using byte and character streams. Include examples of file handling operations such as reading, writing, and appending.
9. Develop a GUI-based Java application using AWT or Swing for Decimal Calculator using event-driven programming.
10. Create a Java application to simulate a multi-client chat server using multithreading and network programming concepts

PRACTICALS: 30 PERIODS

TOTAL: 75 PERIODS

OUTCOMES:

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

- Explain and apply the basic principles of Object-Oriented Programming in Java.
- Implement method overloading and inheritance in Java to create reusable code.
- Organize code-using packages, utilize interfaces for abstraction, and handle exceptions effectively.
- Develop networked applications and perform file I/O operations in Java.
- Create interactive applications using event-driven programming techniques in Java.

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BoS (CSE)

1/2/25

AD

TEXT BOOKs:

1. Herbert Schildt, "Java - The complete reference", 13th Edition, Tata Mc Graw Hill, 2024.

REFERENCES:

1. Cay S. Horstmann, "Core Java SE 9 for the Impatient", 2nd Edition, Addison-Wesley,2017.
2. Paul Deitel, Harvey M. Deitel, "Java How to Program", 11th Edition, Pearson Education, 2018.
3. Balagurusamy E, "Programming in Java" McGraw Hill Education. 6th Edition. 2019.
4. Steven Holzner, "Java 2 Black Book", Dreamtech Press. 2011.

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	2	3	2	2	-	-	2	-	-	3	3	2
2	3	3	3	2	2	-	-	2	-	-	2	3	2
3	3	2	2	2	2	-	-	2	-	-	2	3	2
4	3	2	3	2	2	-	-	2	-	-	2	3	2
5	3	2	3	2	3	2	2	3	2	2	2	3	2
Average	3	2.2	2.6	2	2.2	2	2	2.2	2	2	2.2	3	2

CHAIRMAN
BoS (CSE)

24CS303	PRINCIPLES OF OPERATING SYSTEMS	L	T	P	C
	(Common to AD, CSE & IT)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concepts and roles of operating systems.
- Explore processes, threads, and scheduling techniques.
- Comprehend the principles of concurrency and the mechanisms behind deadlocks.
- Examine various memory management methods.
- Analyze the basics of I/O systems and different file system structures.

UNIT I INTRODUCTION TO OPERATING SYSTEMS **9**

Introduction: Defining Operating Systems - Operating System objectives and functions - The evolution of Operating Systems - Operating System operations, Operating System structures: Operating System Services -System calls -System programs - Operating System structure - Developments leading to modern Operating Systems - Virtual machines- OS design considerations for multiprocessor and multicore - Operating System generation - System boot.

UNIT II PROCESSES AND THREADS **9**

Processes: Process concept - Process scheduling - Operations on processes–Inter-process communication, Threads: Multi core programming - Multithreading models - Threading issues, CPU Scheduling: Basic concepts - Scheduling criteria - Scheduling algorithms - Thread scheduling.

UNIT III CONCURRENCY **9**

Process Synchronization: Background - The Critical Section problem - Peterson's solution – Synchronization hardware-Mutex Locks-Semaphores-Classic problems of synchronization, Deadlocks: System model - Deadlock characterization - Methods for handling deadlocks: Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT IV MEMORY MANAGEMENT **9**

Main Memory: Background – Swapping - Contiguous Memory Allocation – Segmentation – Paging - Structure of the Page Table – Virtual Memory: Background - Demand Paging - Copy-on-Write – Page Replacement - Allocation of Frames – Thrashing.

CHAIRMAN
BoS (CSE) 15/10

UNIT V STORAGE MANAGEMENT **9**

Mass-Storage Structure: Disk Structure-Disk Scheduling - Disk Management - RAID - Swap - Space Management - I/O Systems Basics - File System Interface: File concept-Access methods - Directory and Disk Structure – File - System Implementation: File-System Structure - File System implementation - Directory implementation - Allocation methods – Free Space management - Case studies: FAT, NTFS File Systems.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Articulate the essential concepts and functions of operating systems.
- Evaluate processes, threads, and apply various scheduling strategies.
- Demonstrate an understanding of concurrency principles and identify potential deadlocks.
- Implement and compare different memory management techniques.
- Evaluate I/O systems and distinguish between various file system designs.

TEXT BOOKs:

1. Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, "Operating System Concepts", Tenth Edition, John Wiley and Sons Inc., 2018.

REFERENCES:

1. William Stallings, "Operating Systems–Internals and Design Principles", Ninth Edition, Pearson, 2018.
2. Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems Design and Implementation", Third Edition, Prentice Hall, 2006.
3. BrianL.Stuart, "Principles of Operating Systems: Design & Applications", First Edition, Thomson Learning, 2009.
4. Gary Nutt, "Operating Systems", Fourth Edition, Pearson Education,2009.
5. Harvey M. Deitel, PaulJ. Deitel, and David R. Choffnes, "Operating Systems", Fourth Edition, Pearson Education, 2009.
6. Achyut S. Godbole, Atul Kahate, "Operating Systems", Third Edition, McGraw Hill Education, 2017.

CHAIRMAN
BoS (CSE)

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	2	2	-	-	-	-	-	-	-	1	3	2
2	3	2	2	-	-	-	-	-	-	-	1	3	2
3	3	2	2	-	-	-	-	-	-	-	1	3	2
4	3	2	1	-	-	-	-	-	-	-	1	3	2
5	3	2	1	-	-	-	-	-	-	-	1	3	2
Average	3	2	1.60	-	-	-	-	-	-	-	1	3	2

CHAIRMAN
BoS (CSE)

24EC304 DIGITAL LOGIC AND COMPUTER ORGANIZATION (COMMON TO CSE, IT AND AIDS)

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Know about the number systems, different binary arithmetic operations, and logic gates
- Design combinational and sequential circuits.
- Know about the fundamentals of computers.
- Gain knowledge about the design of control units in a processor
- Acquire knowledge about the memory and I/O management.

UNIT I DIGITAL FUNDAMENTALS **9**

Digital Systems – Binary Numbers – Octal – Hexadecimal Conversions – Signed Binary Numbers – Complements – Logic Gates – Boolean Algebra – K-Maps – Standard Forms – NAND – NOR Implementation.

UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS **9**

Combinational circuits – Adder – Subtractor – ALU Design – Decoder – Encoder – Multiplexers – Introduction to Sequential Circuits – Flip-Flops – Registers – Counters.

UNIT III COMPUTER FUNDAMENTALS **9**

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High-Level Language.

UNIT IV PROCESSOR **9**

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V MEMORY AND I/O **9**

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

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.

- Understand the concept of number systems, logic gates and different binary arithmetic operations.
- Design and analyse the operation of different combinational logic circuits.
- Design and analyse the operation of different sequential logic circuits
- Understand the design and implementation of a digital system.
- Understand the computer functional blocks,execution of instructions and memory hierarchy and different issues in parallelism

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", 5th Edition, Pearson Education, 2013.
2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", 5th Edition, Morgan Kaufmann/Elsevier, 2013.

REFERENCES :

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", 6th Edition, Tata McGraw-Hill, 2012
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 10th Edition, Pearson Education, 2016 .
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2017.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24CS304L	DATA STRUCTURES LABORATORY	L	T	P	C
	(Common to AD, CSE & IT)	0	0	2	1

OBJECTIVES:

The Student should be made to:

- Implement simple abstract data types (ADTs) and recursion.
- Construct linear and nonlinear data structures.
- Understand the various operations associated with search trees.
- Become familiar with sorting and searching algorithms.
- Execute tree and graph traversal algorithms.

LIST OF EXPERIMENTS:

1. Implement simple ADTs as Python classes.
2. Implement recursive algorithms in Python.
3. Implement List ADT using Python arrays.
4. Linked list implementations of List.
5. Implementation of Stack and Queue ADTs.
6. Applications of List, Stack and Queue ADTs.
7. Implementation of sorting and searching algorithms.
8. Implementation of Hash tables.
9. Tree representation and traversal algorithms.
10. Implementation of AVL Trees.
11. Graph representation and Traversal algorithms.
12. Implementation of minimum spanning tree algorithms.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Construct functions to realize fundamental abstract data types (ADTs) and execute operations using recursion.
- Propose appropriate methods for linear and nonlinear data structures to tackle given problem scenarios.
- Apply sorting and searching algorithms to solve specified problems.
- Implement tree traversal algorithms for data manipulation.
- Use graph traversal and shortest path algorithms to facilitate data retrieval processes.

CHAIRMAN
BoS (CSE) 07/10

List of Equipment for a Batch of 30 Students:

1. Standalone desktops with Python 3 Interpreter for Windows / Linux – 30 Nos

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	3	-	-	-	-	2	-	-	-	3	2
2	3	3	3	2	-	-	-	2	-	3	-	3	2
3	3	3	3	2	-	-	-	2	-	3	2	3	2
4	3	3	3	2	-	-	-	2	-	3	2	3	2
5	3	3	3	2	-	-	-	2	-	-	3	3	2
Average	3	3	3	2	-	-	-	2	-	3	2.33	3	2

CHAIRMAN
BoS (CSE)

24AD302L **FOUNDATIONS OF DATA SCIENCE LABORATORY** **L T P C**
0 0 2 1

OBJECTIVES:

The Student should be made to:

- Understand the Python Programming packages Python, NumPy, SciPy, Matplotlib, Pandas, Statmodels, Seaborn, Plotly, Bokeh Language.
- Prepare data for data analysis through understanding its distribution.
- Understand and implement classification and Regression Model.
- Acquire knowledge in plotting using visualization tools.
- Apply data science techniques in solving healthcare problems.

LIST OF EXPERIMENTS:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with NumPy arrays.
3. Frequency distributions.
4. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
   a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
5. Working with Pandas data frames.
6. Correlation and scatter plots.
7. Regression.
8. Basic plots using Matplotlib.
9. Visualizing Geographic Data with Basemap
10. Mini project: Students work in teams on a healthcare problem using data science to improve accuracy and evaluate model performance.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Use Python and its libraries (NumPy, SciPy, Matplotlib, Pandas, Seaborn, Plotly, and Bokeh) to work on data science projects.
- Utilize data by analyzing its distribution for better decision-making.
- Build a classification and regression models to solve problems.
- Create clear and effective data visualizations using different tools.
- Use data science methods to solve healthcare problems, improving accuracy and assessing model performance in team projects.

CHAIRMAN
BoS (AD) 27/03/25

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Software Tools:
  - Python, NumPy, SciPy, Matplotlib, Pandas, Statsmodels, Seaborn, Plotly, Bokeh
- Hardware Tools:

Stand alone desktops 30 Nos.

(or)

Server supporting 30 terminals or more.

CHAIRMAN
BoS (AD)

24EEC301L	SOFT SKILLS DEVELOPMENT (Common to All Branches)	L T P C 0 0 2 1

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.

CHAIRMAN
BoS (S&H) 14/10

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

24MA403	PROBABILITY AND STATISTICS (Common to ADS, BME and IT)	L T P C 3 1 0 4

OBJECTIVES:

The Student should be made to:

- Introducing the basic concepts of probability and random variables
- Understand discrete and continuous random variables and their probability distributions
- Apply the testing of hypothesis for small and large samples which plays an important role in real life problems
- Evaluating the basic concepts of classifications of design of experiments
- Creating the statistical tools and statistical quality control in engineering problems

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 TESTING OF HYPOTHESIS 9+3

Sampling distributions - Estimation of parameters - Statistical hypothesis - large sample test based on normal distribution for single mean and difference of means -small sample tests: t-test for mean - F- test Chi-square test for Goodness of fit and Independence of attributes.

UNIT IV DESIGN OF EXPERIMENTS 9+3

One way and two-way classifications - Completely Randomized Design - Randomized Block Design -Latin Square Design-22 factorial design.

UNIT V STATISTICAL QUALITY CONTROL 9+3

Control charts for measurements(X and R charts) - Control charts for attributes (p, c and np charts) - Tolerance limit-Acceptance sampling.

TOTAL: (45+15) PERIODS

CHAIRMAN
BoS (S&H) 14/10

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
- Applying the concept of testing of hypothesis for small and large samples in real life problems
- Analyzing the basic concepts of classifications of design of experiments
- Creating the notion of sampling distributions and in the field of statistical quality control used in engineering and management problems

TEXT BOOKS:

1. Johnson R.A., Miller, I and Freund J, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Richard A. Johnson., "Probability and Statistics for Engineers", Pearson Education, 8th Edition, 2019.

REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, 8th Edition, 2021.
2. S.C.Gupta, and V.K.Kapoor, "Fundamental of Mathematical Statistics ", S Chand Publications Reprint, 2013.
3. Spiegel Schiller "Probability and Statistics" Tata McGraw-Hill Publishing Company Limited, New Delhi. 3rd Edition, 2018.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 14/10

24AD401	ARTIFICIAL INTELLIGENCE (Common to AD, CSE, IT and ECE)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the various characteristics of intelligent agents
- Interpret the fundamentals of approaches to solving problems using AI methodologies
- Utilize Logic-Driven Knowledge Representation
- Explore methods for structuring knowledge using categories, objects, and ontologies
- Develop AI-Based Solutions for Industry Challenges

UNIT I INTRODUCTION 9

Introduction to AI - Foundation and History of AI - Future of Artificial Intelligence Characteristics of Intelligent Agents - Agents and Environments - Structure of Agents - Nature of Environments - Typical Intelligent Agents.

UNIT II PROBLEM SOLVING METHODS 9

Problem solving Methods - Search Strategies - Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems - Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games - Alpha-Beta Pruning.

UNIT III KNOWLEDGE REPRESENTATION 9

Predicate Logic - Propositional Logic - Agents Based on Professional Logic - First Order Logic - Unification - Forward Chaining - Backward Chaining - Resolution - Knowledge Representation - Ontological Engineering - Categories and Objects - Events - Mental Events and Mental Objects - Reasoning Systems for categories - Reasoning with Default Information.

UNIT IV PLANNING AND REASONING 9

Classical Planning - Heuristic Planning - Hierarchical Planning - Analysis of Planning approach Uncertainty - Basic Probability Notation - Bayes Rule - Naive Bayes Models - The semantics of Bayesian Networks - Exact Inference in Bayesian Networks - Causal Networks.

UNIT V AI REAL-WORLD APPLICATIONS 9

Fraud Detection in Banking and Finance - AI-Powered Voice Assistants - Object Detection in Autonomous Vehicles - AI in Self-Driving Cars - Automated Grading and Feedback Systems - AI in Music Composition and Creativity - Traffic Management and Smart Transportation - Case Study on AI - Assisted X-Ray Analysis.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 15/10/25

OUTCOMES:

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

- Interpret the features, functions, and categories of intelligent agents within AI systems
- Apply heuristic techniques to optimize search efficiency in complex problem-solving
- Examine the principles of predicate logic, propositional logic, and first-order logic for AI-based reasoning
- Determine the effectiveness of classical, heuristic, and hierarchical planning approaches in AI problem-solving
- Design AI-driven solutions for real-world applications

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.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	0	0	0	-	0	0	0	0	2	2
CO2	3	3	2	3	2	0	-	0	0	0	2	3	2
CO3	3	3	2	2	0	2	-	0	0	2	2	3	2
CO4	3	3	2	2	0	1	-	0	1	1	2	2	2
CO5	3	3	2	2	1	3	-	2	2	3	1	3	2

CHAIRMAN
BoS (AD)

24AD402 **BIG DATA ANALYTICS** L T P C

3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand big data and provide an overview of Apache Hadoop Ecosystem.
- Learn HDFS Concepts and Interfacing with HDFS.
- Understand MapReduce concepts.
- Understand Pig and Hive frameworks in big data.
- Learn data streams in big data environment.

UNIT I INTRODUCTION TO BIGDATA 9

Introduction to Big Data and Hadoop: Types of Digital Data - Introduction to Big Data - Big Data Analytics - History of Hadoop - Analyzing Data with Hadoop - Hadoop Streaming - Hadoop Eco System - Applications of Big Data: marketing - fraud detection - risk assessment - credit risk management - healthcare - medicine - advertising.

UNIT II HADOOP DISTRIBUTED FILE SYSTEM 9

HDFS (Hadoop Distributed File System): Design of HDFS - HDFS Concepts - Command Line Interface - Hadoop file system interfaces - Data flow - Data Ingest with Flume and Sqoop - Hadoop I/O: Compression - Serialization - Avro and File-Based Data structures.

UNIT III MAPREDUCE PROGRAMMING 9

MapReduce: Anatomy of a MapReduce - Job Run - Failures - Job Scheduling - Shuffle and Sort - Task Execution - MapReduce Types and Formats - MapReduce Features - Composing MapReduce calculations.

UNIT IV PIG AND HIVE 9

Hadoop Ecosystem: Introduction to PIG - Execution Modes of Pig - Comparison of Pig with Databases - Grunt - Pig Latin - User Defined Functions - Data Processing operators - Hbase - data model and implementations - Hbase clients - Hbase examples - Hive - data types and file formats - HiveQL data definition - HiveQL data manipulation - HiveQL queries.

UNIT V DATA STREAMS 9

Mining Data Streams: Stream Data Model - Sampling Data in the Stream - Filtering Streams - Counting Distance Elements in a Stream - Estimating Moments - Counting Ones in Window - Decaying Windows. Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 27/03/25

OUTCOMES:

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

- List the components of Hadoop and Hadoop Eco-System.
- Access and Process Data on Distributed File System.
- Manage Job Execution in Hadoop Environment.
- Exploring Pig and Hive frameworks to deal with big data.
- Describe the data streams and graph analytical tools R.

TEXT BOOKS:

1. Seema Acharya, Subhasini Chellappan, "Big Data and Analytics" Wiley Publication, 2015.
2. Tom White "Hadoop: The Definitive Guide", Fourth Edition, O'reily Media, 2015.

REFERENCES:

1. Raj Kamal, Preeti Saxena, "Big Data Analytics: Introduction to Hadoop, Spark, and Machine Learning", McGraw Hill, 2018.
2. Jay Liebowitz, "Big Data and Business Analytics" CRC press, 2013.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
4. Jure Leskovec, Anand Rajaraman, Jeffrey Ullman. "Mining of Massive Datasets." Cambridge University Press, 2014.

CO - PO Mapping:

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

CHAIRMAN
BoS (AD)

24CS401	COMPUTER NETWORKS (Common to AD, CSE & IT)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Comprehend protocol layering and communication at the physical level.
- Understand the mechanisms and protocols of the data link layer.
- Gain knowledge of network protocol addresses and routing protocols.
- Analyze the functionalities of TCP and UDP.
- Grasp the concepts of the application layer protocols.

UNIT I NETWORK MODELS AND PHYSICAL LAYER **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 DATA LINK LAYER **9**

Introduction – Link Layer Addressing – Error Detection and Correction: Introduction – Block Coding – CRC – Checksum– Framing – HDLC - Point-to-point protocol. Media Access Control: Random Access – Channelization - Wired LAN: Standard Ethernet – Connecting Devices – Virtual LANs.

UNIT III NETWORK LAYER **9**

Network Layer Services- Network layer performance - IPV4 addresses – Internet Protocol (IP) - ICMPv4. Unicast Routing Algorithms: Distance Vector and Link-state routing – Static Routing - Dynamic Routing Protocols: RIP and OSPF - IPV6 addressing- IPV6 protocol- Software-defined networks

UNIT IV TRANSPORT LAYER **9**

Introduction – Transport layer protocols: Simple – Stop-and-wait - Go-back-N – Selective Repeat - Piggybacking – UDP – TCP- SCTP- Quality of Service: Data Flow Characteristics – Flow control to improve QoS.

UNIT V APPLICATION LAYER **9**

World Wide Web and Hyper Text Transfer Protocol -File transfer protocol – NFS-Electronic Mail - Telnet – Secure shell – Domain name system – 5G Network Utilization – CoAP-MQTT

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CSE) 07/04/25

OUTCOMES:

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

- Explore the fundamentals of network models and the physical layer.
- Identify error detection and correction methods, along with protocols at the data link layer.
- Outline various addressing schemes and implement routing protocols at the network layer.
- Illustrate different transport layer protocols and apply appropriate flow control and QoS techniques.
- Design and implement various protocols at the application layer based on their working principles.

TEXT BOOK:

1. Behrouz A. Forouzan "Data Communications and Networking with TCP / IP Protocol Suite", 6th Edition, 3rd August 2022.
2. Behrouz A. Forouzan, "Data Communications and Networking", McGraw-Hill, 5th Edition, 2013

REFERENCES:

1. Kurose James F. and Ross Keith W., "Computer Networking: A Top-Down Approach", 6th Edition, Pearson Education, New Delhi, 2017.
2. Stallings, "Data and Computer Communications", PHI, 10th Edition, New Delhi, 2015
3. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
4. William Stallings. Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
5. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

CO – PO Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	3	2	-	-	2	-	2	2	-	2	3	2
CO2	3	3	-	-	2	2	2	-	2	-	2	3	2
CO3	3	3	-	2	2	-	2	-	2	-	2	3	2
CO4	3	3	2	2	2	-	-	-	2	2	2	3	2
CO5	3	3	-	-	-	-	-	2	2	-	2	3	2
Average	3.00	3.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	3.00	2.00

CHAIRMAN
BoS (CSE)

24IT401	DATABASE DESIGN AND MANAGEMENT (Common to AD, CSE and IT)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn the fundamentals of data models, ER diagrams and SQL
- Study relational database design using conceptual mapping and normalization
- Understand the fundamental concepts of transaction processing, concurrency control techniques and recovery procedures
- Learn the file organization and Query optimization implementation techniques
- Gain knowledge on data model and querying in object-relational and No-SQL databases

UNIT I DATABASE SYSTEMS CONCEPTS AND BASICS OF SQL 9

Purpose of Database System – Views of data – Data Models – Database System Architecture Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping– Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features.

UNIT II RELATIONAL DATABASE DESIGN 9

Embedded SQL– Dynamic SQL - Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION PROCESSING AND RECOVERY 9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV PHYSICAL DATABASE DESIGN AND QUERY PROCESSING 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing. Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V NOSQL SYSTEMS 9

Distributed Databases: Architecture, Data Storage, Data Fragmentation - Replication and Allocation Techniques for Distributed Database Design. Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (IT) 29/03/25

OUTCOMES:

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

- Illustrate the fundamentals of Database Design and Management and conceptual modelling
- Apply the conceptual-to-relational mapping and normalization techniques for database design
- Describe the concurrency control and recovery mechanisms in Database Design and Management
- Able to organize, index files and optimize the given queries
- Implement the data model and querying in No-SQL databases

TEXT BOOKs:

1. Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson, Seventh Edition, Global Edition, 2016
2. A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", fifth Edition McGraw Hill, 2012.
3. Vlad Vlasceanu, Wendy A. Neu, Andy Oram, Sam Alapati, "An Introduction to Cloud Databases", O'Reilly Media, Inc., 2019.

REFERENCEs:

1. C.J.Date, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2004.
2. 2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.

Mapping COs with POs:

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

CHAIRMAN
BoS (IT)

24MC003	CONSTITUTION OF INDIA (Common to All Branches)	L T P C 2 0 0 0

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) 20/6/25

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)

24AD403L	BIG DATA ANALYTICS LABORATORY	L T P C
		0 0 2 1

OBJECTIVES:

The Student should be made to:

- Install various tools for big data analysis.
- Write a MapReduce programs for processing big data.
- Write a MapReduce programs for processing real-world dataset.
- Install programming framework PIG and HIVE for handling big data.
- Create a graph analytics tools using R.

LIST OF EXPERIMENTS:

1. Install and configure Hadoop distributed file system (HDFS).
2. Implement wordcount frequency programs using MapReduce.
3. Implement MapReduce programs to process real-world dataset.
4. Install and run Pig Latin scripts to sort, group, join, project, and filter your data.
5. Cluster the customer based on buying behavior using HIVE/HADOOP.
6. Install and run Hive to create, alter and drop databases, tables, views, functions and indexes.
7. Implement a MapReduce Programs to count distance elements in a stream.
8. Install MongoDB and create, update and drop database and document.
9. Visualize the given dataset using graph analytics tools R.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Deploy various tools for big data analytics.
- Solve problems using MapReduce Technique.
- Develop simple solutions using PIG/HIVE.
- Process unstructured data in MongoDB.
- Visualize the dataset using R.

CHAIRMAN
BoS (AD) 27/03/25

List of Equipment for a batch of 30 students:

SOFTWARE: Hadoop, RStudio, Apache HBase, MongoDB, Apache Hive.

HARDWARE: Standalone desktops-30 Nos.

CO - PO Mapping:

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

CHAIRMAN
BoS (AD)

24AD404L	ARTIFICIAL INTELLIGENCE LABORATORY (Common to AD, CSE and IT)	L T P C 0 0 2 1

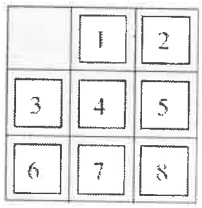
OBJECTIVES:

The Student should be made to:

- Demonstrate agent-based problem-solving for a two-location vacuum world.
- Apply game-tree search strategies to optimize AI problem-solving.
- Implement inference mechanisms for AI-based decision-making.
- Solve Constraint Satisfaction Problems by applying AI techniques like backtracking and heuristics.
- Develop AI agents that generate sequences of actions to achieve specific goals in structured environments

LIST OF EXPERIMENTS:

1. Develop a simple reflex agent program in Python for the vacuum-cleaner world problem. This particular world has just two locations: squares A and B. The vacuum agent perceives which square it is in and whether there is dirt in the square. It can choose to move left, move right, suck up the dirt, or do nothing.
2. Implement Alpha-Beta Pruning algorithm for optimizing game-tree search in AI.
3. Solve the 8-puzzle problem, which consists of a 3×3 board with eight numbered tiles and a blank space. A tile adjacent to the blank space can slide into the space. The objective is to reach a specified goal state as given below. Find minimum number of steps required to reach the goal.



Goal State

4. Write a Python program to solve N Queen Problem using backtracking. The N Queen is the problem of placing N chess queens on an N×N chessboard so that no two queens attack each other.
5. Write a Python program for a path search problem to find a path from point A to point B using A* Search Algorithm.
6. Using Hill Climbing Search Algorithm, find the solution for a Travelling Salesman Problem, which has to find the shortest route from a starting location and back to the starting location after visiting all the other cities.
7. Implement Propositional Logic inference techniques in an AI-based expert system to diagnose diseases based on given symptoms.
8. Implement Resolution based first order logic Inferences for AI Tasks.

CHAIRMAN
BoS (AD) 27/03/25

9. Solve the crypt arithmetic puzzle SEND+MORE=MONEY using a Python program. Find digits that replace letters to make a mathematical statement true. Each letter in the problem represents one digit (0–9). No two letters can represent the same digit. When a letter repeats, it means a digit repeats in the solution.
10. Design Classical Planning Algorithms for an AI-based robotic navigation system to autonomously generate and execute a sequence of actions, ensuring the robot reaches a target location while avoiding obstacles in a predefined environment.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Evaluate the performance of the vacuum agent in different scenarios.
- Implement Minimax and Alpha-Beta Pruning to enhance decision-making efficiency.
- Apply logical inference methods like Propositional Logic and First-Order Logic for knowledge representation.
- Design the solutions for problems like N-Queens and 8-puzzle problem.
- Develop classical planning algorithms such as STRIPS and state-space search.

List of Equipment for a batch of 30 students:

SOFTWARE: PYTHON / JAVA

HARDWARE: Standalone desktops-30 Nos.

CO - PO Mapping:

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

CHAIRMAN
BoS (AD)

24IT402L	DATABASE DESIGN AND MANAGEMENT LABORATORY (Common to AD, CSE and IT)	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand data definition and data manipulation commands using SQL
- To learn nested and join queries to manipulate a database
- To study database design using conceptual modelling and normalization
- To implement cursor and function manipulation and trigger in PL/SQL
- To develop an entries application with user interface and database

LIST OF EXPERIMENTS:

1. a) Manipulate a database by creating, inserting, deleting, updating and retrieving tables.

   b) Using DDL commands create a table and alter and drop table.

2. Apply the following DML commands for

   i. Data insertion using different ways.

   ii. Integrity constraints

   iii. Usage of truncate command.

3. Manipulate tables in a database using simple queries, nested queries, sub queries and joins.
4. Manipulate tables in a database using aggregation functions, grouping and ordering commands.
5. Using implicit and explicit cursor manipulate a table in PL/SQL.
6. Create and drop a trigger in PL/SQL.
7. Using procedure and function manipulate a database using PL/SQL.
8. Write query to handle an exception that has occurred.
9. Design a database using ER modelling and normalization.
10. Develop an enterprise application using user interface and database.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Understand the database development life cycle
- Create a SQL queries for manipulating nested and join queries in a table
- Design relational database using conceptual-to-relational mapping and normalization
- Implement various PL/SQL objects
- Develop a database application for real life scenario

CHAIRMAN
BoS (IT) 29/03/25

List of Equipment for a Batch of 30 Students:

1. Standalone desktops with PL/SQL or ORACLE for Windows / Linux - 30 Nos.

Mapping of COs with POs:

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

CHAIRMAN
BoS (IT)

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 14/10
BoS (S&H)

TEXT BOOKS:

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

REFERENCES:

1. Thomas A Harris, "IAm 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

24AD501	BUSINESS ANALYTICS	L T P C
	(COMMON TO AD AND CSE)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the analytics life cycle
- Comprehend the process of acquiring business intelligence
- Understand various types of analytics for business forecasting
- Model the supply chain management for analytics
- Apply analytics for different functions of a business

UNIT I INTRODUCTION TO BUSINESS ANALYTICS 9

Analytics and Data Science - Analytics Life Cycle - Types of Analytics - Business Problem Definition - Data Collection - Data Preparation - Hypothesis Generation - Modeling - Validation and Evaluation - Interpretation - Deployment and Iteration - Business Analysis - Business Analyst - The evolving role of the Business Analyst.

UNIT II BUSINESS INTELLIGENCE 9

Data Warehouses and Data Mart - Knowledge Management - Types of Decisions - Decision Making Process - Decision Support Systems - Business Intelligence - Introduction to OLTP and OLAP - Data models for OLTP and OLAP - Analytic functions.

UNIT III BUSINESS FORECASTING 9

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models - Data Mining and Predictive Analysis Modeling - Machine Learning for Predictive analytics.

UNIT IV HR & SUPPLY CHAIN ANALYTICS 9

Human Resources - Planning and Recruitment - Training and Development - Supply chain network - Planning Demand, Inventory and Supply - Logistics - Analytics applications in HR & Supply Chain - Applying HR Analytics to make a prediction of the demand for hourly employees for a year.

UNIT V MARKETING & SALES ANALYTICS 9

Marketing Strategy, Marketing Mix, Customer Behavior - Selling Process - Sales Planning - Analytics applications in Marketing and Sales - Predictive Analytics for Customers' behaviour in marketing and sales. Making decisions with uncertain information – Decision Trees – Value of Information – Utility and Decision Making

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 25/09/2025

OUTCOMES:

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

- Explain the real-world business problems and model with analytical solutions
- Identify the business processes for extracting Business Intelligence
- Apply predictive analytics for business fore-casting
- Apply analytics for supply chain and logistics management
- Use analytics for marketing and sales

TEXTBOOK:

1. James R. Evans, "Business Analytics: Methods, Models, and Decisions", 3rd Edition, Pearson, 2020.

REFERENCES:

1. Prasad R N, Seema Acharya, "Fundamentals of Business Analytics", 2nd Edition, Wiley Publications, 2016.
2. Philip Kotler and Kevin Keller, "Marketing Management", 15th Edition, PHI, 2016.
3. VSP RAO, "Human Resource Management", 3rd Edition, Excel Books, 2010.
4. Mahadevan B, "Operations Management - Theory and Practice", 3rd Edition, Pearson Education, 2018.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	1	1	-	-	-	1	2	1	2	2
CO2	3	3	3	2	3	-	-	-	1	2	2	3	1
CO3	2	2	3	3	2	-	-	-	3	1	1	3	1
CO4	2	1	1	2	2	-	-	-	3	3	2	1	3
CO5	2	3	2	3	2	-	-	-	3	3	2	3	1
Average	2.20	2.20	2.40	2.20	2.00	-	-	-	2.20	2.20	1.60	2.40	1.60

CHAIRMAN
BoS (AD)

24AD502	TEXT ANALYTICS	L T P C 3 0 0 3

OBJECTIVES:

The student should be able to:

- Understand advanced methods for keyword extraction, semantic enrichment, and evaluation in multilingual contexts
- Apply clustering and classification algorithms for text mining, including modern deep learning methods
- Explore text visualization, anomaly detection, and sentiment analytics for actionable insights
- Detect and analyse trends and events in large-scale text streams using streaming analytics tools
- Implement text analytics solutions in real-world applications across various domains

UNIT I TEXT EXTRACTION **9**

Introduction; Rapid automatic keyword extraction; Named Entity Recognition; Relation extraction; Transformer-based keyword extraction; Benchmark evaluation - precision, recall, efficiency, stop list generation.

UNIT II DOCUMENT CLUSTERING **9**

Multilingual clustering - LSA, Tucker1, PARAFAC2; Constrained clustering; Document embeddings (Word2Vec, Doc2Vec, Sentence Transformers); Hierarchical clustering; Community detection.

UNIT III CONTENT-BASED CLASSIFICATION **9**

Document classification algorithms; Deep learning methods (CNN, LSTM); Transfer learning models (BERT, RoBERTa); Nonnegative matrix factorisation in classification.

UNIT IV ANOMALY AND TREND DETECTION **9**

Text visualisation; Sentiment tracking; Authorship/change tracking; Visual analytics; Adaptive thresholding for anomaly detection; Real-time sentiment dashboards; Graph-based anomaly detection.

UNIT V TEXT STREAMS **9**

Events/trends in text streams; Feature extraction; Event & trend detection; Dynamic topic modelling; Streaming NLP frameworks; Embedding external semantics.

TOTAL PERIODS: 45

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COURSE OUTCOMES:

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

- Apply advanced text extraction methods including NER and transformer-based techniques
- Implement clustering algorithms with modern embeddings for multilingual corpora
- Design classification pipelines using deep learning and transfer learning models
- Perform anomaly and trend detection using visual analytics and graph-based methods
- Analyze large-scale text streams using dynamic topic models and streaming NLP frameworks

TEXT BOOKS

1. Michael W Berry & Jacob Kogan, "Text Mining: Applications and Theory", Wiley, 2010.
2. Charu C Aggarwal & ChengXiang Zhai, "Mining Text Data", Springer, 2012.
3. Jurafsky, D, & Martin, J, "Speech and Language Processing", 3rd Edition, Prentice Hall, 2023.

REFERENCE BOOKS

1. Gary Miner, "Practical Text Mining and Statistical Analysis for Non-structured Data", Academic Press, 2012.
2. Buitelaar, P, Cimiano P, Magnini B, "Ontology Learning from Text", IOS Press, 2005.
3. Devlin J et al., "BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding", NAACL 2019.
4. Reimers N, & Gurevych I, "Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks", EMNLP 2019.

CO–PO–PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	3	3	-	-	1	2	2	2	3	3
CO2	3	3	3	3	3	-	-	1	2	2	3	3	3
CO3	2	3	3	3	3	-	-	2	3	3	3	3	3
CO4	3	3	3	3	3	-	-	2	3	3	3	3	3
CO5	3	3	3	3	3	-	-	3	3	3	3	3	3
Average	2.80	3.00	2.80	3.00	3.00	-	-	1.80	2.60	2.60	2.80	3.00	3.00

CHAIRMAN
BoS (AD)

24AD503	MACHINE LEARNING TECHNIQUES	L T P C
	(COMMON TO AD, CSE AND IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Provide a comprehensive introduction to machine learning concepts, types of learning, and fundamental learning problems
- Explain neural networks, perceptions, multilayer architectures, backpropagation, and genetic algorithms for modeling and learning
- Introduce Bayesian learning methods, probabilistic models, and computational learning theory including hypothesis spaces and complexity
- Explore advanced learning techniques such as rule-based learning, reinforcement learning, and explanation-based learning
- Enable practical application of machine learning using tools like Azure ML in areas such as image recognition, fraud detection, and medical diagnosis

UNIT I INTRODUCTION **9**

Introduction to Machine Learning - Essential concepts of ML - Types of learning -Learning Problems - Perspectives and Issues - Concept Learning - Version Spaces and Candidate Eliminations - Inductive bias - Decision Tree learning - Representation - Algorithm - Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS **9**

Neural Network Representation - Problems - Perceptron's - Multilayer Networks and Back Propagation Algorithms - Advanced Topics - Genetic Algorithms - Hypothesis Space Search - Genetic Programming - Models of Evaluation and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING **9**

Bayes Theorem - Concept Learning - Maximum Likelihood - Minimum Description Length Principle - Bayes Optimal Classifier - Gibbs Algorithm - Naïve Bayes Classifier -Bayesian Belief Network - EM Algorithm - Probability Learning - Sample Complexity - Finite and Infinite Hypothesis Spaces - Mistake Bound Model.

UNIT IV ADVANCED LEARNING **9**

Learning Sets of Rules - Sequential Covering Algorithm - Learning Rule Set - First Order Rules - Sets of First Order Rules - Induction on Inverted Deduction - Inverting Resolution - Analytical Learning-Perfect Domain Theories-Explanation Base Learning - FOCL Algorithm - Reinforcement Learning - Task - Q-Learning - Temporal Difference Learning

UNIT V MACHINE LEARNING IN PRACTICE AND APPLICATIONS **9**

Performance Measurement, Azure Machine Learning. Applications: Image Recognition - Email spam and Malware Filtering - Online fraud detection- Medical Diagnosis.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Describe the essential concepts, types, and issues of machine learning and explain concept learning models
- Develop neural networks and genetic algorithm models to solve classification and optimization problems
- Apply Bayesian and probabilistic learning techniques for inference, classification, and estimation
- Implement advanced machine learning strategies such as rule-based learning, FOCL, and reinforcement learning (Q-learning, TD learning)
- Utilize machine learning tools and platforms (e.g., Azure ML) for solving real-world problems like spam filtering, fraud detection, and medical diagnosis

TEXT BOOK:

1. Tom M. Mitchell, "Machine Learning", 1st 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", 3rd Edition, O'Reilly Media, 2023.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer, 2023 (Corrected reprint).
5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, Latest Reprint 2024.

CO - PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	1	2	3	2
CO2	3	3	3	2	3	-	-	-	2	2	2	3	3
CO3	3	3	2	2	3	-	-	-	-	1	3	3	2
CO4	3	3	3	3	3	1	-	-	1	2	3	3	3
CO5	3	3	3	2	3	2	-	-	2	3	3	3	3
Average	3.00	2.80	2.60	2.00	2.80	1.50	-	-	1.60	1.80	2.60	3.00	2.60

CHAIRMAN
BoS (AD)

24IT501	WEB TECHNOLOGY	L	T	P	C
	(Common to AD, CSE and IT)	3	0	2	4

OBJECTIVES:

The Student should be made to:

- Understand fundamentals of web architecture, HTML syntax, and HTML5 features.
- Learn CSS styling and JavaScript for responsive, interactive web pages.
- Apply Java Servlets, JSP, session management, and MVC for dynamic web apps.
- Explore DOM, XML, and modern event handling for web data manipulation.
- Understand AJAX (XMLHttpRequest, Fetch API) and develop SOAP/REST web services.

UNIT I BASICS OF WEB AND HTML **9**

Web Essentials: Clients, Servers, and Communication - Internet-Basic Internet Protocols - World Wide Web - HTTP Request Message - Response Message - Web Clients Web Servers - Markup Languages: An Introduction to HTML - History and Evolution - Basic Syntax and Semantics - Essential HTML Elements - Headings - Forms and Input Elements - Tables and Lists - Semantic Tags in HTML5 - HTML5 Features and APIs.

UNIT II CSS AND CLIENT SIDE SCRIPTING **9**

Style Sheets: CSS- Introduction- Features - Syntax - Types - Selectors - Cascading - Inheritance - Text Properties - Box Model - Layout - Normal Flow - Flexbox – Grid - Responsive Design - CSS3 Features - Client - Side Programming: JavaScript - Overview - Embedding in HTML - Syntax - Variables - Data Types - Operators - Control Statements - Functions - Objects - Arrays - Built-in Objects - DOM Manipulation - Events - Debugging.

UNIT III SERVER SIDE PROGRAMMING **9**

Java Servlets Technology Architecture - Servlet Life Cycle - Form GET and POST Actions - Session Handling - HttpSession - URL Rewriting - Understanding Cookies - Databases and Java Servlets - JSP Technology: Introduction to JSP - JSP and Servlets - Basics of JSP - Directives - Scriptlets - Expressions - Running JSP Applications - JavaBeans Classes and JSP - Tag Libraries and Files - JSTL - Support for the Model-View-Controller Paradigm.

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UNIT IV **DOM AND XML** **9**

Host Objects: Browsers and the DOM - Introduction to DOM - Document Tree - Modern Event Handling and Delegation. Web Data: Basic XML - DTD - XML Schema - Namespaces - DOM-based XML Parsing - Introduction to JSON - Parsing and Transformation: SAX Parsing - Xpath - XSLT - Displaying XML - Overview of Client-Side XML/JSON handling.

UNIT V **AJAX AND WEB SERVICES** **9**

AJAX: Client-Server Architecture - XMLHttpRequest - Callback Methods - Fetch API. Web Services: JAX-RPC - Java Web Service Server and Client - WSDL - SOAP - RESTful Services - JSON and XML. Software Installation - Java Object Persistence.

THEORY: 45 PERIODS

LAB EXPERIMENTS:

1. HTML and Image Maps
   a. Create a web page embedding an image map.
   b. Define and fix hot spots on the image.
   c. Display related information dynamically when hot spots are clicked.
2. CSS Styling
   i. Implement a web page demonstrating all types of Cascading Style Sheets including inline, internal, and external CSS.
   ii. Use CSS3 features such as Flexbox, Grid, and Responsive Design.
3. Website Development with CSS and JavaScript Validation
   i. Develop a multi–page CRM website using CSS for styling.
   ii. Perform form validation and DOM manipulation using JavaScript.
4. Create and deploy a servlet–based web app connecting to a database using JDBC.
5. Develop JSP applications for:
   i. Conducting online examinations.
   ii. Displaying student mark lists from a database.
6. Create XML files with corresponding DTD and XML Schema definitions.
7. Design and implement a web service (SOAP–based or RESTful) for a calculator application.
8. Parse XML documents using DOM and SAX parsers programmatically.
9. Develop an AJAX application using XMLHttpRequest and Fetch API.

PRACTICALS: 30 PERIODS
TOTAL: 75 PERIODS

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OUTCOMES:

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

- Understand Web Architecture and use HTML5 for Structured Web Content.
- Apply CSS and JavaScript for responsive and interactive web pages.
- Develop Dynamic web apps using Java Servlets, JSP, and session management.
- Manipulate web data with DOM, XML/JSON parsing, and event handling.
- Implement AJAX and create web services with SOAP, REST, JSON, and XML.

TEXT BOOKs:

1. Jeffrey C Jackson, Web Technologies - A Computer Science Perspective, Pearson Education, 2007.

REFERENCES:

1. Harvey M Deitel, Paul J Deitel, Abbey Deitel, Internet and World Wide Web How to Program, Pearson Education Limited, 2014.
2. Marty Hall and Larry Brown, Core Web Programming, Volume I and II, Pearson Education, 2nd Edition, 2001.
3. Paul S Wang, Dynamic Web Programming and HTML5, CRC Press, 2013. 6. Chris Bates, Web Programming–Building Internet Applications, Wiley, 2014.

COs - POs Mapping

Course Outcomes	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	1	2	1	1	2	1	1	2	1	1	2	1
2	2	1	2	1	3	1	1	2	2	1	1	3	1
3	3	2	3	2	2	1	1	2	2	2	1	3	2
4	2	2	1	3	3	1	1	1	2	1	1	3	1
5	3	2	2	3	3	2	2	1	2	–	–	–	–
Average	2.60	1.60	2.00	2.00	2.50	1.40	1.20	1.40	2.00	1.00	1.00	2.75	1.25

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BoS (IT) 23/10/25

24AD504L	MACHINE LEARNING LABORATORY	L T P C
	(COMMON TO AD, CSE AND IT)	0 0 2 1

OBJECTIVES:

The Student should be made to:

- Understand and implement core machine learning algorithms like Decision Trees, Perceptron's, and Naive Bayes
- Apply neural network techniques including Multilayer Perceptron's and backpropagation for classification problems
- Explore evolutionary approaches like Genetic Algorithms for solving optimization problems
- Practice probabilistic and clustering algorithms such as the EM algorithm and Q-Learning
- Gain hands-on experience with cloud-based ML tools (e.g., Azure ML) for deploying real-world applications

LIST OF EXPERIMENTS:

1. Implement the Candidate Elimination Algorithm using a categorical dataset and derive the version space.
2. Construct a Decision Tree using the ID3 algorithm and classify new data samples using a real-world dataset.
3. Implement a Perceptron model for binary classification using logic gate data (AND/OR).
4. Train a Multilayer Perceptron using the Backpropagation algorithm for XOR classification.
5. Apply Genetic Algorithm to solve an optimization problem like function maximization or TSP.
6. Implement the Naive Bayes Classifier to filter emails into spam and non-spam categories.
7. Apply the EM Algorithm for clustering using the Gaussian Mixture Model dataset and visualize the result.
8. Implement Q-Learning algorithm to train an agent for navigating a maze environment.
9. Build a Rule-Based Classifier using the Sequential Covering Algorithm on a structured dataset.
10. Use Azure Machine Learning Studio to develop and deploy a simple image classifier (e.g., cats vs. dogs).

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Implement and evaluate basic supervised learning techniques including Candidate Elimination and Decision Trees
- Develop and train neural network models for both linear and non-linear classification tasks
- Apply probabilistic classifiers and clustering algorithms to real datasets
- Use optimization and reinforcement learning techniques such as Genetic Algorithms and Q-Learning
- Design, build, and deploy end-to-end machine learning models using cloud platforms like Azure ML Studio

CO – PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	1	2	3	2
CO2	3	2	2	1	2	-	-	-	-	1	2	3	2
CO3	3	3	3	2	3	-	-	-	-	2	3	3	3
CO4	3	3	3	2	3	-	-	-	-	2	3	3	2
CO5	3	3	3	2	3	-	-	-	-	2	3	3	3
Average	3.00	2.60	2.60	1.60	2.60	-	-	-	-	1.60	2.60	3.00	2.40

CHAIRMAN
BoS (AD)

24AD505L	MINI PROJECT - I	L T P C
		0 0 2 1

OBJECTIVES:

The student should be made to:

- Impart knowledge on solving real time problems related to artificial intelligence and data science.
- Explore emerging research issues in solving a specific problem right from its problem identification and literature review till the completion of successful solution.
- Make the students come up with innovative and new ideas in their area of interest.
- Workout with the strategies, to find a solution for addressing the problem in project management.
- Improve effective team building, good coordination and make students to face reviews and viva voce examination.

GUIDELINES FOR REVIEW AND EVALUATION

The students in a group of not more than 3 members 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 a minimum of three reviews. There shall be a minimum of three members in the review committee. The guide will be an additional member of the Review Committee and he/she should be present during the presentation of his/her group. A project report may be prepared and submitted to the head of the department at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the head of the department.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Formulate specific problem statements for ill-defined real life problems with reasonable assumptions and constraints.
- Perform literature search in the area of interest.
- Conduct experiments, design and analysis, solution iterations and document the results.
- Perform error analysis and synthesise the results and arrive at scientific conclusions.
- Document the results in the form of technical report and give oral presentation.

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24EEC501L	PROFESSIONAL SKILLS DEVELOPMENT (Common to All Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Sharpen problem solving skills and to improve thinking ability of the students
- Drive the students to use language with great commitment and cooperation
- Expertise the creative thinking and presentation skills to meet company needs
- Develop and foster the soft skills through individual and group activities
- Expose students to right attitudinal and behavioural thoughts

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 REASONONG 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

CHAIRMAN 14/10
BoS (S&H)

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition Feb 2017.
2. MurtyG R K, "Soft Skills for Success", DGM Icfai Books, Revised Edition, 2005.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; Sixth edition 2016.
2. AggarwalRS, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand Publishing; New Delhi, 2018.
3. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; Eighth Edition, 2018.
4. Covey Sean, "Seven Habits of Highly Effective Teens", Fireside Publishers, New York, 1998.
5. Carnegie Dale, "How to win Friends and Influence People", Simon & Schuster, New York, 1998.

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) 14/10

24AD101PE KNOWLEDGE REPRESENTATION AND REASONING L T P C

3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the principles, models, and methods of knowledge representation in Artificial Intelligence
- Impart a solid foundation in propositional and first-order logic for problem solving
- Enable students to design and implement reasoning systems using rule-based and logic programming approaches
- Explore structured knowledge representation techniques such as semantic networks, frames, and description logics
- Develop skills in handling non-monotonic reasoning and reasoning under uncertainty

UNIT I INTRODUCTION TO KNOWLEDGE REPRESENTATION AND PROPOSITIONAL LOGIC 9

Overview of knowledge representation and reasoning, formal logic foundations, propositional logic language, syntax, semantics, truth values, valid arguments, rules of inference, natural deduction, axiomatic systems, Hilbert-style proofs, tableau method, and resolution refutation method.

UNIT II FIRST-ORDER LOGIC AND RULE-BASED REASONING 9

Syntax, semantics, entailment, proof systems, forward chaining, unification, rule-based systems, the Rete algorithm with examples, OPS5 expert system shell, Skolemization, terminological facts, properties, categories, reification, RDF, and event calculus for reasoning about change.

UNIT III SEMANTIC REPRESENTATION AND LOGIC PROGRAMMING 9

Natural language semantics, conceptual dependency (CD) theory, mapping English to CD, backward chaining, logic programming, Prolog programming, search control, and the cut operator. Coverage includes FOL resolution method, clause form, equality handling, and complexity issues.

UNIT IV STRUCTURED KNOWLEDGE REPRESENTATION AND DESCRIPTION LOGICS 9

Semantic networks, frames, scripts, goals, plans, actions, plan applier mechanisms, reasoning strategies, normalisation, structure matching, classification, A-box reasoning, description logic extensions (ALC and others), examples, taxonomies, inheritance, and belief representation.

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UNIT V NON-MONOTONIC REASONING AND ADVANCED LOGIC 9

Circumscription, minimal models, event calculus revisited, default logic, autoepistemic logic, epistemic logic, and reasoning puzzles such as the muddy children problem. Emphasis on reasoning under uncertainty and incomplete knowledge in intelligent systems.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain fundamental concepts of knowledge representation, propositional logic, and reasoning techniques
- Apply first-order logic, rule-based systems, and inference mechanisms to solve computational problems
- Develop Prolog programs for semantic representation and reasoning tasks
- Analyze structured knowledge representation models and apply description logic concepts
- Implement non-monotonic reasoning techniques for uncertain and incomplete information in intelligent systems

TEXT BOOKS:

1. Russell S, & Norvig P, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson, 2020.
2. **Kaushik Saroj,** "Artificial Intelligence", CENGAGE India, 2nd Edition, 2022.

REFERENCES:

1. Poole D, & Mackworth A, "Artificial Intelligence: Foundations of Computational Agents", 3rd Edition, Cambridge University Press, 2023.
2. Huth M, & Ryan M, "Logic in Computer Science: Modelling and Reasoning about Systems", Cambridge University Press, 2nd Edition, 2004.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	1	-	-	-	-	2	1	3	3
CO2	3	3	2	2	2	-	-	-	-	2	2	3	2
CO3	2	3	3	2	2	-	-	-	2	3	1	2	3
CO4	3	3	2	3	2	-	-	-	2	3	2	2	2
CO5	3	3	3	3	2	-	-	-	1	2	2	2	2
Average	3.00	2.80	2.20	2.20	1.80	-	-	-	1.66	2.40	1.60	2.40	2.40

CHAIRMAN
BoS (AD)

24IT501PE	RECOMMENDER SYSTEMS (Common to AD & IT)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concepts and foundations of recommender systems.
- Learn the significance of data mining algorithms in building effective recommender Sytems.
- Gain knowledge of collaborative filtering techniques and their applications.
- Acquire skills for designing and implementing practical recommender systems.
- Study collaborative filtering methods to real-world recommendation problems.

UNIT I INTRODUCTION TO RECOMMENDER SYSTEM 9

Recommender System Functions - Linear Algebra Notation: Matrix Addition - Multiplication - Transposition - Inverses - Covariance Matrices - Understanding Ratings Applications - Issues.

UNIT II COLLABORATIVE FILTERING 9

User-based Nearest Neighbour Recommendation - Item-based Nearest Neighbour Recommendation - Model Based and Pre-processing Based Approaches - Attacks on Collaborative Recommender Systems.

UNIT III CONTENT BASED RECOMMENDATION 9

High Level Architecture of Content-based Systems - Advantages and Drawbacks - Item Profiles - Obtaining Item Features From Tags - Representing Item Profiles - Methods for Learning User Profiles - Similarity Based Retrieval - Classification Algorithms.

UNIT IV HYBRID APPROACHES 9

Opportunities for Hybridization - Monolithic Hybridization Design: Feature Combination - Feature Augmentation - Parallelized Hybridization Design: Weighted - Switching - Mixed - Pipelined Hybridization Design: Cascade Meta-level - Limitations of Hybridization Strategies.

UNIT V EVALUATING RECOMMENDER SYSTEM 9

Introduction - General Properties of Evaluation Research - Evaluation Designs - Evaluation on Historical Datasets - Error Metrics - Decision-Support Metrics - User - Centred Metrics.

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TOTAL: 45 PERIODS

OUTCOMES:

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

- Gaining knowledge of essential techniques and challenges in recommender systems.
- Evaluate types of recommender systems: Non-Personalized - content based - collaborative filtering.
- Apply algorithms and techniques to develop recommender systems that are widely used in the Internet.
- Building high-performance - state-of-the-art recommender systems.
- Evaluating recommender system: decision support metrics and user centered metrics.

TEXTBOOKs:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction. 1st Edition, Cambridge University Press, 2011.

REFERENCES:

1. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook. 1st Edition, Springer, 2011.
2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems for Learning. 1st Edition, Springer, 2013.
3. Charu C. Aggarwal, Recommender Systems: The Textbook. Springer, 2016.
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets. 3rd Edition, Cambridge University Press, 2020.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	1	2	1	-	-	-	-	-	-
2	1	2	-	-	1	-	-	-	-	-	-
3	2	3	1	-	1	-	-	-	2	-	-
4	3	2	2	2	1	-	-	-	2	-	-
5	1	2	-	2	1	-	-	-	-	-	-
Average	1.80	2.20	1.33	3.00	1.00	-	-	-	2.00	-	-

CHAIRMAN
BoS (IT)

24AD102PE	NATURAL LANGUAGE PROCESSING	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce basics of NLP and statistical models
- Learn morphological analysis and POS tagging methods
- Understand syntactic structures and parsing algorithms
- Learn semantic representation and topic modeling
- Learn information extraction and sentiment analysis methods

UNIT I FOUNDATIONS OF NATURAL LANGUAGE PROCESSING 9

Introduction to NLP, challenges, empirical laws, text processing, spelling correction, edit distance, noisy channel model, N-gram language models, evaluation and smoothing.

UNIT II MORPHOLOGY AND PART-OF-SPEECH TAGGING 9

Advanced smoothing, computational morphology, finite-state methods, POS tagging, HMMs, Viterbi, Baum-Welch, maximum entropy models, CRFs.

UNIT III SYNTAX AND PARSING 9

Syntax basics, parsing algorithms, CKY, PCFGs, inside-outside probabilities, dependency grammar, transition-based parsing, MST-based parsing.

UNIT IV SEMANTICS AND TOPIC MODELS 9

Distributional semantics, embeddings, lexical semantics, word sense disambiguation, topic modeling (LDA, variants, applications).

UNIT V INFORMATION EXTRACTION, SUMMARIZATION, AND SENTIMENT ANALYSIS 9

Entity linking, information extraction, relation extraction, summarization methods, text classification, sentiment analysis.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply text processing and simple language models
- Implement POS tagging using statistical and ML models
- Build and evaluate phrase structure and dependency parser
- Apply embeddings and topic models for text analysis
- Develop systems for IE, summarization, and sentiment analysis

CHAIRMAN
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TEXT BOOKS:

1. Jurafsky D & Martin J H, "Speech and Language Processing", 3rd ed., Pearson, 2023.
2. Eisenstein J, "Introduction to Natural Language Processing", MIT Press, 2019.

REFERENCES:

1. Bird S, Klein E, & Loper E, "Natural Language Processing with Python", O'Reilly Media, 2009.
2. Goldberg Y, "Neural Network Methods for Natural Language Processing", Morgan & Claypool, 2017.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	2	2	-	-	-	-	1	2	3	2
CO2	3	2	3	2	2	-	-	-	-	1	2	2	2
CO3	3	3	3	2	3	-	-	-	-	1	2	2	2
CO4	3	2	3	3	3	-	-	-	-	-	2	3	3
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3
Average	3.00	2.40	3.00	2.40	2.40	-	-	-	-	1.50	2.00	2.40	2.40

CHAIRMAN
BoS (AD)

24AD103PE	HEALTH CARE ANALYTICS (COMMON TO AD AND CSE)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the statistical methods for the design of biomedical research
- Comprehend the fundamentals of mathematical and statistical theory in the application of Healthcare
- Apply the regression and correlation analyze in the healthcare data
- Understand the Meta analysis and variance analysis
- Interpret the results of the investigational methods

UNIT I INTRODUCTION **9**

Introduction, Computers and bio statistical analysis, Introduction to probability, likelihood & odds, distribution variability. Finding the statistical distribution using appropriate software tool like R/ Python.

UNIT II STATISTICAL PARAMETERS **9**

Statistical parameters p-values, computation, level chi square test and distribution and hypothesis testing -single population proportion, difference between two population proportions, single population variance, tests of homogeneity. Testing of statistical parameters using appropriate software R / Python.

UNIT III REGRESSION AND CORRELATION ANALYSIS **9**

Regression model, evaluating the regression equation, correlation model, correlation coefficient. Finding regression, correlation for the data using appropriate software like R / Python.

UNIT IV ANALYSIS OF VARIANCE **9**

META analysis for research activities, purpose and reading of META analysis, kind of data used for META analysis, completely randomized design, randomized complete block design, repeated measures design, factorial experiment. Testing the variance using appropriate software tool like R / Python.

UNIT V CASE STUDIES **9**

Epidemical reading and interpreting of epidemical studies, application in community health, Case study on Medical Imaging like MRI, CT. Case study on respiratory data, Case study on ECG data.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Explain statistical methods used in designing biomedical research
- Demonstrate understanding mathematical and statistical principles applied to healthcare datasets
- Perform regression and correlation analysis on healthcare-related data using software tools like R/Python
- Analyze healthcare research data using meta-analysis and analysis of variance techniques
- Interpret the results of statistical investigations and derive meaningful insights into healthcare decisions

TEXT BOOKS:

1. Wayne W. Daniel, "Biostatistics-A Foundation for Analysis in the Health Sciences", John Wiley & Sons Publication, 10th Edition, 2018.
2. Chandan K Reddy, Charu C Aggarwal, "Health Care data Analysis", 1st Edition, CRC, 2020.
3. Bernard Rosner, "Fundamentals of biostatistics", Nelson Education, 8th Edition, 2015.

REFERENCES:

1. Marcello Pagano and Kimberlee Gauvreu, "Principles of Biostatistics", Chapman and Hall/CRC, 2nd Edition, 2018.
2. Ronald N Forthofer and EunSul Lee, "Introduction to Biostatistics", Academic Press, 1st Edition, 2014.
3. Animesh K. Dutta, "Basic Biostatistics and its Applications", New Central Book Agency, 1st Edition, 2006.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	2	-	-	2	2	1	2	2	2
CO2	3	2	1	2	2	-	-	2	3	2	2	3	2
CO3	3	3	2	3	3	-	-	2	3	2	2	3	2
CO4	3	2	2	3	3	-	-	2	3	2	2	3	3
CO5	3	3	2	3	2	-	-	2	2	2	2	3	3
Average	3.00	2.40	1.60	2.60	2.40	-	-	2.00	2.60	1.80	2.00	2.80	2.40

CHAIRMAN
BoS (AD)

24CS102PE	ADVANCED DATA SCIENCE	L	T	P	C
	(Common to AD, CSE & IT)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand advanced data science concepts and their applications in various industries.
- Learn scalable machine learning, deep learning, and data engineering approaches.
- Explore big data platforms, cloud-based analytics, and real-time processing pipelines.
- Gain exposure to compliance, ethics, and regulatory frameworks in the Indian context.
- Apply data science techniques to industry-specific use cases in fintech, healthcare, telecom, and smart cities.

UNIT I DATA FOUNDATIONS & INDUSTRY CONTEXT 9

Role of data science in industries: finance, healthcare, retail, telecom, manufacturing - Data preprocessing at scale: pipelines, feature engineering, dimensionality reduction - Handling imbalanced datasets and missing data - Industry-specific challenges: financial fraud detection, patient health records, supply chain optimization - Indian context: data ecosystems (Aadhaar, UPI, India Stack, Smart Cities initiatives).

UNIT II ADVANCED MACHINE LEARNING FOR INDUSTRY 9

Gradient boosting techniques: XGBoost, LightGBM, CatBoost - Ensemble methods: bagging, boosting, stacking - Automated machine learning (AutoML) for rapid model development - Model interpretability: SHAP, LIME, feature importance - Industry use cases: credit risk modeling (banking), customer churn (telecom), recommendation engines (e-commerce).

UNIT III DEEP LEARNING & AI APPLICATIONS 9

CNNs for computer vision in industry (manufacturing defects, medical imaging) - RNNs, LSTMs, GRUs for sequential/temporal data (stock prediction, speech analysis) - Transfer learning with pre-trained models for industry datasets - Representation learning: embeddings for text, graphs, and customer behavior - Case studies: Indian healthcare (radiology AI), fintech (fraud detection), agritech (crop yield prediction).

UNIT IV BIG DATA, CLOUD, & REAL-TIME ANALYTICS 9

Big data ecosystem: Hadoop, Spark, distributed computing - Cloud-based data science platforms: AWS Sagemaker, Azure ML, Google Vertex AI - Real-time data pipelines: Kafka, Flink, Spark Streaming - Industry compliance: scalability, monitoring, deployment in enterprises - Indian industry applications: UPI fraud detection, real-time telecom analytics, Smart City IoT data streams.

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BoS (CSE) 23/9/25

UNIT V ETHICS, COMPLIANCE, & EMERGING INDUSTRY TRENDS 9

Data ethics and responsible AI in enterprises - Data privacy & compliance: GDPR, India's DPDP Act 2023, RBI & SEBI regulations - Bias, fairness, and transparency in AI-driven decision making - Emerging trends: Federated learning, Edge AI, AutoML, Quantum ML - Industry adoption: healthcare AI regulation in India, fintech governance, AI in government digital services.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain advanced data science workflows and industry-specific challenges.
- Apply advanced machine learning algorithms to solve real-world business problems.
- Implement deep learning models for computer vision, NLP, and sequential data.
- Develop scalable analytics pipelines using big data and cloud-based platforms.
- Evaluate ethical, legal, and compliance issues in industrial applications of data science.

TEXT BOOK:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, 2017.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
3. Valliappa Lakshmanan, Sara Robinson, Michael Munn, "Machine Learning Design Patterns", O'Reilly, 2020.

REFERENCES:

1. Rajendra Akerkar, "Data Science: Theory and Practice", Cambridge University Press, 2020.
2. Pratap Dangeti, "Statistics for Machine Learning", Packt, 2017.
3. NITI Aayog, "Responsible AI for All - Strategy Paper", Government of India, 2021.
4. OECD & RBI Guidelines on AI/ML in Financial Services, 2023.

COs - POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	2	2	1	2	-	-	-	-	-	-	3	2
2	3	3	3	2	2	-	-	-	-	-	-	3	2
3	3	3	3	2	2	-	-	-	-	-	-	3	2
4	2	3	3	2	2	-	-	-	-	-	-	2	2
5	2	2	2	2	3	-	-	-	-	-	-	2	2
Average	**2.60**	**2.60**	**2.60**	**1.80**	**2.20**	-	-	-	-	-	-	**2.60**	**2.00**

CHAIRMAN
BoS (CSE)

24AD104PE	PREDICTIVE ANALYTICS	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Explain terminology, technology and applications of predictive analysis
- Apply data preparation techniques and generate appropriate association rules
- Discuss various descriptive models, their merits, demerits and application
- Describe various predictive modeling methods
- Introduce the text mining tools, technologies and case study which is used in day-to-day analytics cycle

UNIT I INTRODUCTION TO PREDICTIVE ANALYTICS 9

Overview of Predictive Analytics - Setting Up the Problem - Data Understanding - Single Variable - Data Visualization in One Dimension - Data Visualization, Two or Higher Dimensions - The Value of Statistical Significance - Pulling It All Together into a Data Audit.

UNIT II DATA PREPARATION AND ASSOCIATI ON RULES 9

Data Preparation - Variable Cleaning - Feature Creation - Item sets and Association Rules - Terminology - Parameter Settings - How the Data Is Organized - Measures of Interesting Rules - Deploying Association Rules - Problems with Association Rules - Building Classification Rules from Association Rules.

UNIT III MODELLING 9

Descriptive Modeling - Data Preparation Issues with Descriptive Modeling - Principal Component Analysis - Clustering Algorithms - Interpreting Descriptive Models - Standard Cluster Model Interpretation.

UNIT IV PREDICTIVE MODELLING 9

Decision Trees - Logistic Regression - Neural Network Model - K-Nearest Neighbours - Naive Bayes - Regression Models - Linear Regression - Other Regression Algorithms.

UNIT V TEXT MINING 9

Motivation for Text Mining - A Predictive Modeling Approach to Text Mining - Structured vs. Unstructured Data - Why Text Mining Is Hard- Data Preparation Steps - Text Mining Features - Modeling with Text Mining Features- Regular Expressions - Case Studies: Survey Analysis.

TOTAL: 45 PERIODS

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BoS (AD) 25/09/25

OUTCOMES:

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

- Understand the importance of predictive analytics
- Able to prepare and process data for the models
- Ability to model data and establish baseline performance
- Describe principles of predictive analytics and apply them to achieve real, pragmatic solutions
- Illustrate the features and applications of text mining

TEXT BOOKS:

1. Dean Abbott, "Applied Predictive Analytics Principles and Techniques for the Professional Data Analyst", Wiley, 2014.
2. Anasse Bari, Mohammad Chaouchi, Tommy Jung, "Predictive Analytics for Dummies", 2nd Edition, Kindle Edition, 2017.

REFERENCES:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012.
2. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
3. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2013.
4. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	3	2	-	-	-	-	2	1	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	2
CO3	3	3	3	3	3	-	-	-	-	2	1	2	2
CO4	3	3	3	3	3	-	-	-	-	2	2	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	2
Average	3.00	3.00	2.80	3.00	2.40	-	-	-	-	2.00	1.60	2.40	2.00

CHAIRMAN
BoS (AD)

24AD105PE	GENERATIVE AI	L T P C
	(COMMON TO AD, CSE AND IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concepts and evolution of Generative AI
- Learn the mathematical and computational foundations behind generative models
- Explore state-of-the-art generative architectures like GANs, VAEs, Transformers, and Diffusion models
- Develop hands-on skills to design and implement generative AI applications
- Analyze ethical, societal, and regulatory aspects of Generative AI in real-world domains

UNIT I INTRODUCTION TO GENERATIVE AI 9

History and evolution of AI - Discriminative vs Generative models - Generative AI characteristics - Applications in text, image, audio, video, and code - Overview of AI ecosystems (ChatGPT, Stable Diffusion, MidJourney, Copilot, Gemini) - Benefits and challenges - Generative AI pipeline - Introduction to embeddings and latent spaces - Components of a generative system.

UNIT II FOUNDATIONS OF MACHINE LEARNING & DEEP LEARNING 9

Supervised, unsupervised, reinforcement learning - Neural networks basics - CNNs, RNNs, LSTMs - Attention mechanism - Transformer architecture (BERT vs GPT) - Probability and statistics in generative modeling - Representation learning - Software tools and frameworks (TensorFlow, PyTorch, HuggingFace).

UNIT III CORE GENERATIVE MODELS 9

Variational Autoencoders (VAEs) - Generative Adversarial Networks (GANs): architecture, training, and challenges - Diffusion Models: principles and applications - Large Language Models (LLMs): GPT, PaLM, LLaMA - Fine-tuning and prompt engineering - Evaluation metrics for generative models (perplexity, FID, BLEU, ROUGE).

UNIT IV APPLICATIONS OF GENERATIVE AI 9

Text generation: summarization, chatbots, content creation - Image generation: art, design, and healthcare imaging - Audio and speech synthesis: voice cloning, music generation - Multimodal generation: text-to-image, text-to-video - Generative AI in business, education, and entertainment - Case studies of real-world applications - Hands-on with pre-trained generative models.

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UNIT V V ETHICS, POLICY, AND FUTURE DIRECTIONS 9

Bias and fairness in generative AI - Deepfakes, misinformation, and intellectual property issues - AI explainability and transparency - Responsible AI practices - Environmental and computational costs of GenAI - Global regulations and governance - Future directions: AGI, multi - agent systems, personalized AI, domain-specific models - Open challenges and research opportunities.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the basic principles and types of Generative AI systems
- Apply deep learning concepts to generative modelling
- Implement and experiment with different generative models using modern AI frameworks
- Evaluate the performance and limitations of generative models
- Critically analyze ethical societal, and regulatory issues associated with Generative AI

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
2. Palash Goyal, Sumit Pandey, Karan Jain, Deep Learning for Natural Language Processing, Apress, 2018.

REFERENCES:

1. Sebastian Raschka, Yuxi (Hayden) Liu, Machine Learning with PyTorch and Scikit-Learn, Packt, 2022.
2. Tom B. Brown et al., Language Models are Few-Shot Learners, NeurIPS 2020.
3. OpenAI, GPT - 4 Technical Report, 2023.
4. Lilian Weng, Generative Models Survey Blog, 2021.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	2	-	-	2	2	1	2	3	2
CO2	3	3	3	2	2	-	-	2	3	2	2	3	3
CO3	3	3	3	2	2	-	-	2	3	2	2	3	3
CO4	2	3	3	2	2	-	-	2	3	2	2	2	3
CO5	2	2	2	2	3	-	-	2	2	2	2	2	2
Average	2.60	2.60	2.60	1.80	2.20	-	-	2.00	2.60	1.80	2.00	2.60	2.60

CHAIRMAN
BoS (AD)

24IT203PE	APP DEVELOPMENT	L	T	P	C
	(Common to AD, CSE & IT)	2	0	2	3

OBJECTIVES:

The Student should be made to:

- Understand different paradigms of mobile and web application development.
- Acquire skills in building native Android and iOS applications with appropriate tools and frameworks.
- Provide exposure to modern cross-platform frameworks such as React-Native and Flutter.
- Enable integration of services such as APIs and notifications into apps.
- Familiarize with non-functional aspects like performance, UI/UX, deployment, and monetization.

UNIT I APP DEVELOPMENT PARADIGMS AND ARCHITECTURE 6

Mobile Vs Web apps - Native - Hybrid - Cross-Platform - Progressive Web Apps - Responsive and Adaptive UI Design - App Architecture Patterns: MVC.

UNIT II NATIVE APP DEVELOPMENT 6

Android Development using Kotlin: Activities - Intents - Fragments - Layouts - Material Design Components - Event Handling - Data Persistence - iOS Development: Xcode - View Controllers - UI Components - SwiftUI Basics - Core Data.

UNIT III CROSS-PLATFORM APP DEVELOPMENT 6

React-Native: Components - JSX - Props - State - Navigation - Styling - Flutter: widgets - State Management - Hot Reload - Layout Design - Integration with Native Modules - Comparison of React-Native and Flutter for different Use Cases.

UNIT IV APP SERVICES AND INTEGRATION 6

REST API consumption - JSON Parsing - Authentication Mechanisms: OAuth - Firebase Auth - Push Notifications - Accessing Device Hardware: Camera - GPS - Sensors - Offline Capabilities - Caching.

UNIT V NON-FUNCTIONAL ASPECTS AND DEPLOYMENT 6

Performance Tuning - Debugging - Profiling - Memory and Battery Optimization - UI/ UX Guidelines - App Monetization Models - App Store Guidelines - Packaging - Deployment: Google Play Store - Apple App Store.

THEORY: 30 PERIODS

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BoS (IT) 23/10/25

LIST OF EXPERIMENTS:

1. Develop a simple responsive web app (HTML, CSS, JS) that adapts layout for mobile and desktop devices.
2. Implement a to-do list mobile app using the MVC architecture.
3. Build an Android app in Kotlin with multiple activities connected via intents.
4. a) Create a React Native application to display a list of books using FlatList and Props.
   b) Create a Flutter application with multiple widgets to perform simple arithmetic operations.
5. Develop an iOS app in Swift using SwiftUI with Core Data persistence.
6. a) Create an Android application to get the Bluetooth devices and list available devices using Bluetooth and Vibrator Service.
   b) Create an Android application to get the System Announcements using Broadcast Receiver.
7. Develop a mobile app that fetches real-time data using REST API and JSON parsing.
8. Implement push notifications in Android using Firebase Cloud Messaging.
9. Profile a mobile app using debugging and performance tools to analyze CPU, memory, and battery usage.

PRACTICALS: 30 PERIODS
TOTAL: 60 PERIODS

OUTCOMES:

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

- Describe various paradigms of mobile and web app development, including native, hybrid, cross- platform, and PWAs.
- Develop native mobile applications using Android and iOS with proper UI, storage, and lifecycle handling.
- Build cross-platform mobile applications using frameworks such as React-Native.
- Integrate REST APIs, authentication and device features into mobile applications.
- Evaluate mobile applications for performance, UI/UX quality, deployment readiness, and monetization opportunities.

TEXT BOOKs:

1. Simone Alessandria, Flutter Projects: Building Real-World Cross-Platform Apps. Packt Publishing, 2023.
2. Wei-Meng Lee, Beginning Android Application Development. Wiley, 2018.
3. ECMA, React-Native Official Documentation, Meta Platforms. Latest Edition.

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BoS (IT)

REFERENCES:

1. Carmine Zaccagnino, Programming Flutter: Native, Cross-Platform Apps the Easy Way. Packt Publishing, 2020.
2. Apple Developer Documentation - SwiftUI and iOS Development. Complete Developer Guide.
3. Shyam Seshadri, Building Cross-Platform Apps Using React-Native. Packt Publishing, 2020.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	3	2	2	-	-	-	-	1	2
2	3	3	3	3	3	-	-	-	-	1	2
3	3	3	3	3	3	-	-	-	-	1	2
4	3	3	3	3	3	-	-	-	-	1	2
5	3	3	3	3	3	-	-	-	-	1	2
Average	2.80	2.80	3.00	2.80	2.80	-	-	-	-	1.00	2.00

CHAIRMAN
BoS (IT) 23/10/25

24AD201PE	USER INTERFACE DESIGN	L T P C
		3 00 3

OBJECTIVES:

The Student should be made to:

- Understand the various characteristics of intelligent agents.
- Interpret the fundamentals of approaches to solving problems using AI methodologies.
- Utilize Logic-Driven Knowledge Representation.
- Explore methods for structuring knowledge using categories, objects, and ontologies.
- Develop AI-Based Solutions for Industry Challenges.

UNIT I USER INTERFACE DESIGN PROCESS **9**

Introduction to user interface design - User interface Design Process - Obstacles - Usability - Human Characteristics in Design - Human Interaction Speed - Business Functions - Requirements Analysis - Direct and Indirect methods - Basic Business Functions - Design Standards - System Training - Human Consideration in Screen Design.

UNIT II UX DESIGN BASICS AND PRINCIPLES **9**

Introduction to UX Design - User Centered Design Process - Popular UX Frameworks. UX Design principles - Design Ideation - Information Architecture: Card Sort – Interaction Modeling: Scenarios and Storyboards - Information Design - Visual Design Concepts: Grid System and Page Layouts - Visual Hierarchy - Typography - Color - Iconography - Brand Identity.

UNIT III UX ANALYSISAND RESEARCH **9**

Research methodology- Contextual Enquiry - Data capturing - Consolidating and Analyzing - Understanding Stakeholders - Users and Competition - User Segmentation: Profiles and Personas.

UNIT IV WIREFRAMING, PROTOTYPING AND TESTING **9**

Sketching Principles - Sketching Red Routes - Responsive Design - Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods -Synthesizing Test Findings - Prototype Iteration

UNIT V UX EVALUATION AND IMPLEMENTATION **9**

Introduction to Usability Evaluation - Usability Heuristics - Evaluation Methods: Heuristic Evaluation - Usability Testing - Accessibility - Digital Devices / Usage Environments - Multichannel delivery possibilities and UX Technologies.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 25/09/25

OUTCOMES:

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

- Interpret the features, functions, and categories of intelligent agents within AI systems.
- Use heuristics to improve search in complex problems and compare different AI planning methods.
- Examine the principles of predicate logic, propositional logic, and first-order logic for AI-based reasoning.
- Design, prototype, and improve user-friendly interfaces by focusing on key tasks and user feedback.
- Design AI-driven solutions for real-world applications.

TEXT BOOKS:

1. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, "About Face: The Essentials of Interaction Design", 6th Edition, Wiley, 2021.
2. Helen Sharp, Yvonne Rogers, Jenny Preece, "Interaction Design: Beyond Human-Computer Interaction", 6th Edition, Wiley, 2023.

REFERENCES:

1. Brad Nunnally, David Farkas, "UX Research: Practical Techniques for Designing Better Products", Rosenfeld Media, 2016.
2. Louis Rosenfeld, Peter Morville, Jorge Arango, "Information Architecture: For the Web and Beyond", 4th Edition, O'Reilly Media, 2015.
3. Jeff Gothelf, Josh Seiden, "Lean UX: Designing Great Products with Agile Teams", 3rd Edition, O'Reilly Media, 2021.
4. Steve Krug, "Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability", 3rd Edition, New Riders, 2013.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	3	2
CO2	3	3	3	3	3	-	-	-	-	-	-	3	3
CO3	3	3	3	3	2	-	-	-	-	-	-	3	3
CO4	2	2	3	-	3	-	-	-	2	2	-	2	3
CO5	3	3	3	2	3	-	-	-	2	2	2	3	3
Average	3.00	2.80	2.80	2.50	2.60	-	-	-	2.00	2.00	2.00	3.00	2.80

CHAIRMAN
BoS (AD)

24CS203PE	MERN STACK (Common to AD & CSE)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Introduce core web technologies and basic HTML structures to create simple, well-structured web pages.
- Explain and apply CSS styling, responsive design principles, and Bootstrap components to enhance the presentation and adaptability of web pages.
- Apply JavaScript ES6 features and DOM manipulation to build interactive web elements, while using Git and GitHub for effective version control.
- Analyze and implement client–server interactions through RESTful APIs and perform CRUD operations using MongoDB integration.
- Design and develop dynamic single-page applications in React.js by integrating front-end and back-end technologies for deployment.

UNIT I INTRODUCTION TO WEB DEVELOPMENT AND HTML FUNDAMENTALS 9

Overview of web technologies and architecture (Frontend, Backend, Full Stack) - MERN (MongoDB, Express.js, React, Node.js) - Setting up the development environment (VS Code, Node.js, npm, browser tools) - HTML Structure and Boilerplate - Elements, Tags, and Attributes - Block vs Inline Elements, Semantic vs Non-semantic Elements - Common Tags: headings, paragraphs, links, lists, images, tables, forms - Form elements and attributes (input, textarea, button, select, etc.) - Media tags (audio, video, iframe) - Meta tags and accessibility basics.

UNIT II CSS, RESPONSIVE DESIGN AND BOOTSTRAP FRAMEWORK 9

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases (compile build, test, package) Maven Profiles, Maven repositories (local, central, global), Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle.

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UNIT III JAVASCRIPT, ES6 ESSENTIALS AND VERSION CONTROL WITH GIT **9**

JavaScript basics: variables (var, let, const), data types, operators - Control structures: conditionals, loops (for, while, do-while) - Functions: declarations, expressions, arrow functions- Arrays and objects, array/object methods - DOM manipulation and events - ES6 features: template literals, destructuring, spread/rest, modules- (import/export), classes, inheritance- Practical exercises: form validation, interactive UI elements- Introduction to Git and GitHub - Basic commands: init, add, commit, push, pull - Branching and merging

UNIT IV NODE.JS & EXPRESS.JS AND MONGODB **9**

What is Node.js? Event-driven architecture, npm - Creating a simple server - Introduction to Express.js: routing, middleware, REST APIs - Handling requests and responses - Serving static files - Basic CRUD operations with in - memory data - Introduction to NoSQL and MongoDB - Documents, collections, and databases - CRUD operations (create, read, update, delete) - Connecting MongoDB with Node.js (using Mongoose) - Data modeling and schema basics.

UNIT V REACT.JS FUNDAMENTALS **9**

Introduction to React and JSX - Components: functional and class-based - Props and state management - Event handling - Conditional rendering, lists, and keys - React hooks (use State, use Effect) - Routing with React Router - Simple form handling and validation

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to,

- Understand and apply core web technologies such as HTML, CSS, and JavaScript to create structured and responsive web pages.
- Demonstrate proficiency in using the MERN stack by building full-stack applications using MongoDB, Express.js, React, and Node.js.
- Utilize version control systems like Git and GitHub for collaborative development, code management, and project tracking.
- Implement client-server interactions using RESTful APIs and manage data using CRUD operations in MongoDB.
- Design, integrate, and deploy a complete web application by combining front-end and back-end technologies and presenting the project effectively.

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REFERENCES:

1. Greg Lim, "Beginning MERN Stack Development", July 2021.
2. Nabendu Biswas, "Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS", Dec 2023.
3. Chirag Meghwal, "Mastering MERN Stack Development: From Beginner to Pro: A Comprehensive Guide to Building Modern Web Applications with MongoDB, Express.js, React, and Node.js", June 2024.
4. Udemy: React, NodeJS, Express & MongoDB - The MERN Fullstack Guide.
5. Coursera: MERN Stack Front to Back: Full Stack React, Redux & Node.js Specialization

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	2	2	2	-	-	-	-	-	-	-	-	2	1
2	2	2	2	1	2	-	-	-	-	-	-	2	1
3	1	2	-	-	-	-	-	2	-	-	-	2	1
4	1	2	3	-	-	-	-	-	-	-	-	2	1
5	2	2	3	-	-	-	-	-	-	-	-	2	1
Average	**1.60**	**2.00**	**2.50**	**1.00**	**2.00**	**-**	**-**	**2.00**	**-**	**-**	**-**	**2.00**	**1.00**

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24AD202PE	WEB APPLICATION SECURITY	L T P C
	(COMMON TO AD, CSE AND IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of web application security
- Focus on wide aspects of secure development and deployment of web applications
- Learn how to build secure APIs
- Learn the basics of vulnerability assessment and penetration testing
- Get an insight about Hacking techniques and Tools

UNIT I FUNDAMENTALS OF WEB APPLICATION SECURITY 9

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation.

UNIT II SECURE DEVELOPMENT AND DEPLOYMENT 9

Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM).

UNIT III SECURE API DEVELOPMENT 9

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys, OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 9

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT V HACKING TECHNIQUES AND TOOLS 9

Social Engineering, Injection, Cross-Site Scripting (XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Understanding the basic concepts of web application security and the need for it
- Be acquainted with the process for secure development and deployment of web applications
- Design and develop Secure Web Applications that use Secure APIs
- Identify the importance of carrying out vulnerability assessment and penetration testing
- Acquire the skill to think like a hacker and to use hackers tool sets

TEXT BOOKS:

1. Andrew Hoffman, "Web Application Security: Exploitation and Countermeasures for Modern Web Applications", 2nd Edition, O'Reilly Media, Inc, 2024.
2. Bryan Sullivan, Vincent Liu, "Web Application Security: A Beginners Guide", The McGraw-Hill Companies, 2012.
3. Neil Madden, "API Security in Action", Manning Publications Co., NY, USA, 2020.

REFERENCES:

1. Michael Cross, "Developer's Guide to Web Application Security", Syngress Publishing, Inc, 2007.
2. Ravi Das and Greg Johnson, "Testing and Securing Web Applications", Taylor & Francis Group, LLC, 2021,.
3. Prabath Siriwardena, "Advanced API Security", A press Media LLC, USA, 2020.
4. Malcom McDonald, "Web Security for Developers", No Starch Press, Inc 2020.
5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams "Grey Hat Hacking: The Ethical Hacker's Handbook", 3rd Edition, The McGraw-Hill Companies, 2011.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	1	-	-	3	-	1	-	2	2
CO2	3	2	3	1	3	-	-	3	1	1	1	2	3
CO3	3	2	3	1	3	-	-	3	2	2	2	2	3
CO4	3	3	2	3	3	-	-	3	1	2	2	3	3
CO5	3	3	2	3	3	-	-	3	2	2	2	3	3
Average	3.00	2.40	2.20	1.80	2.60	-	-	3.00	1.50	1.60	1.75	2.40	2.80

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24CS204PE	DEVOPS	L	T	P	C
	(Common to AD, CSE & IT)	2	0	2	3

OBJECTIVES:

The Student should be made to:

- Introduce DevOps fundamentals and cloud platforms with version control using Git and GitHub.
- Enable students to build and manage projects using Maven and Gradle build tools.
- Implement continuous integration workflows using Jenkins and relevant plugins.
- Automate configuration management tasks using Ansible playbooks and modules.
- Develop and manage DevOps pipelines using Azure DevOps and GitHub integration.

UNIT I INTRODUCTION TO DEVOPS **6**

Devops Essentials - Introduction to AWS, GCP, Azure - Version control systems: Git and Github.

UNIT II COMPILE AND BUILD USING MAVEN & GRADLE **6+6**

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases (compile build, test, package) Maven Profiles, Maven repositories (local, central, global), Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle.

PRACTICALS:

1. Create Maven Build pipeline in Azure.
2. Run regression tests using Maven Build pipeline in Azure.

UNIT III CONTINUOUS INTEGRATION USING JENKINS **6+9**

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

PRACTICALS:

1. Install Jenkins in Cloud.
2. Create CI pipeline using Jenkins.
3. Create a CD pipeline in Jenkins and deploy in Cloud.

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UNIT IV CONFIGURATION MANAGEMENT USING ANSIBLE 6+9

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible.

PRACTICALS:

1. Create an Ansible playbook for a simple web application infrastructure.
2. Build a simple application using Gradle.

UNIT V BUILDING DEVOPS PIPELINES USING AZURE 6+6

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure– pipelines. yaml file.

PRACTICALS:

1. Install Ansible and configure ansible roles and to write playbooks

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to,

- Understand the functionalities and actions performed using version control tools like Git.
- Apply build tools like Maven and Gradle to automate test case execution.
- Analyze the process of Continuous Integration, Testing, and Deployment using Jenkins and its workspace.
- Evaluate the effectiveness of configuration management using Ansible in automating deployments.
- Design and Create a Cloud-based DevOps pipeline using Azure DevOps tools for end-to-end automation.

TEXT BOOKs:

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014.

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REFERENCEs:

1. Thorne Montgomery "Ansible DevOps Cookbook: End-to-end automation solutions including setup, playbooks, cloud services, CI/CD integration, and Ansible Tower management ", First edition 2024.
2. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step– By– Step Exercises", Second Edition, Kindle Edition, 2016.
3. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014.
4. Hands On Azure Devops: Cicd Implementation For Mobile, Hybrid, and Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni.
5. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
6. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.
7. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	3	2	3	-	-	-	-	-	-	2	2
2	3	3	3	2	3	-	-	-	-	-	-	2	2
3	3	3	3	2	3	-	-	-	-	-	-	2	2
4	3	3	3	2	3	-	-	-	-	-	-	2	2
5	3	3	3	2	3	-	-	-	-	-	-	2	2
Average	**3.00**	**3.00**	**3.00**	**2.00**	**3.00**	-	-	-	-	-	-	**2.00**	**2.00**

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24CS206PE	XML AND WEB SERVICES	L	T	P	C
	(Common to AD & CSE)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the basics of XML.
- Learn XML based technologies and SOAP
- Evaluate the technologies behind Web Services
- Learn to work with RESTful web services
- Implement and consume RESTful web services

UNIT I INTRODUCTION **9**

Role of XML - XML and the Web - XML Language Basics - SOAP - Web Services - Revolutions of XML - Service Oriented Architecture

UNIT II SOAP **9**

Overview Of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns and Faults - SOAP With Attachments.

UNIT III WEB SERVICE TECHNOLOGIES **9**

Overview - Architecture - Key Technologies -UDDI - WSDL - ebXML - SOAP And Web Services In E-Com - Overview Of .NET And J2EE

UNIT IV INRTODUCTION TO RESFUL WEBSERVICES **9**

Kinds of Things on the Programmable Web - HTTP: Documents in Envelopes - Method Information - Scoping Information - The Competing Architectures - Technologies on the Programmable Web - Leftover Terminology - Web Services are Web Sites - del.icio.us: The Sample Application - Making the Request: HTTP Libraries - Processing the Response: XML Parsers - JSON Parsers: Handling Serialized Data - Clients Made Easy with WADL

UNIT V DEVELOPING AND CONSUMING RESTFUL WEB SERVICES **9**

Introducing the Simple Storage Service - Object-Oriented Design of S3 - Resources -HTTP Response Codes Resource URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface - A Service Implementation.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Explain how to write XML documents.
- Apply XML-based technologies and SOAP for web services.
- Analyze the structure and implement web services.
- Utilize RESTful web services effectively.
- Design, create, and consume RESTful web services using JSON.

TEXT BOOKs:

1. Frank. P. Coyle, "XML, Web Services and The Data Revolution", Pearson Education, 2002.
2. Leonard Richardson and Sam Ruby, "RESTful Web Services", O'Reilly Media, 2007.
3. Lindsay Bassett, "Introduction to JavaScript Object Notation", O'Reilly Media, 2015.

REFERENCES:

1. Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, "Developing Java Web Services", Wiley Publishing Inc., 2004.
2. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.
3. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers, 2005.

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	2	2	3	2	3	-	1	-	-	-	-	2	1
2	2	2	3	2	3	-	1	-	-	-	-	2	1
3	2	2	3	2	3	-	1	-	-	2	2	2	1
4	2	2	3	2	3	-	1	-	-	2	2	2	1
5	2	2	3	2	3	-	1	-	-	2	2	2	1
Average	**2.00**	**2.00**	**3.00**	**2.00**	**3.00**	**-**	**1.00**	**-**	**-**	**2.00**	**2.00**	**2.00**	**1.00**

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BoS (CSE)

24IT703PE	HUMAN COMPUTER INTERACTION (Common to AD & IT)	L T P C 3 0 0 3

OBJECTIVES:

The Student Should be Made to:

- Understand the fundamentals of Human-Computer interaction, including human capabilities and computer processing.
- Learn models, frameworks, and interface styles for effective interaction design.
- Apply user-centered design principles, accessibility, and modern design methodologies to develop usable systems.
- Explore cognitive models, evaluation frameworks, and usability testing techniques for system analysis.
- Gain knowledge of collaborative systems, emerging interface applications, and Web/Mobile interaction trends.

UNIT I INTRODUCTION TO HUMAN AND COMPUTER 9

The Human: Introduction - Input /Output Channels - Memory - Thinking: Reasoning and Problem Solving - Individual Differences - Psychology and Design of Interactive Systems - The Computer: Introduction - Text Entry Devices - Positioning - Pointing and Drawing - Digital Documents: E-Signatures - Scanning Technologies - Memory - Processing.

UNIT II INTERACTION DESIGN AND USER INTERFACES 9

The Interaction: Models of Interaction - Frameworks and HCI - Ergonomics - Interaction Styles - Elements of WIMP Interface - Natural User Interfaces - User Experience Design - Context of Interaction - Engagement and Fun - Paradigm for Interaction.

UNIT III USER CENTERED DESIGN AND MODERN PRACTICES 9

Interaction Design Basics: Process of Design - User Focus - Scenarios - Persona Creation and User Journeys - Navigation Design - Screen Design and Layout - Responsive and Adaptive Design - Iteration and Prototyping - HCI in Software Process: Software Life Cycle - Usability Engineering - Agile UX Practices - Iterative Design and Prototyping.

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UNIT IV ADVANCED COGNITIVE MODELS 9

Cognitive Models: Goal and Task Hierarchies - Linguistic Models - Mental Models and Cognitive Load Theory - Physical and Device Models - Cognitive Architecture - Communication and Collaboration Model: Face-to-Face Communication - Conversation - Text-Based Communication - Group Working - Virtual Collaboration Environments Models of the System: Standard Formalism - Predictive Modeling - AI-Driven Evaluation Frameworks.

UNIT V EMERGING INTERFACE APPLICATIONS 9

Groupware: Groupware Systems - Computer-Mediated Communication - Meeting and Decision Support Systems - Shared Applications and Artifacts - Frameworks for Groupware - Implementing Synchronous Groupware - Hypertext - Multimedia and WWW: Social Media Collaboration Tools - Cloud-Based Applications and Saas Platforms - Web Technology and Issues - Mobile-First Design - Progressive Web Applications - Voice & Conversational Interfaces - Static and Dynamic Web Content.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze human and computer capabilities to design effective interaction systems.
- Compare different interface models, interaction styles, and paradigms.
- Design user-centered interfaces using modern practices.
- Apply cognitive models, predictive modeling, and usability evaluation methods in real-world scenarios.
- Develop and evaluate collaborative applications integrating cloud, mobile-first design, Pwas, conversational interfaces, and AR/VR Technologies.

TEXT BOOKs:

1. Samit Bhattacharya, Human-Computer Interaction: User-Centric Computing for Design. McGraw-Hill India is 1st Edition, published in 2019.

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REFERENCES:

1. Sharp, Rogers, Preece, Interaction Design-Beyond Human Computer Interaction. 4th Edition, Wiley, 2015.
2. M.G. Helander, Handbook of Human-Computer Interaction. Elsevier, 2014
3. Mark R. Lehto, Steven J. Landry, Introduction to Human Factors and Ergonomics for Engineers. 2nd Edition, CRC Press Taylor & Francis Group, 2013.

COs - POs Mapping:

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	1	2	2	2	1	-	-	-	3	2	1	3	2
2	3	1	2	2	2	-	-	-	3	2	1	3	2
3	2	2	1	1	2	-	-	-	3	2	1	3	2
4	2	3	2	2	3	-	-	-	3	2	1	3	2
5	3	2	3	3	2	-	-	-	3	2	1	3	2
Average	2.20	2.00	2.00	2.00	2.00	-	-	-	3.00	2.00	1.00	3.00	2.00

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24AD301PE	VIRTUALIZATION TECHNIQUES	L T P C
	(COMMON TO AD, CSE AND IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the concepts of virtualization and virtual machines.
- Understand the implementation of process and system virtual machines.
- Explore the aspects of high level language virtual machines.
- Gain expertise in server, network and storage virtualization.
- Understand and deploy practical virtualization solutions and enterprise solutions

UNIT I OVERVIEW OF VIRTUALIZATION 9

System architectures - Virtual Machine basics - Process vs System Virtual Machines - Taxonomy. Emulation: Basic Interpretation - Threaded Interpretation - Precoded and Direct Threaded Interpretation - Binary Translation. System Virtual Machines - Key concepts - Resource utilization basics.

UNIT II PROCESS VIRTUAL MACHINES 9

Implementation - Compatibility - Levels - Framework - State Mapping - Register - Memory Address Space - Memory Architecture Emulation - Memory Protection - Instruction Emulation - Performance Tradeoff - Staged Emulation - Exception Emulation - Exception Detection - Interrupt Handling - Operating Systems Emulation - Same OS Emulation - Different OS Emulation - System Environment.

UNIT III HIGH LEVEL LANGUAGE VIRTUAL MACHINES AND SERVER VIRTUALIZATION 9

HLL virtual machines: Pascal P-Code - Object Oriented HLLVMs - Java VM architecture - Java Native Interface - Common Language Infrastructure. Server virtualization: Partitioning techniques - virtual hardware - uses of virtual servers - server virtualization platforms.

UNIT IV NETWORK AND STORAGE VIRTUALIZATION 9

Design of Scalable Enterprise Networks - Layer2 Virtualization - VLAN - VFI - Layer 3 Virtualization - VRF - Virtual Firewall Contexts - Network Device Virtualization - Data-Path Virtualization - Routing Protocols. Hardware Devices - SAN backup and recovery techniques - RAID - Classical Storage Model - SNIA Shared Storage Model - Virtual Storage: File System Level and Block Level

UNIT V APPLYING VIRTUALIZATION 9

Practical Virtualization Solutions: Comparison of Virtualization Technologies: Guest OS/ Host OS - Hypervisor - Emulation - Kernel Level - Shared Kernel, Enterprise Solutions: VMWare Server - VMWare ESXi - Citrix Xen Server - Microsoft Virtual PC - Microsoft Hyper-V - Virtual Box, Server Virtualization: Configuring Servers with Virtualization - Adjusting and Tuning Virtual servers - VM Backup - VM Migration, Desktop

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Virtualization: Terminal services - Hosted Desktop - Web-based Solutions - Localized Virtual Desktops, Network and Storage Virtualization: Virtual Private Networks - Virtual LAN - SAN and VSAN - NAS.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Deploy legacy OS on virtual machines
- Analyze the intricacies of server, storage and network virtualizations
- Design and develop applications on virtual machine platforms
- Apply virtual network and storage concepts including VLANs, routing, RAID, and SAN models
- Manage virtualization technologies for servers, desktops, and networks

TEXT BOOKS:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

REFERENCES:

1. Kumar Reddy, Victor Moreno, "Network virtualization", Cisco Press, July, 2006
2. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress 2005.
3. Kenneth Hess, Amy Newman, "Practical Virtualization Solutions: Virtualization from the Trenches", Prentice Hall, 2010

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3			-	2		-	-	-	-	-	-	2
CO2	3	2	-	2	2	-	-	-	-	-	-	2	2
CO3	3	2	3	-	3	-	-	-	-	2	-	2	2
CO4	3	2	2	-	3	-	-	-	-	-	2	2	2
CO5	3	-	2	-	3	-	-	-	2	-	2	2	2
Average	3.00	2.00	2.33	2.00	2.60	-	-	-	2.00	2.00	2.00	2.00	2.00

CHAIRMAN
BoS (AD)

29.10.25

24AD302PE	DATA WAREHOUSING AND DATA MINING	L T P C
	(COMMON TO AD, CSE AND EEE)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the foundational concepts of data warehousing and OLAP
- Enable students to understand and apply data mining techniques
- Provide skills for frequent pattern mining and association rule learning
- Develop proficiency in classification and clustering methods
- Expose students to advanced concepts in web mining and distributed data mining

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP) 9

Basic Concepts - Data Warehousing Components - Building a Data Warehouse - Database Architectures for Parallel Processing - Parallel DBMS Vendors - Multidimensional Data Model - Data Warehouse Schemas for Decision Support - Concept Hierarchies - Characteristics of OLAP Systems - Typical OLAP Operations, OLAP and OLTP.

UNIT II DATA MINING - INTRODUCTION 9

Introduction to Data Mining Systems - Knowledge Discovery Process - Data Mining Techniques - Issues - Applications - Data Objects and Attribute Types - Statistical Description of Data - Data Preprocessing - Cleaning, Integration, Reduction, Transformation and Discretization - Data Visualization - Data Similarity and Dissimilarity Measures.

UNIT III DATA MINING - FREQUENT PATTERN ANALYSIS 9

Mining Frequent Patterns, Associations and Correlations - Mining Methods - Pattern Evaluation Method - Pattern Mining in Multilevel, Multi-Dimensional Space - Constraint-Based Frequent Pattern Mining - Classification Using Frequent Patterns.

UNIT IV CLASSIFICATION AND CLUSTERING 9

Decision Tree Induction - Bayesian Classification - Rule-Based Classification - Classification by Back Propagation - Support Vector Machines - Lazy Learners - Model Evaluation and Selection - Techniques to Improve Classification Accuracy. Clustering Techniques - Cluster Analysis - Partitioning Methods - Hierarchical Methods: Agglomerative and Divisive - Model Based Clustering Methods: Fuzzy clusters and Expectation Maximization Algorithm

UNIT V WEB MINING AND PATTERN MINING 9

Web Mining - Mining the web page layout structure - mining web link structure - mining multimedia data on the web - Automatic classification of web documents and web usage mining - Distributed Data Mining. Recent trends in Distributed Warehousing and Pattern Mining - Class Imbalance Problem - Graph Mining - Social Network Analysis.

TOTAL: 45 PERIODS

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COURSE OUTCOMES:

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

- Understand and explain the architecture, components, and operations of data warehousing and OLAP systems
- Apply knowledge discovery techniques and perform data preprocessing for real-world data mining applications
- Implement frequent pattern mining methods and evaluate pattern mining in multilevel and multidimensional spaces
- Perform classification and clustering using various machine learning models and evaluate the performance of models
- Analyze and apply web mining techniques and address recent challenges like distributed mining, class imbalance, and graph-based mining

TEXT BOOKS:

1. Jiawei Han and M Kamber, Data Mining Concepts and Techniques, 4th Edition, Elsevier Publication, 2022.
2. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2019.

REFERENCES:

1. G Dong and J Pei, Sequence Data Mining, Springer, 2010.
2. Ralph Kimball, Margy Ross, The Data Warehouse Toolkit, 3rd Edition, Publisher: Wiley, 2013.

Mapping of COs with POs:

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

CHAIRMAN
BoS (AD)

24AD303PE	STORAGE TECHNOLOGIES (COMMON TO AD, CSE AND IT)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Identify different storage virtualization technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

UNIT I STORAGE SYSTEMS **9**

Introduction to Information Storage: Digital data and its type - Information storage - Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics - Cloud services and cloud deployment models - Big data analytics - Data Center Environment: Building blocks of a data center - Compute systems and compute virtualization and Software-defined data center.

UNIT II INTELLIGENT STORAGE SYSTEMS AND RAID **9**

Components of an intelligent storage system - Components - addressing - and performance of hard disk drives and solid-state drives - RAID - Types of intelligent storage systems - Scale-up and scale out storage Architecture.

UNIT III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION **9**

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, CSAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN, FCoE SAN connectivity, FCoE architecture.

UNIT IV BACKUP, ARCHIVE AND REPLICATION **9**

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

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UNIT V SECURING STORAGE INFRASTRUCTURE 9

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

TOTAL :45 PERIODS

OUTCOMES:

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

- Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
- Illustrate the usage of advanced intelligent storage systems and RAID
- Interpret various storage networking architectures - SAN, including storage subsystems and virtualization
- Examine the different role in providing disaster recovery and remote replication technologies
- Infer the security needs and security measures to be employed in information storage management

TEXTBOOK:

1. EMC Corporation, Information Storage and Management, Wiley, India, 2012.
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, "Introduction to Storage Area Networks", Ninth Edition, IBM - Redbooks, December 2017.
3. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, "Storage Networks Explained", Second Edition, Wiley, 2009

REFERENCES:

1. Chuck Ballard et al, "EMC Education Services - Information Storage and Management: Storing, Managing and Protecting Digital Information", EMC Education Services, 2nd Edition, 2012.
2. Ulf Troppens, Rainer Erkens, Wolfgang Müller-Friedt, Rainer Wolafka, Nils Haustein, "Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE", 2nd Edition, 2009.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	1	3	3	-	-	1	1	1	3
CO2	3	1	2	3	3	-	-	3	2	3	2
CO3	1	1	3	2	2	-	-	3	1	1	2
CO4	3	2	1	2	2	-	-	1	1	3	1
CO5	1	3	2	1	2	-	-	1	2	3	1
AVG	1.8	1.8	1.8	2.2	2.4	-	-	1.8	1.4	2.2	1.8

CHAIRMAN
BoS (AD)

24CS302PE	CLOUD SERVICES MANAGEMENT	L	T	P	C
	(Common to AD & CSE)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand key cloud concepts, service models, and lifecycle management processes.
- Develop strategic plans aligning cloud adoption with business and operational goals.
- Apply best practices for provisioning, monitoring, and securing cloud resources.
- Assess cloud pricing models and conduct cost-benefit analysis for investments.
- Design evaluations of cloud pricing models and cost-benefit analyses for investments.

UNIT I CLOUD SERVICE MANAGEMENT FUNDAMENTALS **9**

Cloud Ecosystem - The Essential Characteristics - Basics of Information Technology Service Management and Cloud Service Management - Service Perspectives - Cloud Service Models - Cloud Service Deployment Models - Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open Source cloud software's.

UNIT II CLOUD SERVICES STRATEGY **9**

Cloud Strategy Fundamentals - Cloud Strategy Management Framework - Cloud Policy, Key Driver for Adoption - Risk Management - IT Capacity and Utilization - Demand and Capacity matching - Demand Queueing - Change Management - Cloud Service Architecture - Create a Cost - model for a web application using various services and do Cost - benefit analysis.

UNIT III CLOUD SERVICE MANAGEMENT **9**

Cloud Service Reference Model - Cloud Service Life Cycle - Basics of Cloud Service Design - Dealing with Legacy Systems and Services - Benchmarking of Cloud Services - Cloud Service Capacity Planning - Cloud Service Deployment and Migration - Cloud Marketplace - Cloud Service Operations Management - Create alerts for usage of Cloud resources.

UNIT IV CLOUD SERVICE ECONOMICS **9**

Pricing models for Cloud Services - Freemium - Pay Per Reservation - Pay per User, Subscription based Charging - Procurement of Cloud - based Services - Capex vs Opex Shift - Cloud service Charging - Cloud Cost Models - Create Billing alerts for your Cloud Organization

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UNIT V CLOUD SERVICE GOVERNANCE & VALUE 9

IT Governance Definition - Cloud Governance Definition - Cloud Governance Framework - Cloud Governance Structure - Cloud Governance Considerations - Cloud Service Model Risk Matrix - Understanding Value of Cloud Services - Measuring the value of Cloud Services - Balanced Scorecard - Total Cost of Ownership.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Effectively manage and support cloud-based IT services principles.
- Develop and implement strategies to adopt and optimize cloud services.
- Manage and optimize cloud services to ensure efficient, secure, and reliable delivery.
- Analyze costs and benefits to optimize cloud service investments.
- Implement governance to maximize cloud value, compliance, and risk.

TEXT BOOKs:

1. Enamul Haque, "Cloud Service Management and Governance: Smart Service Management in Cloud Era", Enel Publications, 2023.
2. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, "Cloud Computing: Concepts, Technology & Architecture", First Edition, Pearson Education 2014

REFERENCES:

1. Thomas Erl, Ricardo Puttini, Zaigham Mohammad, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall Publication, 2013.
2. Thomas Erl, Robert Cope, Amin Naserpour, "Cloud Computing Design Patterns", Prentice Hall Publication, 2015.
3. Praveen Ayyappa, "Economics of Cloud Computing", LAP Lambert Academic Publishing, 2020.
4. Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi, "Mastering Cloud Computing Foundations and Applications Programming", MK, 2013.

COs - POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	1	1	1	-	-	-	2	1	3	2	1
2	3	1	2	3	2	-	-	-	3	3	1	2	2
3	1	1	3	1	3	-	-	-	3	3	2	2	1
4	3	3	3	3	3	-	-	-	3	3	2	2	1
5	3	3	3	3	3	-	-	-	3	3	2	1	2
Average	**2.60**	**2.20**	**2.40**	**2.20**	**2.40**	**-**	**-**	**-**	**2.80**	**2.60**	**2.00**	**1.80**	**1.40**

CHAIRMAN
BoS (CSE)

24CS305PE	SECURITY AND PRIVACY IN CLOUD (Common to AD & CSE)	L 3	T 0	P 0	C 3

OBJECTIVES:

The Student should be made to:

- Explain cloud computing models and related security challenges.
- Analyze and design secure cloud infrastructure.
- Implement access control and identity management mechanisms in cloud systems.
- Evaluate cloud security design patterns and management strategies.
- Assess privacy, security-as-a-service, and cloud auditing mechanisms.

UNIT I CLOUD COMPUTING AND SECURITY FUNDAMENTALS 9

Cloud Computing Defined - The SPI Framework for Cloud Computing - The Traditional Software Model - The Cloud Services Delivery Model - Cloud Deployment Models - Key Drivers to Adopting the Cloud - The Impact of Cloud Computing on Users - Governance in the Cloud - Overview of Cloud Security - Security Services– Basics of Cryptography - Conventional and Public-Key Cryptography - Hash Functions - Authentication Mechanisms - Digital Signatures.

UNIT II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD 9

Security design principles for cloud computing - Comprehensive data protection and end-to-end access control - Common threats and attack vectors - Infrastructure security at network, host, and application levels - Secure isolation and virtualization strategies - Inter-tenant segmentation - Data protection strategies including retention, deletion, archiving - Data security aspects and mitigation techniques - Encryption, redaction, tokenization, obfuscation - PKI, key management, and provider data security.

UNIT III ACCESS CONTROL AND IDENTITY MANAGEMENT 9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention

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UNIT IV CLOUD SECURITY DESIGN PATTERNS AND MANAGEMENT 9

Introduction to Cloud Security Design Patterns - Cloud Bursting - Geo-tagging - Secure Cloud Interfaces - Cloud Resource Access Control - Secure On-Premise Internet Access - Secure External Cloud - Security Management in the Cloud - Security Management Standards - Availability Management - SaaS, PaaS, and IaaS Availability Management - Access Control Mechanisms - Security Vulnerability Management - Patch Management - Configuration Management.

UNIT V PRIVACY, SECURITY-AS-A-SERVICE AND CLOUD MANAGEMENT 9

Privacy in Cloud Computing - Data Life Cycle - Key Privacy Concerns - Privacy Risk Management and Compliance - Security-as-a-Service: Email Filtering - Web Content Filtering - Identity-as-a-Service - Monitoring and Auditing: Activity Monitoring - Incident Response - Audit Log Management - Cloud Management: User and Identity Management - Security Information and Event Management (SIEM).

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain cloud service models, deployment types, and their security impacts.
- Design secure cloud architectures using encryption and access control.
- Implement IAM techniques like RBAC, MFA, and SSO in cloud systems.
- Apply security design patterns and manage cloud configurations.
- Assess privacy risks and use auditing and security-as-a-service tools.

TEXT BOOKs:

1. Mather, Kumaraswamy and Latif, "Cloud Security and Privacy", OREILLY 2011.
2. Raj Kumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing:", Wiley 2013.
3. Dave shackleford, "Virtualization Security", SYBEX a wiley Brand 2013.

REFERENCES:

1. Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.
2. Mark C. Chu-Carroll, "Code in the Cloud", Pragmatic Bookshelf, 2011.
3. Dave shackleford, "Virtualization Security: Protecting Virtualized Environments", SYBEX a wiley Brand, 2012.
4. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering the Cloud Computing", Morgan Kaufmann, 2013.
5. Chris Dotson, "Practical Cloud Security", O'Reilly Media, 2019.

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COs - POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	-	-	2	2	2	-	-	-	1	3	1
2	3	3	3	2	2	2	2	-	-	-	-	3	2
3	3	3	3	2	2	1	1	1	-	-	-	3	3
4	3	3	3	2	2	1	-	2	-	-	-	3	2
5	3	3	3	2	3	2	2	-	-	-	2	2	3
Average	**3**	**3**	**3**	**2**	**2.2**	**1.6**	**1.75**	**1.5**	**-**	**-**	**1.5**	**2.8**	**2.2**

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BoS (CSE) 23/9/25

24AD304PE	EDGE COMPUTING	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the evolution from cloud to edge computing and the need for low-latency, real-time processing
- Explain the architecture, infrastructure, and platforms that support edge computing environments
- Explore edge computing applications in domains such as 5G, IoT, self-driving cars, and distributed systems
- Familiarize learners with containerization, orchestration, messaging protocols, and analytics pipelines for edge deployments
- Enable students to apply machine learning and deep learning techniques for intelligent edge-based applications

UNIT I CLOUD TO EDGE EVOLUTION AND ARCHITECTURES 9

Introduction to Cloud Computing: Definition of cloud computing - Service models Deployment model -Advantages of cloud computing. From Cloud to Edge Computing: Waves of Innovation: Drivers for edge computing adoption (IoT growth, 5G, AI) - Comparison: Cloud vs. Fog vs. Edge computing. Introduction to Edge Computing Architectures. Edge-to-cloud communication models - Scalability, fault tolerance, and interoperability considerations.

UNIT II EDGE COMPUTING FOR USER APPLICATIONS 9

Edge Computing for User Applications: Overview of application domains for edge computing - 5G Network Slicing - Self-Driving Cars - Internet of Things (IoT). Concepts of Distributed Systems in Edge Computing: Time Ordering in Distributed Systems - Clock Synchronization - Distributed Snapshots.

UNIT III EDGE INFRASTRUCTURE AND SERVICES 9

Edge Data Centers: Definition and characteristics of edge data centers - Differences between traditional and edge data centers - Physical deployment models. Lightweight Edge Clouds: Concept and need for lightweight edge cloud platforms. Services Provided by Different Edge Service Providers - Edge-as-a-Service (EaaS) model - Comparison of services and deployment scenarios. Edge Storage Systems: Need for specialized storage in edge computing - Design principles for key-value stores at the edge - Popular key-value store technologies (e.g., Redis, RocksDB) in edge environments.

UNIT IV EDGE PLATFORMS AND DATA PIPELINES 9

Docker Containers in Edge Computing: Concept, advantages and Role of Docker in lightweight deployment at the edge - Security and resource optimization in containerized edge systems. Kubernetes in Edge Computing: Overview of Kubernetes architecture- Edge-specific Kubernetes distributions - Challenges of running Kubernetes in constrained edge environments. MQTT for End-to-End Edge Pipelines - Edge Analytics Topologies - Centralized vs. decentralized analytics at the edge - Topologies for M2M and WSN networks - Case study: MQTT-based analytics in a sensor network.

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UNIT V INTELLIGENCE AT THE EDGE **9**

Machine Learning for Edge Sensor Data: Overview of edge-based machine learning - Data acquisition and preprocessing at the edge - Predictive Maintenance - Image Classification at the Edge. Deep Learning On-Device Inference: Definition and benefits of on-device inference - Frameworks for edge deep - Model optimization techniques - Latency considerations for AI-powered edge applications. Latency-Sensitive Applications at the Edge - Edge AI vs. Cloud AI.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of this course, the students will be able to

- Describe the limitations of cloud computing for latency-sensitive applications and the advantages of edge computing
- Analyze and design edge architectures and distributed system components for real-time processing
- Evaluate the role of edge data centers, lightweight edge clouds, and storage systems in various service scenarios
- Implement container-based deployments, orchestration, and messaging protocols for end-to-end edge data pipelines
- Apply machine learning and deep learning inference techniques to develop and optimize latency-sensitive edge applications

TEXT BOOK:

1. Lanyu Xu & amp, Weisong Shi, "Edge Computing: Systems and Applications", 1st Edition, 2025.
2. K Anitha Kumari, G Sudha Sadasivam, D Dharani, M Niranjana Murthy, "Edge Computing: Fundamentals, Advances and Applications", 1st Edition, 2021.

REFERENCE BOOKS:

1. Rajkumar Buyya (Editor), Satish Narayana Srirama (Editor), "Fog and Edge Computing: Principles and Paradigms", Wiley, 2019.
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
3. Rajiv Misra, Yashwant Patel, "Cloud and Distributed Computing: Algorithms and Systems", Wiley 2020.

CO/PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	2	1	-	-	-	2	-	1	3	2
CO2	2	3	3	3	2	-	-	-	2	-	1	3	3
CO3	2	3	2	3	2	-	-	-	1	-	1	3	3
CO4	1	2	3	3	3	-	-	-	2	-	2	3	3
CO5	2	3	3	3	3	-	-	-	2	-	2	3	3
Average	2.0	2.6	2.2	2.8	2.2	-	-	-	1.8	-	1.4	3.0	2.8

CHAIRMAN
BoS (AD)

24AD305PE	INFORMATION RETRIEVAL TECHNIQUES	L T C P
	(COMMON TO AD AND IT)	3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the basics of information retrieval, including text processing, search models, and evaluation methods
- Explain mathematical and probabilistic models used in search systems
- Explore advanced techniques like topic modelling and web link analysis for better search relevance
- Demonstrate how to build efficient indexing and search systems using compression and processing algorithms
- Apply machine learning techniques to improve modern search systems, including explainable and neural-based retrieval

UNIT I INTRODUCTION TO INFORMATION RETRIEVAL 9

Basic Text Processing: Tokenization Stop words Stemming Lemmatization - Zipf's and Heap's law. Spelling correction and Edit distances: Hamming distance - longest common Subsequence - Levenstein edit distance Boolean Retrieval Model. Basic Ranking and Evaluation Measures: Vector Space Model - TF*IDF - IR Evaluation: Precision - Recall, F-measures - Mean Reciprocal Rank (MRR) - Mean Average Precision (MAP) - Normalized Discounted Cumulative Gain (NDCG) - Designing test collection - relevance judgments.

UNIT II MODELING 9

Probabilistic Retrieval Model: Introduction - Generative Model - Probabilistic Ranking Principle - Binary Independence Model - Okapi 25 - Bayesian Networks for IR. Statistical Language Model: Basics of Language Model - Query-likelihood Approach and different Smoothing Methods - Advance Query Type: Query expansion - Relevance feedback - Novelty and Diversity.

UNIT III TOPIC MODELING AND LINK ANALYSIS 9

Introduction to topic model - Latent Semantic Indexing - Probabilistic Latent Semantic Indexing - Latent Dirichlet Allocation - Topic model for IR. Link Analysis Introduction: World Wide Web as Graph - PageRank - HITS - Topic-specific and Personalized PageRank.

UNIT IV INDEXING AND SEARCHING 9

Compression Methods: Ziv-Lempel - Variable-Byte - Gamma - Golomb - Gap encoding. Query Processing: TAAT - DAAT - WAND - Fagin's algorithm. Near Duplicate Detection: Shingling - Min-wise independent permutations - locality sensitive hashing.

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UNIT V SUPERVISED AND UNSUPERVISED RETRIEVAL TECHNIQUES 9

Retrieval using word-embeddings and clustering - Introduction to Learning to Rank for retrieval - Retrieval using classification - Explainable Information Retrieval (XIR) - Retrieval-Augmented Generation (RAG) - Privacy and Ethical Issues in IR.

Total: 45 Hours

OUTCOMES:

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

- Understand and apply fundamental text processing techniques and retrieval models used in information retrieval systems
- Analyse and implement string similarity, ranking, and evaluation methods to measure retrieval effectiveness
- Apply probabilistic and language modelling techniques, including advanced query refinement methods
- Use topic modelling, link analysis, and indexing techniques for efficient and accurate information retrieval
- Apply machine learning and recent advances such as neural models, explainable IR, and address ethical aspects of retrieval systems

TEXT BOOKS:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
2. Stefan Büttcher, Charles L A Clarke, Gordon V Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", MIT Press, 2010.

REFERENCES:

1. Jure Leskovec, Anand Rajaraman, Jeffrey D Ullman, "Mining of Massive Datasets", Cambridge University Press, 2011. ISBN: 978-1107077232.
2. Larry Wasserman, "All of Statistics", Springer, 2004. ISBN-13: 978-0387402727.

CO - PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	0	2	3	-	-	0	0	0	2	3	2
CO2	3	3	2	3	3	-	-	0	0	0	2	3	2
CO3	3	3	2	3	3	-	-	0	0	2	2	3	2
CO4	3	2	2	2	3	-	-	0	1	1	2	3	1
CO5	3	3	2	2	3	-	-	2	2	2	3	3	3
Average	3.00	2.60	2.00	2.40	3.00	-	-	2.00	1.50	2.50	2.20	3.00	2.40

CHAIRMAN
BoS (AD)

24IT101PE	CYBER SECURITY (Common to AD, CSE and IT)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concepts of cyber security, threats, and attack surfaces.
- Learn cryptographic principles, vulnerabilities, and secure communication methods.
- Explore system, network, and application-level security with Indian case studies.
- Gain practical exposure to tools for reconnaissance, detection, and defense.
- Study ethical, legal, and industrial aspects of cyber security practices in India

UNIT I INTRODUCTION TO CYBER SECURITY AND INDIAN CONTEXT 9

Cyber security: Evolution and Need - History of Internet and its Impact - CIA Triad - Cybercrime: Causes, History - Motivations - Classification of Cybercrimes: Financial Fraud - Phishing - Ransomware - Cyber Criminals and their Profiles - Indian Cyber Laws: IT Act 2000 and amendments - Digital Personal Data Protection Act 2023 - Cybercrime and Punishment - Role of CERT-In, National Cyber Security Policy - RBI and SEBI guidelines.

UNIT II ATTACKS, VULNERABILITIES, AND COUNTERMEASURES 9

OWASP Top 10 - Malware - Ransomware - Insider Threats - Wireless Network Attacks: Wi-Fi Sniffing - Evil Twin - KRACK - Web Application Attacks in India: Banking/UPI Frauds - Aadhaar Breaches - Attack Vectors and Tools: Metasploit - Burp Suite - Countermeasures: Patching - Secure Coding - MFA - Network Monitoring.

UNIT III RECONNAISSANCE AND INFORMATION GATHERING 9

Footprinting and Reconnaissance: Harvester - Whois - Netcraft - Shodan - Information Gathering: DNS - Email Servers - Social Media - Scanning Techniques: Port Scanning - Vulnerability Scanning - Banner Grabbing and OS Fingerprinting - Case study: Aadhaar Data Leaks and Government Portal Exposures.

UNIT IV INTRUSION DETECTION & CYBER DEFENSE 9

Host-based IDS - Network-based IDS - Distributed/Hybrid IDS - Intrusion Detection Exchange Format - Honeypots and Deception Systems - Tools: Snort - Suricata - Zeek - SIEM Platforms: Splunk - ELK Stack - Indian Initiatives: National Cyber Coordination Centre - Cyber Surakshit Bharat.

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UNIT V INTRUSION PREVENTION AND INDUSTRY PRACTICES 9

Firewalls: Policies - Placement - Configurations - Intrusion Prevention Systems - Unified Threat Management - Compliance Standards: RBI - SEBI - UIDAI - Cyber Ethics & Bug Bounty Programs in Indian IT Industry - Emerging Trends: AI/ML in Security - Quantum-Safe Cryptography - Case Studies: AIIMS Ransomware Attack (2022) - Cosmos Bank.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply Knowledge of mathematics, computing, and security principles to solve engineering problems.
- Identify, analyze, and design solutions for real-world cyber security problems.
- Use modern tools, frameworks, and techniques for implementing cyber security solutions.
- Communicate effectively and work in teams to solve security challenges.
- Apply ethical, legal, and sustainable practices in cyber security.

TEXT BOOKs:

1. William Stallings, Cryptography and Network Security. Pearson, 8th Edition, 2022.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger, Security in Computing. Pearson, 5th Edition, 2015.
3. Mark Ciampa, Security Guide to Network Security Fundamentals. Cengage, 7th Edition, 2021.

REFERENCES:

1. Ross Anderson, Security Engineering. Wiley, 3rd Edition, 2020.
2. EC-Council, Certified Ethical Hacker (CEH) Study Guide. Wiley, 2020.
3. NIST Cybersecurity Framework, 2023 (online resource). ISO/IEC 27001:2022, Information Security Management Standard.

COs – POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	2	1	2	-	-	-	-	-	-
2	3	3	2	2	2	-	-	-	2	-	-
3	3	3	3	2	2	1	-	-	2	-	-
4	2	3	3	2	2	1	1	-	3	-	-
5	2	2	2	2	3	1	1	2	3	2	2
Average	2.60	2.60	2.40	1.80	2.2	1.00	1.00	2.00	2.50	2.00	2.00

CHAIRMAN
BoS (IT)

24AD401PE	CYBER SECURITY AND PRIVACY	L T P C
	(COMMON TO AD AND IT)	3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the foundational principles of cyber security, including the CIA triad and common security breaches
- Analyze governance, risk management, and compliance (GRC) frameworks used in industry and organizations
- Learn and apply contingency planning, incident response, and cyber security policy frameworks
- Explore core cyber security technologies such as encryption and access control, and examine industry-specific threats
- Understand the principles of information privacy, regulatory compliance frameworks (GDPR, DPDP), and the economic and ethical aspects of privacy

UNIT I INTRODUCTION TO CYBER SECURITY 9

Overview of Cyber Security - Importance of Cyber Security in today's world - Basic principles: Confidentiality - Integrity - Availability (CIA) - Foundations of Cyber Security - Fundamental Concepts in Cyber Security - Detailed study of the CIA Triad - Case Study: Data Breach at Target.

UNIT II SECURITY MANAGEMENT AND GOVERNANCE 9

Overview of GRC Framework - Understanding Security Standards - GRC in Cyber Security Management - Incident Response: Processes and Best Practices - Disaster Recovery (DR) Planning - Business Continuity Planning (BCP).

UNIT III CYBER SECURITY POLICIES AND RISK MANAGEMENT 9

Enterprise Security Policies (ESSP) - Information Security Policies (ISSP) - System Security Policies (SYSSP) - Cyber Risk Identification and Assessment - Control Measures for Cyber Risks - Frameworks and Tools for Risk Mitigation.

UNIT IV PRIVACY AND REGULATORY PERSPECTIVES 9

Understanding Information Privacy - Methods for Measuring Privacy - Theories of Privacy - Overview of Privacy, Anonymity, and Regulation - Impact of Data Breaches on Privacy - Privacy Regulations and their Significance.

UNIT V INDUSTRY PERSPECTIVE AND PRIVACY REGULATIONS 9

Défense Technologies in Cyber Security - Attacks and Exploits in the Cyber World - Case Study: Industry-specific Cyber Security Challenges - Overview of Access Control Mechanisms - Encryption Technologies and Standards - Data Protection and Privacy in Europe: GDPR - India's Data Protection: DPDP and Aadhar - Comparisons between Global Privacy Frameworks - Economic Value of Privacy - Privacy Valuation Models: WTA and WTC - Business Strategy and Privacy Management.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Describe fundamental cyber security concepts, the CIA triad, and real-world data breaches
- Apply governance and risk management principles to assess organizational cyber security preparedness
- Develop contingency plans including incident response, disaster recovery, and business continuity strategies
- Evaluate and implement cyber security technologies such as access control and encryption within an enterprise setting
- Analyse privacy regulations (GDPR, DPDP), information privacy concerns, and the economic value of privacy in strategic decision-making

TEXT BOOKS:

1. Michael E Whitman, Herbert J Mattord, "Principles of Information Security", 6th Edition, Cenage Learning, N. Delhi, 2018.
2. Darktrace, "Technology", https://www.darktrace.com/en/technology/#machine-learning, accessed November 2018.
3. Van Kessel P, "Is cyber security about more than protection?", EY Global Information Security Survey 2018-2019.
4. Johnston, A.C. and Warkentin M, "Fear appeals and information security behaviours: An empirical study", MIS Quarterly, 2010.

REFERENCES:

1. Arce I et al, "Avoiding the top 10 software security design flaws, IEEE Computer Society Center for Secure Design (CSD), 2014.
2. Smith, H J, Dinev T, & Xu H, "Information privacy research: an interdisciplinary review, MIS Quarterly, 2011.
3. Acquisti A, John L K, & Loewenstein G, "What is privacy worth?" , The Journal of Legal Studies, 2013
4. Xu H, Luo X R, Carroll J M, Rosson M B, "The personalization privacy paradox: An exploratory study of decision making process for location-aware marketing" , Decision Support Systems, 2011.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	3	2	-	-	3	2	2	3	3
CO2	3	3	3	2	3	2	-	-	2	1	3	3	3
CO3	3	3	3	3	3	3	-	-	3	2	3	3	3
CO4	3	3	3	2	3	3	-	-	3	1	3	3	3
CO5	3	3	3	3	3	3	-	-	3	2	3	3	3
Average	3.00	3.00	2.80	2.20	3.00	2.60	-	-	2.80	1.60	2.80	3.00	3.00

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BoS (AD)

24IT103PE	ETHICAL HACKING	L	T	P	C
	(Common to AD, CSE & IT)	2	0	2	3

OBJECTIVES:

The Student should be made to:

- Understand the principles, application areas and legal framework governing ethical hacking.
- Acquire skills in reconnaissance, scanning, exploitation, and securing systems.
- Equip students to test and protect networks, web applications and mobile platforms.
- Provide exposure to advanced security domains like IoT, cloud, malware analysis, and cryptography.
- Prepare students for professional certifications and industry careers in cybersecurity.

UNIT I FOUNDATIONS AND RECONNAISSANCE 6

Ethical Hacking Concepts - Definitions - Hacker Types - Cyber Laws - Professional Ethics - TCP/IP Protocol Review - Common Attack Vectors - Malware Overview - Footprinting - Reconnaissance - Passive and Active Information Hathering.

UNIT II SCANNING AND ENUMERATION 6

Network Scanning: Host Discovery - Port Scanning - Service Detection: Nmap - Masscan - Vulnerability Scanning Tools: Nessus - OpenVAS - Enumeration: SNMP - LDAP - SMB - NetBIOS - DNS - NTP - Banner Grabbing - OS Fingerprinting Techniques.

UNIT III SYSTEM AND NETWORK HACKING 6

System Hacking Phases: Gaining Access - Privilege Escalation - Maintaining Access, - Clearing Tracks - Exploitation using Metasploit Framework - Post-exploitation Techniques - Wireless Attacks: WEP/WPA/WPA2 Cracking - Evil Twin AP - Packet Sniffing.

UNIT IV WEB AND APPLICATION SECURITY 6

Web Server Vulnerabilities and Misconfigurations - OWASP Top 10 Vulnerabilities: SQL Injection - XSS - CSRF - LFI/RFI - SSRF - API Security Flaws and Testing - Session Hijacking Methods: Token/Cookie Theft - Replay - Fixation.

UNIT V ADVANCED SECURITY AND EMERGING TECHNIQUES 6

Evasion Techniques: IDS/IPS Bypass - Firewall Evasion - Honeypot Detection - Malware threats: Classification - Static/Dynamic Analysis - Sandboxing - AV Evasion - Mobile Platform Security: Android/iOS.

THEORY: 30 PERIODS

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LIST OF EXPERIMENTS

1. Perform footprinting and reconnaissance using OSINT tools (WHOIS, nslookup, Maltego, Recon-ng) in a simulated environment.
2. Demonstrate social engineering techniques (phishing simulation / fake login page) and explain countermeasures.
3. Conduct network scanning and host discovery using Nmap/Masscan to identify open ports and running services.
4. Perform vulnerability scanning of a test system using Nessus/OpenVAS and generate a report.
5. Demonstrate system hacking techniques (password cracking, privilege escalation) using Metasploit in a controlled lab VM.
6. Simulate wireless network attacks (WEP/WPA cracking, Evil Twin AP) and demonstrate preventive measures.
7. Test for web application vulnerabilities (SQL Injection, XSS, CSRF) using Burp Suite or OWASP ZAP on a demo web app.
8. Perform a session hijacking attack (cookie/token capture and replay) in a safe lab setup and suggest defenses.
9. Conduct malware analysis (static and dynamic) of a sample malware in a sandbox and document findings.

PRACTICALS: 30 PERIODS
TOTAL: 60 PERIODS

OUTCOMES:

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

- Explain the principles, scope, and legal aspects of ethical hacking.
- Perform reconnaissance, scanning using industry-standard tools and techniques.
- Exploit and secure operating systems and applications in simulated environments.
- Assess and mitigate vulnerabilities in web, wireless, and mobile platforms.
- Apply advanced security testing for cloud, IoT, and malware analysis, and prepare professional security reports.

TEXT BOOKs:

1. Patrick Engebretson, The Basics of Hacking and Penetration Testing. 4th Edition, Syngress, 2022.
2. Dafydd Stuttard, Marcus Pinto, The Web Application Hacker's Handbook. 2nd Edition, Wiley, 2011.
3. EC-Council, Certified Ethical Hacker (CEH) v13 Official Curriculum. EC-Council Press, 2025.

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REFERENCES:

1. Georgia Weidman, Penetration Testing: A Hands-On Introduction to Hacking. No Starch Press, 2019.
2. Kevin Mitnick, The Art of Invisibility. Little, Brown and Company, 2017.
3. Peter Kim, The Hacker Playbook 3: Practical Guide to Penetration Testing. Secure Planet, 2018.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	3	2	2	-	-	-	-	1	2
2	2	3	3	3	3	-	-	-	-	1	2
3	3	3	3	3	3	2	-	-	-	1	2
4	3	3	3	3	3	2	-	1	-	1	2
5	3	3	3	3	3	-	-	1	-	1	2
Average	2.60	2.80	3.00	2.80	2.80	2.00	-	1.00	-	1.00	2.00

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BoS (IT) 23/10/25

24AD402PE	DIGITAL FORENSICS	L T P C
	(COMMON TO AD AND IT)	3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the fundamentals of cyber forensics, including methods, tools, and techniques used in cyber investigations
- Explore different computer forensic technologies and systems used in law enforcement, military, and corporate sectors
- Understand the legal aspects of evidence collection, data seizure, and the investigation of digital crime scenes
- Provide insights into cyber laws and the Indian legal framework governing cyberspace
- Familiarize students with various types of cybercrimes, punishments, digital signature mechanisms, and E-governance practices

UNIT I INTRODUCTION TO CYBER FORENSICS 10

Cyber forensics: Information Security Investigations - Corporate Cyber Forensics - Scientific method in forensic analysis - investigating large scale Data breach cases - Analyzing malicious software. Types of Computer Forensics Technology - Types of Military Computer Forensic Technology - Types of Law Enforcement: Computer Forensic Technology - Types of Business Computer Forensic Technology - Specialized Forensics Techniques - Spyware and Adware - Encryption Methods and Vulnerabilities - Protecting Data from Being Compromised Internet Tracing Methods - Security and Wireless Technologies - Avoiding Pitfalls with Firewalls Biometric Security Systems.

UNIT II COMPUTER FORENSICS 9

Types of Computer Forensics Systems: Internet Security Systems - Intrusion Detection Systems - Firewall Security Systems - Storage Area Network Security Systems - Network Disaster Recovery Systems - Public Key Infrastructure Systems - Wireless Network Security Systems - Satellite Encryption Security Systems - Instant Messaging (IM) Security Systems - Net Privacy Systems - Identity Management Security Systems - Identity Theft - Biometric Security Systems - Router Forensics - Cyber forensics tools and case studies. Ethical Hacking: Essential Terminology - Windows Hacking - Malware - Scanning - Cracking.

UNIT III EVIDENCE COLLECTION AND DATA SEIZURE 9

Collecting Evidence - Collection Options Obstacles - Types of Evidence - The Rules of Evidence - Volatile Evidence - General Procedure - Collection and Archiving - Methods of Collection - Controlling Contamination: The Chain of Custody - Reconstructing the Attack - The digital crime scene - Investigating Cybercrime - Investigating Web attacks - Investigating network Traffic - Identification of Data: Timekeeping - Forensic Identification and Analysis of Technical Surveillance Devices - Reconstructing Past Events.

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UNIT IV CYBERSPACE **8**

Basic of law - Understanding cyber space - Defining cyber law - Scope and jurisprudence - Concept of jurisprudence - Overview of Indian legal system - Introduction to IT Act 2000 - Amendment in IT Act.

UNIT V CYBER CRIMES **9**

Cyber Crimes - Types of cyber-crimes against individual institution - various offenses and punishments - digital signature concepts of public key and private key - certification authorities and their role - creation and authentication of digital signature. E-contracting - salient features of E-contracts - formation of E-contracts and types - E-governance - E-governance models - E-commerce salient features and advantages.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Describe the principles, scope, and scientific approach of cyber forensics and its application in different sectors
- Identify and analyze various forensic technologies and tools used in military, law enforcement, and corporate investigations
- Apply procedures for collecting digital evidence, maintaining the chain of custody, and reconstructing cybercrime incidents
- Explain the legal aspects of cyberspace and analyze the impact of IT Act 2000 and its amendments on cybercrime investigations
- Examine various types of cybercrimes and apply concepts related to digital signatures, E-contracts, E-governance, and E-commerce in a legal context

TEXT BOOKS:

1. John R Vacca, "Computer Forensics: Computer Crime Scene Investigation", 2nd Edition, Charles River Media, 2005.
2. Ravi Kumar & B Jain, "Cyber Forensics - Concepts and Approaches", ICFAI university press, 2006.
3. Christof Paar & Jan Pelzl, "Understanding Cryptography: A Textbook for Students and Practitioners, 2nd Edition, Springer's, 2024.

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REFERENCES:

1. Ali Jahangiri, "Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts", First edition, 2009.
2. Harley Hahn, "Internet Complete Reference, second Edition, Osborne/McGraw- Hill, 1996.
3. Ramesh Bangia, "Internet and Web design", Firewall Media, (An imprint of Lakshmi Publications Pvt. Ltd), Second Edition, 2006.
4. Barkhs and U Rama Mohan, "Cyber Law Crimes", Third Edition, Asia Law House, 2017.
5. Viveek Sood, "Cyber Laws Simplified", Fourth reprint, McGrawHill, 2008.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	0	0	0	2	1	-	-	-	2	2	2
CO2	2	3	3	2	3	0	1	-	-	-	2	3	2
CO3	0	2	3	3	3	2	2	-	-	-	3	3	2
CO4	0	2	0	0	0	3	3	-	-	-	2	0	1
CO5	1	2	2	0	2	2	2	-	-	-	2	2	2
Average	1.66	2.20	2.66	2.50	2.66	2.25	2.25	-	-	-	2.20	2.50	1.80

CHAIRMAN
BoS (AD) 25/09/25

24CS403PE	MODERN CRYPTOGRAPHY (Common to AD & CSE)	L 3	T 0	P 0	C 3

OBJECTIVES:

The Student should be made to:

- Understand the hardness assumptions underlying cryptographic primitives.
- Identify and classify different types of cryptographic attacks.
- Describe the concept of provable security and the role of random oracles.
- Analyze the Data Encryption Standard (DES) in the light of pseudorandom permutation constructions.
- Apply PRFs in constructing MACs, including variable-length MACs.

UNIT I INTRODUCTION **9**

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations.

UNIT II FORMAL NOTIONS OF ATTACKS **9**

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model.

UNIT III RANDOM ORACLES **9**

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo-random Functions (PRF).

UNIT IV BUILDING A PSEUDORANDOM PERMUTATION **9**

The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction.

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UNIT V MESSAGE AUTHENTICATION CODES 9

Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes: One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. Formally Analyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply the concepts of trapdoor permutations, hard-core predicates, and Goldwasser–Micali encryption
- Evaluate the inter-relationships among various attack models.
- Construct pseudorandom generators and functions from one-way functions.
- Apply the Luby–Rackoff construction to block cipher design.
- Evaluate one-way function assumptions in one-time signatures.

TEXT BOOKs:

1. J.P. Aumasson, "Serious Cryptography: A Practical Introduction to Modern Encryption", 2nd Edition, San Francisco, CA, USA: No Starch Press, 2024.
2. J. Katz and Y. Lindell, "Introduction to Modern Cryptography", 4th Edition, Boca Raton, FL, USA, Chapman & Hall/CRC, 2025.

REFERENCES:

1. Alfred Menezes, Paul van Oorschot, Scott Vanstone "A Handbook of Applied Cryptography", First edition, CRC Press, 1996.
2. Dan Boneh & Victor Shoup B, "A Graduate Course in Applied Cryptography", Open-access, 2023.

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	3	3	1	-	-	-	2	1	1	2	1
2	1	3	2	1	2	-	-	-	3	2	2	2	1
3	1	1	2	3	2	-	-	-	1	1	1	1	1
4	3	1	2	1	3	-	-	-	3	2	1	3	2
5	2	3	3	3	3	-	-	-	3	1	1	2	1
Average	2	2.2	2.4	2.2	2.2	-	-	-	2.4	1.4	1.2	2	1.2

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BoS (CSE)

24IT104PE	BLOCKCHAIN TECHNOLOGY	L	T	P	C
	(Common to AD, CSE ECE & IT)	3	0	0	3

OBJECTIVES:

The Student Should be Made to:

- Understand blockchain evolution, distributed systems, consensus, and decentralization.
- Learn Bitcoin structure, transactions, mining, wallets, altcoins, and limitations.
- Explore Ethereum components, EVM, and deploying applications on networks.
- Study Web3 frameworks, contract deployment, and enterprise blockchain platforms.
- Examine new blockchain platforms, challenges, research, and future projects.

UNIT I INTRODUCTION TO BLOCKCHAIN 9

Blockchain: The Growth of Blockchain Technology - Distributed Systems - History and Bitcoin - Features - Types - Consensus: Mechanism - Types - Consensus in Blockchain. Decentralization: Methods - Platforms - Routes - Blockchain and Full Ecosystem Decentralization - Smart Contracts - Decentralized Organizations.

UNIT II FUNDAMENTALS OF 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 - Transactions and Messages - Ether Cryptocurrency / Tokens - The Ethereum Virtual Machine - Ethereum Development Environment: Test Networks - Setting up a Private Net - Starting up the Private Network.

UNIT IV WEB3 AND HYPERLEDGE 9

Introduction To Web3 - Contract Deployment - POST Requests - Development Frameworks - Hyperledger as a Protocol - The 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,

- Able to explain the principles of Blockchain technology and its impact on digital Transactions.
- Compare and evaluate various consensus mechanisms used in Blockchain.
- Demonstrate knowledge of cryptocurrencies by analyzing Bitcoin, Alternative Coins, and their limitations.
- Develop and deploy Smart Contracts using Ethereum and Web3 frameworks.
- Assess Blockchain scalability and security challenges and explore emerging solutions.

TEXT BOOKs:

1. Imran Bashir, Mastering Blockchain. 3rd Edition, Packt Publishing, 2020.

REFERENCES:

1. Imran. Bashir. Mastering Block Chain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained. Packt Publishing. 2nd Edition, 2018.
2. Peter Borovykh, Blockchain Application In Finance, Blockchain Driven. 2nd Edition, 2018 Arshdeepbahga, Vijay Madisetti, Blockchain Applications: a Hands on Approach. VPT,2017.
3. Vikram Dhillon, David Metcalf and Max Hooper, Blockchain Enabled Applications:Understand The Blockchain Ecosystem and how to Make it Work for You. 1st Edition, Apress, 2017.

COs - POs Mapping:

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	1	2	2	2	1	-	-	-	3	2	1
2	3	1	2	2	2	-	-	-	3	2	1
3	2	2	1	1	2	-	-	-	3	2	1
4	2	3	2	2	3	-	-	-	3	2	1
5	3	2	3	3	2	-	-	-	3	2	1
Average	2.20	2.00	2.00	2.00	2.00	-	-	-	3.00	2.00	1.00

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BoS (IT)

24CS404PE	NETWORK SECURITY	L	T	P	C
	(Common to AD & CSE)	2	0	2	3

OBJECTIVES:

The Student should be made to:

- Learn the fundamentals of cryptography.
- Understand the key management techniques and authentication approaches.
- Apply the network and transport layer security techniques.
- Analyze and understand the application layer security standards.
- Evaluate the real-time security practices to protect systems and data.

UNIT I INTRODUCTION **6+6**

Basics of cryptography, conventional and public-key cryptography, hash functions, authentication, and digital signatures.

PRACTICALS:

1. Implement symmetric key algorithms.
2. Implement asymmetric key algorithms and key exchange algorithms.

UNIT II KEY MANAGEMENT AND AUTHENTICATION **6+6**

Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure. User Authentication: Remote User-Authentication Principles, Remote User-Authentication Using Symmetric Encryption, Kerberos Systems, Remote User Authentication Using Asymmetric Encryption.

PRACTICALS:

1. Implement digital signature schemes.
2. Installation of Wire shark, TCP dump and observe data transferred in client– server communication using UDP/TCP and identify the UDP/TCP datagram.

UNIT III ACCESS CONTROL AND SECURITY **6+6**

Network Access Control: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control - IP Security - Internet Key Exchange (IKE). Transport Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS standard, Secure Shell (SSH) application.

PRACTICALS:

1. Check message integrity and confidentiality using SSL.
2. Experiment Eavesdropping, Dictionary attacks, MITM attacks.

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UNIT IV APPLICATION LAYER SECURITY **6+6**

Electronic Mail Security: Pretty Good Privacy, S/MIME, DomainKeys Identified Mail. Wireless Network Security: Mobile Device Security.

PRACTICALS:

1. Experiment with Sniff Traffic using ARP Poisoning.
2. Demonstrate intrusion detection system using any tool.

UNIT V SECURITY PRACTICES **6+6**

Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Basing, Firewall Location and Configurations. Blockchains, Cloud Security and IoT security.

PRACTICALS:

1. Explore network monitoring tools.
2. Study to configure Firewall, VPN.

TOTAL: 60 PERIODS

OUTCOMES:

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

- Classify the encryption techniques.
- Illustrate the key management technique and authentication.
- Evaluate the security techniques applied to network and transport layer.
- Discuss the application layer security standards.
- Apply security practices for real time applications.

TEXT BOOK:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Global Edition, 8th Edition, July 2024.

REFERENCES:

1. M. Speciner, R. Perlman, C. Kaufman, "Network Security: Private Communications in a Public World", Prentice Hall, 2002.
2. J. Michael Stewart, "Network Security, Firewalls and VPNs", Jones & Bartlett Learning, 2013, ISBN-10: 1284031675, ISBN-13: 978-1284031676.
3. Michael Gregg, "The Network Security Test Lab: A Step-By-Step Guide", Dreamtech Press, 2015, ISBN-10:8126558148, ISBN-13: 978-8126558148.
4. William Stallings, "Network Security Essentials: Applications and Standards", 6th Edition 2017, Pearson.
5. Jean-Philippe Aumasson, "Serious Cryptography: A Practical Introduction to Modern Encryption", 2017, No Starch Press. ISBN: 9781593278267.

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COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	2	2	2	-	-	2	1	2	1	2	3
2	1	1	3	2	2	-	-	2	2	1	1	3	1
3	1	2	1	1	2	-	-	3	3	1	3	2	1
4	2	2	3	2	3	-	-	3	3	2	1	2	1
5	2	1	3	2	2	-	-	2	1	1	3	2	1
Average	**1.80**	**1.80**	**2.40**	**1.80**	**2.20**	**-**	**-**	**2.40**	**2.00**	**1.40**	**1.80**	**2.20**	**1.40**

CHAIRMAN
BoS (CSE) 23/9/25

24CS601PE	AUGMENTED REALITY / VIRTUAL REALITY	L	T	P	C
	(Common to AD, CSE, ECE, EEE & IT)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamental concepts and differences between Augmented Reality (AR) and Virtual Reality (VR).
- Explore various tools, platforms, and technologies used in AR/VR development.
- Understand the working principles of sensor devices used in AR/VR systems.
- Learn modeling techniques for designing virtual and augmented environments.
- Develop simple AR/VR applications for use in diverse real-world domains.

UNIT I INTRODUCTION 9

History of AR - Augmented Reality characteristics - Introduction to Virtual Reality and Augmented Reality - Definition - Introduction to Trajectories and Hybrid Space - Three I's of Virtual Reality - Virtual Reality Vs 3D Computer Graphics - Benefits of Virtual Reality - Components of VR System - Input Devices - 3D Position Trackers - Types of Trackers - Navigation and Manipulation Interfaces - Gesture Interfaces - Types of Gesture - Input Devices - Output Devices - Graphics Display - Human Visual System - Personal Graphics Displays - Large Volume Displays - Sound Displays - Human Auditory System.

UNIT II VR MODELING 9

Modeling - Geometric Modeling - Virtual Object Shape - Object Visual Appearance - Kinematics Modeling - Transformation Matrices - Object Position - Transformation Invariants - Object Hierarchies - Viewing the 3D World - Physical Modeling - Collision Detection - Surface Deformation - Force Computation - Force Smoothing and Mapping - Behavior Modeling - Model Management - Software tools available for VR.

UNIT III AUGMENTED REALITY 9

Introduction to Augmented Reality - Augmented Reality methods - Computer vision for AR - Interaction - Modelling and Annotation - Navigation - Wearable devices

UNIT IV AR AND VR PROGRAMMING 9

AR and VR Libraries - VR Programming - Toolkits and Scene Graphs - World ToolKit - Java 3D - Comparison of World ToolKit and Java 3D - 3D Manipulation tasks - Interaction Techniques for 3D Manipulation.

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UNIT V APPLICATIONS 9

Human Factors in VR - Methodology and Terminology - VR Health and Safety Issues - VR and Society - Medical Applications of VR - Military VR Applications - Emerging Applications of VR - VR Applications in Manufacturing - Applications of VR in Robotics - Information Visualization - VR in Business - VR in Entertainment - VR in Education.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the basic concepts of AR and VR.
- Explain the tools and technologies related to AR/VR.
- Analyze the working principles and functionalities of AR/VR-related sensor devices.
- Design of various models using modeling techniques.
- Develop AR/VR applications in different domains.

TEXT BOOKs:

1. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016.
2. William R. Sherman, Alan B. Craig: "Understanding Virtual Reality - Interface, Application, Design", Morgan Kaufmann, 2018.

REFERENCES:

1. John Vince, "Introduction to Virtual Reality", Springer Verlag, 2004.
2. Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile and Desktop", Packt Publisher, 2018.
3. Erin Pangilinan, Steve Lukas, and Vasanth Mohan, "Creating Augmented and Virtual Realities: Theory and Practice for Next– Generation Spatial Computing", 1st Edition, O'Reilly Media, 2019.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	2	-	3	-	-	2	2	1	2
2	3	2	2	1	3	-	-	3	2	2	3
3	3	3	2	2	3	-	-	3	2	1	2
4	3	3	3	2	3	-	-	3	2	2	3
5	3	3	3	3	3	-	-	3	3	3	3
Average	**3.00**	**2.60**	**2.40**	**2.00**	**3.00**	**-**	**-**	**2.80**	**2.20**	**1.80**	**2.60**

CHAIRMAN
BoS (CSE)

28/11/25

24IT301PE	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
	(Common to CSE, AD & IT)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Gain knowledge of illumination, colour models and output primitives.
- Understand 2D graphics, transformations and clipping techniques.
- Learn 3D graphics, object representations and viewing transformations.
- Explore multimedia system design, standards and data Handling.
- Understand hypermedia concepts, messaging standards and blender basics.

UNIT I ILLUMINATION AND COLOR MODELS **9**

Light sources - Basic Illumination Models - Halftone Patterns and Dithering Techniques: Properties of Light - Standard Primaries and Chromaticity Diagram; Intuitive Colour Concepts - Colour Models - Colour Selection - Output Primitives - Points and Lines - Line Drawing Algorithms - Loading the Frame Buffer - Line Function - Circle and Ellipse Generating Algorithms - Pixel Addressing and Object Geometry - Filled Area Primitives.

UNIT II TWO DIMENSIONAL GRAPHICS **8**

Two Dimensional Geometric Transformations - Matrix Representations - Homogeneous Coordinates, - Composite Transformations - Two Dimensional Viewing - Viewing Coordinate Reference Frame - Window-to-Viewport Coordinate Transformation - Two Dimensional Viewing Functions - Clipping Operations Point - Line and Polygon Clipping Algorithms.

UNIT III THREE DIMENSIONAL GRAPHICS **10**

Three Dimensional Concepts - Three Dimensional Object Representations - Polygon Surfaces - Polygon Tables - Plane Equations - Polygon Meshes - Curved Lines - Curved and Quadratic Surfaces - Blobby Objects - Spline Representations - TRANSFORMATION AND VIEWING: Three Dimensional Geometric - Modeling Transformations - Three Dimensional Viewing - Visible Surface Detection Methods.

CHAIRMAN
BoS (IT)

UNIT IV MULTIMEDIA SYSTEM DESIGN AND FILE HANDLING 10

Multimedia: Basics - Applications - System Architecture - Evolving Technologies - Defining Objects - Data Interface Standards - Databases - Compression and Decompression - Data and File Format Standards - Multimedia I/O Technologies - Digital Voice and Audio - Video Image and Animation - Full Motion Video - Storage and Retrieval Technologies.

UNIT V HYPERMEDIA 8

Multimedia Authoring and User Interface - Hypermedia Messaging - Mobile Messaging - Hypermedia Message Component - Creating Hypermedia Message - Integrated Multimedia Message Standards - Distributed Multimedia Systems. Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Able to design 2D/3D graphics, rendering and transformations.
- Building a portfolio with 3D models and animations.
- Construct programs using computer animation algorithm.
- Write programs for handling critical thinking and innovation in problem-solving.
- Develop programs using gaming, VFX, VR/AR, and animation.

TEXT BOOKs:

1. David J. Eck, Introduction to Computer Graphics. Hobart and William Smith Colleges, Geneva, 2023.

REFERENCES:

1. Bhattacharya, S., Computer Graphics. Oxford University Press, 2018.
2. Judith Jeffcoate, Multimedia in practice: Technology and Applications. PHI, 1998.
3. Foley, Vandam, Feiner and Hughes, Computer Graphics: Principles and Practice. 2nd Edition, Pearson Education, 2003.
4. Jeffrey McConnell, Computer Graphics: Theory into Practice. Jones and Bartlett Publishers, 2006.

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COs- POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	2	3	2	2	–	–	–	2	2	–	3	2
2	3	2	3	2	–	–	–	–	2	2	–	3	2
3	3	2	2	3	2	–	–	–	2	–	–	3	2
4	3	2	2	3	2	–	–	–	–	–	2	3	2
5	3	2	3	3	2	–	–	–	2	–	2	3	2
Average	3.00	2.00	2.60	2.60	2.00	–	–	–	2.00	2.00	2.00	3.00	2.00

CHAIRMAN
BoS (IT)

24CS503PE	VIDEO CREATION AND EDITING	L	T	P	C
	(Common to AD, CSE & IT)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Introduce the broad perspective of linear and nonlinear editing concepts.
- Understand the concept of Storytelling styles.
- Be familiar with audio and video recording. To apply different media tools.
- Know about the working with basic & advanced editing and training techniques.
- Learn and understand the concepts of AVID XPRESS DV 4.

UNIT I FUNDAMENTALS **9**

Evolution of filmmaking - linear editing - non-linear digital video - Economy of Expression - risks associated with altering reality through editing

UNIT II STORYTELLING **9**

Storytelling styles in a digital world through jump cuts, L-cuts, match cuts, cutaways, dissolves, split edits - Consumer and pro NLE systems - digitizing images - managing resolutions - mechanics of digital editing - pointer files - media management.

UNIT III USING AUDIO AND VIDEO **9**

Capturing digital and analog video importing audio putting video on exporting digital video to tape recording to CDs and VCDs.

UNIT IV WORKING WITH FINAL CUT PRO **9**

Working with clips and the Viewer - working with sequences, the Timeline, and the canvas - Basic Editing - Adding and Editing Testing Effects - Advanced Editing and Training Techniques - Working with Audio - Using Media Tools - Viewing and Setting Preferences.

UNIT V WORKING WITH AVID XPRESS DV 4 **9**

Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing to Record and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options

TOTAL: 45 PERIODS

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BoS (CSE) 23/9/25

OUTCOMES:

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

- Compare the strengths and limitations of Nonlinear editing.
- Identify the infrastructure and significance of storytelling.
- Apply suitable methods for recording to CDs and VCDs.
- Address the core issues of advanced editing and training techniques.
- Design and develop projects using AVID XPRESS DV4.

TEXT BOOKs:

1. Avid Xpress DV 4 User Guide, 2007.
2. Final Cut Pro 6 User Manual, 2004.

REFERENCES:

1. Keith Underdahl, "Digital Video for Dummies", Third Edition, Dummy Series, 2001.
2. Robert M. Goodman and Partick McGarth, "Editing Digital Video: The Complete Creative and Technical Guide", Digital Video and Audio, McGraw – Hill 2003.

COs – POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	1	2	1	1	-	-	1	2	3	2	3	1
2	2	3	3	3	1	-	-	1	2	2	1	3	1
3	2	2	3	3	1	-	-	3	1	1	1	3	1
4	2	2	2	2	1	-	-	3	1	1	1	3	1
5	2	1	3	3	1	-	-	3	2	1	2	3	1
Average	**2.20**	**1.80**	**2.60**	**2.40**	**1.00**	**-**	**-**	**2.20**	**1.60**	**1.60**	**1.40**	**3.00**	**1.00**

CHAIRMAN
BoS (CSE)

24AD501PE	DIGITAL MARKETING (COMMON TO AD, CSE AND IT)	L T P C 3 0 0 3

OBJECTIVE:

The Student should be made to:

- Understand digital marketing fundamentals for strong online branding
- Apply SEO and SEM techniques to enhance online visibility and drive targeted traffic
- Design and execute email, mobile, and conversational marketing campaigns
- Use social media and influencer marketing to boost engagement and customer loyalty
- Explore digital transformation and emerging technologies shaping the future of marketing

UNIT I DIGITAL MARKETING FUNDAMENTALS 9

Evolution of Digital Marketing - Introduction to Digital Marketing - Online Market space - Digital Marketing Strategy - Digital Marketing Strategy Frameworks - Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

UNIT II SEARCH ENGINE OPTIMIZATION 9

Search Engine optimization - Keyword Strategy - SEO Strategy - SEO success factors - Advanced SEO Techniques - On-page, Off-page, Technical - Search Engine Marketing - How Search Engine works- SEM components- PPC advertising -Display Advertisement.

UNIT III E-MAIL MARKETING 9

E-Mail Marketing - Types of E-Mail Marketing - Email Automation and Tools - Lead Generation - Integrating Email with social media and Mobile - Measuring and maximizing email campaign effectiveness. Mobile Marketing - Mobile Inventory/channels - Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns - Conversational Marketing.

UNIT IV SOCIAL MEDIA MARKETING 9

Social Media Marketing - Social Media Channels - Leveraging social media for brand conversations and buzz - Successful/benchmark social media campaigns - Engagement Marketing - Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNIT V DIGITAL TRANSFORMATION 9

Digital Transformation & Channel Attribution Analytics Ad words, Email, Mobile, Social media, Web Analytics Changing your strategy based on analysis - Recent trends in Digital marketing - AI and ML in Digital Marketing.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 25/09/25

OUTCOMES:

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

- Explain digital marketing concepts and develop a basic digital marketing strategy
- Implement SEO and SEM techniques to improve website visibility and performance
- Create and evaluate email, mobile, and chatbot-based marketing campaigns
- Design social media strategies that enhance brand presence and customer engagement
- Analyze digital marketing data and apply emerging technologies for strategic decisions

TEXT BOOKS:

1. Dave Chaffey & Fiona Ellis-Chadwick, "Digital Marketing: Strategy, Implementation and Practice", 8th Edition, Pearson, 2022.
2. Puneet Singh Bhatia, "Fundamentals of Digital Marketing", 1st Edition, Pearson Education, 2017.
3. Vandana Ahuja, "Digital Marketing", Oxford University Press, 2015.

REFERENCES:

1. Simon Kingsnorth, Digital Marketing Strategy: An Integrated Approach to Online Marketing, 3rd Edition, Kogan Page, 2022.
2. Philip Kotler, "Marketing 4.0: Moving from Traditional to Digital", 1st Edition, Wiley, 2017.
3. Ryan D, "Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation", Kogan Page Limited, 2014.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	2	1	2	-	-	-	1	2	3	3	2
CO2	2	3	3	3	1	-	-	-	1	2	2	1	2
CO3	2	2	3	3	2	-	-	-	3	1	1	2	1
CO4	2	2	2	2	2	-	-	-	3	1	1	2	2
CO5	2	1	3	3	1	-	-	-	3	2	1	2	1
Average	2.20	1.80	2.60	2.40	1.60	-	-	-	2.20	1.60	1.60	2.00	1.60

CHAIRMAN
BoS (AD)

24AD502PE MULTIMEDIA DATA COMPRESSION AND STORAGE L T P C

(COMMON TO AD AND CSE) 3 0 0 3

OBJECTIVE:

The Student should be made to:

- Understand the core theories behind lossless and lossy data compression algorithms
- Analyze the methods used in classic image compression standards like JPEG
- Evaluate modern video codecs by analyzing their core compression techniques
- Analyze strategies for placing multimedia data on storage systems to ensure efficient retrieval
- Apply disk scheduling algorithms to manage real-time media streams

UNIT I FOUNDATIONS OF MULTIMEDIA COMPRESSION 10

Introduction to Multimedia - Lossless and Lossy Compression Paradigms - Rate-Distortion Theory - Entropy Coding: Basics of Huffman and Arithmetic Coding - Dictionary-based Techniques: LZ77, LZW, and modern variants like Brotli - Basic Audio Compression Principles: Quantization and Sampling.

UNIT II IMAGE COMPRESSION 9

Lossless Image compression - JPEG - CALIC-JPEG LS-Prediction using conditional averages - Progressive Image Transmission - Lossless Image compression formats - Applications - Facsimile encoding.

UNIT III VIDEO COMPRESSION 9

Introduction - Motion Compensation and Estimation - Video Signal Representation - ISO/IEC MPEG-4 AVC (H.264) - High Efficiency Video Coding (H.265/HEVC) - Royalty-Free Codecs: Google's VP9 and AOMedia Video 1(AV1) - Introduction to Scalable Video Coding.

UNIT IV DATA PLACEMENT ON DISKS 9

Statistical placement on Disks - Striping on Disks -Replication Placement on Disks -Constraint allocation on Disks - Tertiary storage Devices - Continuous Placement on Hierarchical storage system - Statistical placement on Hierarchical storage systems.

UNIT V DISK SCHEDULING METHODS 8

Scheduling methods for disk requests - Feasibility conditions of concurrent streams - Scheduling methods for request streams.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 25/07/25

OUTCOMES:

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

- Explain the core theories of lossless and lossy data compression algorithms
- Analyze the methodologies of classic image compression standards like JPEG
- Compare modern video codecs like H.264 and H.265 based on their core techniques
- Explore various strategies for placing multimedia data on storage systems to optimize retrieval
- Apply disk scheduling algorithms to determine the feasibility of supporting concurrent real-time media streams

TEXT BOOKS:

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, "Fundamentals of Multimedia", 3rd Edition, 2021.
2. Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann Series in Multimedia Information and Systems, 5th Edition, 2018.

REFERENCES:

1. Khalid Sayood, "Introduction to Data Compression", 5th Edition, 2017
2. David Salomon, "A concise introduction to data compression", 2008.
3. Lenald Best, "Best's Guide to Live Stream Video Broadcasting", BCB Live Teaching series, 2017.
4. Yun-Qing Shi, "Image and Video Compression for Multimedia Engineering Fundamentals Algorithms and Standards", Taylor& Francis,2019

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	3	1	2	-	-	3	-	-	2	2
CO2	3	2	2	1	2	1	-	-	1	2	-	2	2
CO3	3	2	2	2	1	2	-	-	2	-	-	2	2
CO4	3	2	2	1	2	1	-	-	1	-	-	2	2
CO5	3	2	2	1	2	1	-	-	1	1	-	2	2
Average	3.00	2.00	2.00	1.60	1.60	1.60	-	-	1.60	1.50	-	2.00	2.00

CHAIRMAN
BoS (AD)

24AD503PE	GAME DEVELOPMENT	L T P C
	(COMMON TO AD, CSE AND IT)	3 0 0 3

OBJECTIVE:

The Student should be made to:

- Train the students to acquire knowledge in game design and development
- Learn the mathematics behind game development
- Understand the basics of a game engine
- Survey the gaming development environment and tool kits
- Learn and develop simple games using Pygame environment

UNIT I INTRODUCTION TO GAME DESIGN 9

Games - Designing and Developing Games - Genres - Understanding: Players, Machine-Game: Concepts, Worlds-Creative and Expressive Play- Character Development - Storytelling - Screenplay-Storyboard - Pre-visualization - Script-Creating User Experience - Game play.

UNIT II FOUNDATIONS TO GAME DESIGN 9

Cartesian Coordinate Systems-Vectors-Linear Interpolation - Multiple Coordinate Spaces - Matrices and Linear - Transformations - Polar Coordinate Systems - 3D Rotations, Transformation, Scaling - Geometric Primitives - Viewing in 3D - Viewing Pipeline.

UNIT III GAME ENGINE DESIGN 9

Rendering Concept - Software Rendering - Hardware Rendering - Spatial Sorting Algorithms - Algorithms for Game Engine - Collision Detection - Game Logic - Game AI - Pathfinding.

UNIT IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 8

Pygame Game development - Unity - Unity Scripts - Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.

UNIT V GAME DEVELOPMENT USING PYGAME 10

Developing 2D and 3D interactive games using Pygame - Avatar Creation - 2D and 3D Graphics Programming - Incorporating music and sound - Asset Creations - Game Physics algorithms Development - Device Handling in Pygame - Overview of Isometric and Tile Based arcade Games - Puzzle Games.

TOTAL: 45 PERIODS

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BoS (AD) 25/09/25

OUTCOMES:

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

- Understand the concepts and techniques used in game development
- Understand the mathematical and graphical concepts used for game development
- Implementation of gaming engines
- Survey gaming environments and frameworks
- Implement a simple game in Pygame

TEXT BOOKS:

1. Adam Kramarzewski and Ennio De Nucci, "Practical Game Design: A modern and Comprehensive Guide to Video game Design" Packt Publishing Ltd., 2023.
2. Mastering Game Design with Unity 2021: Immersive Workflows, Visual Scripting, Physics Engine, Game Objects", BPB Publications, 2022.
3. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", A press, 2007.

REFERENCES:

1. Sebastiano M.Cossu, "Beginning Game AI with Unity: Programming Artificial Intelligence with C#", A press, 2020.
2. Sanjay Madhav, "Game Programming Algorithms and Techniques: A Platform Agnostic Approach", Addison Wesley, 2013.
3. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	3	3	3	-	-	-	-	-	-	3	2
CO2	3	3	3	3	3	-	-	-	2	-	-	3	2
CO3	3	3	3	3	3	-	-	-	2	-	-	3	2
CO4	2	3	3	3	3	-	2	-	2	2	2	3	3
CO5	2	3	3	3	3	-	2	-	2	1	2	3	3
Average	2.40	3.00	3.00	3.00	3.00	-	2.00	-	2.00	1.5	2.00	3.00	2.40

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BoS (AD)

24IT303PE	VISUAL EFFECTS (Common to AD, CSE & IT)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the principles, methods and software tools involved in creating visual effects.
- Familiarize students with compositing, motion tracking, 3D integration, and digital matte painting.
- Provide practical exposure to industry-standard software such as Adobe After Effects, Nuke, Blender, and Unreal Engine.
- Enable students to integrate live-action footage with computer-generated imagery for various media platforms.
- Prepare for careers in film, advertising, AR/VR, and interactive media.

UNIT I INTRODUCTION TO VISUAL EFFECTS 9

History and Evolution of Visual Effects - VFX Vs SFX: Animation - VFX Production Pipeline - Pre-production Planning - Storyboarding - Shot Breakdown - Overview of VFX Applications in Films - Advertising, and Gaming - File Formats - Resolution - Frame Rates.

UNIT II COMPOSITING AND MOTION GRAPHICS 9

Compositing Principles: Layer-based - Node-based Compositing - Green Screen and Blue Screen Keying Techniques - Rotoscoping Methods - Color Correction and Grading - Motion Graphics Design Principles - Software Tools: Adobe After Effects - Nuke basics.

UNIT III MOTION TRACKING AND CGI INTEGRATION 9

2D and 3D motion Tracking - Camera Tracking Techniques - Match Moving and Object tracking - Lighting and Shadow Integration - Rendering Passes - CGI and Live-action Integration Workflows - Tools: Mocha Pro - Blender Tracking - Unreal Engine Integration.

UNIT IV DIGITAL MATTE PAINTING AND ENVIRONMENT CREATION 9

Concept Design and Digital Matte Painting Techniques - Photo Bashing - Sky Replacements - Set Extensions - Creating 3D Environments - Projection Mapping - Software: Photoshop - Blender - Maya.

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BoS (IT) 23/10/25

UNIT V ADVANCED VFX AND PROJECT DELIVERY 9

Particle systems and dynamics - Simulations: Fire - Smoke - Water - Cloth and Hair Simulations - AR/VR VFX Workflows - Quality Control and Rendering Optimization - Project Packaging and Delivery - Industry File Management Standards - Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the core principles, components involved in visual effects production.
- Apply compositing, chroma keying, and motion graphics techniques using industry-standard tools like Adobe after Effects and Nuke.
- Integrate 3D elements with live-action footage using motion tracking, match moving, and lighting adjustment.
- Create digital environments using matte painting and 3D set extension techniques.
- Analyze and evaluate the quality, realism, and technical accuracy of visual effects outputs, including AR/VR enhancements and simulations.

TEXT BOOKs:

1. Steve Wright, Digital Compositing for Film and Video. 4th Edition, Routledge, 2020.
2. Mark Christiansen, Adobe After Effects CC Visual Effects and Compositing Studio Techniques. Adobe Press, 2019.
3. Ben Simonds, Blender Master Class: A Hands-On Guide to Modeling, Sculpting, Materials, and Rendering. No Starch Press, 2013.

REFERENCES:

1. Ron Brinkmann, Art and Science of Digital Compositing. Morgan Kaufmann, 2008.
2. Lee Lanier, Professional Compositing with Nuke. Wiley, 2015.
3. Mocha Pro User Guide - Boris FX, 2025.

COs - POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	3	2	2	-	-	-	-	1	2
2	3	3	3	2	3	-	-	-	-	1	2
3	3	3	3	2	3	-	-	-	-	1	2
4	3	3	3	2	3	-	-	-	-	1	2
5	3	3	3	2	3	-	-	-	-	1	2
Average	2.80	2.80	3.00	2.00	2.80	-	-		-	1.00	2.00

CHAIRMAN
BoS (IT)

29.10.25

24AD601PE	ROBOTIC PROCESS AUTOMATION (COMMON TO AD AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be able to:

- Understand RPA fundamentals, including emerging trends like AI integration and hyperautomation
- Design efficient workflows using industry-standard tools with focus on process optimisation
- Apply automation in real-world domains including finance, healthcare, and manufacturing
- Manage exceptions, debugging, logging, and version control in enterprise-scale RPA projects
- Deploy and maintain bots with secure orchestration and compliance considerations

UNIT I INTRODUCTION TO ROBOTIC PROCESS AUTOMATION 9

Emergence of RPA, Evolution, Differentiating RPA from automation, Benefits, Application areas, Components, AI-enhanced RPA, Hyperautomation, Templates, UI, Workflow files.

UNIT II AUTOMATION PROCESS ACTIVITIES 9

Sequence, Flowchart & Control Flow, Data Manipulation, File operations, UI controls, Advanced selectors, API integration, Handling events.

UNIT III APP INTEGRATION, RECORDING AND SCRAPING 9

App integration, Recording mouse & keyboard actions, Web scraping, Process mining, OCR automation, Intelligent Document Processing.

UNIT IV EXCEPTION HANDLING AND CODE MANAGEMENT 9

Exception handling, Logging, Debugging, Error reporting, Version control, Automated bot testing, Project organization, Reusability, State machine.

UNIT V DEPLOYMENT AND MAINTENANCE 9

Publishing, Cloud-based orchestration, Control bots, License management, Updates, Compliance & governance, Open source RPA, Future of RPA.

TOTAL PERIODS : 45

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BoS (AD)

COURSE OUTCOMES:

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

- Explain RPA concepts, AI-enhanced RPA, and hyperautomation trends
- Develop workflows integrating advanced selectors and APIs
- Apply OCR and Intelligent Document Processing for automation tasks
- Implement exception handling, version control, and automated testing in RPA projects
- Deploy and manage bots using cloud orchestration with compliance and governance

TEXT BOOKS

1. Alok Mani Tripathi, "Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with UiPath", Packt Publishing, 2018.
2. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress, 2020.
3. UiPath Academy, "Official UiPath RPA Developer Advanced Training", UiPath Press, 2023.

REFERENCE BOOKS

1. Frank Casale et al., "Introduction to Robotic Process Automation: A Primer", Institute of RPA, 2018.
2. Richard Murdoch, "Robotic Process Automation: Guide to Building Software Robots", Amazon Asia-Pacific, 2018.
3. Gartner, "RPA Market Trends Report", 2023.
4. Deloitte, "RPA Compliance and Governance Framework", 2022.

Mapping of COs with POs:

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

CHAIRMAN
BoS (AD)

24CS602PE	NEURAL NETWORKS AND DEEP LEARNING (Common to AD & CSE)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the basics in deep neural networks
- Recognize the basics of associative memory and unsupervised learning networks
- Apply CNN architectures of deep neural networks
- Analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- Apply auto encoders and generative models for suitable applications.

UNIT I INTRODUCTION **9**

Neural Networks - Application Scope of Neural Networks - Artificial Neural Network: An Introduction - Evolution of Neural Networks - Basic Models of Artificial Neural Network - Important Terminologies of ANNs - Supervised Learning Network.

UNIT II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS **9**

Training Algorithms for Pattern Association - Autoassociative Memory Network- Heteroassociative Memory Network - Bidirectional Associative Memory (BAM) - Hopfield Networks - Iterative Autoassociative Memory Networks - Temporal Associative Memory Network - Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps - Learning Vector Quantization - Counter propagation Networks - Adaptive Resonance Theory Network.

UNIT III THIRD-GENERATION NEURAL NETWORKS **9**

Spiking Neural Networks - Convolutional Neural Networks - Deep Learning Neural Networks - Extreme Learning Machine Model - Convolutional Neural Networks: The Convolution Operation - Motivation - Pooling - Variants of the basic Convolution Function - Structured Outputs - Data Types - Efficient Convolution Algorithms - Neuroscientific Basis - Applications: Computer Vision, Image Generation, Image Compression.

UNIT IV DEEP FEEDFORWARD NETWORKS **9**

History of Deep Learning - A Probabilistic Theory of Deep Learning - Gradient Learning - Chain Rule and Backpropagation - Regularization: Dataset Augmentation - Noise Robustness - Early Stopping, Bagging and Dropout - batch normalization - VC Dimension and Neural Nets.

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UNIT V RECURRENT NEURAL NETWORKS 9

Recurrent Neural Networks: Introduction - Recursive Neural Networks - Bidirectional RNNs - Deep Recurrent Networks - Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply Convolution Neural Network for image processing.
- Understand the basics of associative memory and unsupervised learning networks.
- Apply CNN and its variants for suitable applications.
- Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
- Apply autoencoders and generative models for suitable applications.

TEXT BOOKs:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

1. James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. François Chollet, "Deep Learning with Python", Manning Shelter Island, 2017.
4. S Rajasekaran, G A Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications", PHI Learning, 2017.
5. Santanu Pattanayak, "Pro Deep Learning with TensorFlow", Apress, 2017.
6. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.
7. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", 1st Edition, Springer International Publishing, 2018.
8. Jojo Moolayil, "Learn Keras for Deep Neural Networks", Apress,2018
9. Vinita Silaparasetty, "Deep Learning Projects Using TensorFlow 2", Apress, 2020

CHAIRMAN
BoS (CSE)

COs - POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	2	3	2	3	1	-	2	1	-	-	2	1
2	3	1	2	1	-	-	-	-	1	2	2	1	-
3	3	3	3	3	3	1	-	2	1	-	-	2	1
4	3	3	3	3	3	-	-	2	-	2	3	2	2
5	1	1	3	2	3	-	-	2	-	-	-	1	-
Average	**2.60**	**2.00**	**2.80**	**2.20**	**3.00**	**1.00**	**-**	**2.00**	**1.00**	**2.00**	**2.50**	**1.60**	**1.33**

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24AD602PE	QUANTUM COMPUTING (COMMON TO AD AND CSE)	L T P C 3 0 0 3

OBJECTIVES :

The student should be able to:

- Understand fundamentals of classical and quantum computation with emphasis on quantum mechanics concepts relevant to computing
- Apply advanced mathematical models and simulation tools for designing quantum algorithms
- Develop quantum circuits and error correction schemes for real-world applications
- Analyse quantum information processing, communication, and cryptography protocols
- Explore emerging trends such as quantum machine learning and post-quantum cryptography

UNIT I QUANTUM COMPUTING BASIC CONCEPTS 9

Complex Numbers; Linear Algebra; Matrices & Operators; Postulates of Quantum Mechanics; Qubits & Superpositions; Bloch Sphere; Measurement Theory.

UNIT II QUANTUM GATES AND CIRCUITS 9

Single & Multi-qubit gates; Parameterized quantum gates; Gate decomposition; Circuit development; Quantum error correction.

UNIT III QUANTUM ALGORITHMS 9

Quantum parallelism; Deutsch's & Deutsch–Jozsa Algorithms; Quantum Fourier Transform; Grover's Search; Quantum Phase Estimation; VQE & QAOA.

UNIT IV QUANTUM INFORMATION THEORY 9

Data compression; Shannon's noiseless channel coding theorem; Schumacher's theorem; Noisy quantum channels; Entanglement entropy; Quantum teleportation.

UNIT V QUANTUM CRYPTOGRAPHY 9

Shor's Algorithm; Quantum Key Distribution - BB84, Ekert91; Device-independent QKD; Post-quantum cryptography.

TOTAL PERIODS: 45

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COURSE OUTCOMES:

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

- Explain mathematical foundations and physical principles of quantum computation
- Apply quantum gates, circuits, and error correction methods in simulations
- Implement and analyse core and NISQ-era quantum algorithms
- Evaluate concepts in quantum information theory and communication protocols
- Assess security implications of quantum computing and apply quantum/post-quantum cryptographic schemes

TEXT BOOKS

1. Parag K. Lala, "Quantum Computing: A Beginner's Introduction", McGraw Hill, 2020.
2. Michael A. Nielsen, Isaac L, "Chuang, Quantum Computation and Quantum Information", Cambridge University Press, 2010.
3. Chris Bernhardt, "Quantum Computing for Everyone", MIT Press, 2020.

REFERENCE BOOKS

1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.
2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.
3. Preskill, J, "Lecture Notes on Quantum Computation", Caltech, 2018.
4. McArdle, S. et al., "Variational quantum algorithms", Rev. Mod. Phys., 2020.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	3	-	-	1	2	2	2	3	2
CO2	3	3	3	3	3	-	-	1	2	2	3	3	3
CO3	2	3	3	3	3	-	-	2	3	2	3	2	3
CO4	3	3	3	3	3	-	-	2	3	3	3	3	3
CO5	3	2	3	3	3	-	-	2	3	3	3	3	2
Average	2.80	2.80	2.80	2.80	3.00	-	-	1.60	2.60	2.40	2.80	2.80	2.60

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BoS (AD)

24AD603PE	3D PRINTING AND DESIGN (COMMON TO AD AND CSE)	L T P C 3 0 0 3

OBJECTIVES:
The student should be able to:

- Introduce fundamentals, processes, and materials in 3D printing
- Provide knowledge of inkjet and laser-based 3D printing technologies
- Familiarize with sustainable materials, AI-based optimisation, and Industry 4.0 relevance
- Enable applications of additive manufacturing in engineering and biomedical sectors
- Explore future trends and supply chain integration of additive manufacturing

UNIT I INTRODUCTION **9**

Introduction, Design considerations - Material, Size, Resolution, Process; Modelling and viewing - 3D; Model preparation - Digital; Slicing; Software; File formats; Sustainable materials; Cloud-based collaboration tools.

UNIT II PRINCIPLE **9**

Processes - Extrusion, Wire, Granular, Lamination, Photopolymerisation, Hybrid manufacturing; Materials - Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene, Smart materials; Material Selection - Processes, applications, limitations.

UNIT III INKJET TECHNOLOGY **9**

Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations - Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation; Liquid-based fabrication; Biomedical applications; AI-based optimisation.

UNIT IV LASER TECHNOLOGY **9**

Light Sources - Types, Characteristics; Optics - Deflection, Modulation; Material feeding and flow - Liquid, powder; Printing machines - Types, Working Principle, Support structures; Ultrafast lasers in microfabrication; Safety protocols.

UNIT V INDUSTRIAL APPLICATIONS **9**

Product Models, manufacturing - Printed electronics, Biopolymers, Healthcare, Food, Medical, Biotechnology, Displays, Aerospace, Automotive; On-demand manufacturing & supply chain integration; Future trends.

TOTAL PERIODS: 45

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COURSE OUTCOMES:

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

- Explain fundamentals, sustainable materials, and collaboration tools
- Compare 3D printing processes, hybrid methods, and smart materials
- Apply inkjet technology in industrial/biomedical application
- Analyze laser-based technologies and safety protocols
- Evaluate industrial applications and future trends in additive manufacturing

TEXT BOOKS

1. Christopher Barnatt, "3D Printing: The Next Industrial Revolution", Create Space Independent Publishing Platform, 2016.
2. Ian M. Hutchings, Graham D. Martin, "Inkjet Technology for Digital Fabrication", John Wiley & Sons, 2013.
3. Andreas Gebhardt, "Understanding Additive Manufacturing", Hanser Publishers, 2011.

REFERENCE BOOKS

1. Chua C K, Leong K F, Lim C S, "Rapid Prototyping: Principles and Applications", 2nd Ed., World Scientific, 2010.
2. Joan Horvath, "Mastering 3D Printing", A Press, 2014.
3. Murphy S V, Atala A, "3D bioprinting of tissues and organs", Nature Biotechnology, 2014.

CO-PO-PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	3	-	-	-	2	-	2	3	2
CO2	3	3	3	2	3	-	-	-	2	-	3	3	3
CO3	2	3	3	3	3	-	-	-	3	-	3	2	3
CO4	3	3	3	3	3	-	-	-	3	-	3	3	3
CO5	3	2	3	3	3	-	-	-	3	-	3	3	2
Average	2.80	2.60	2.80	2.60	3.00	-	-	-	2.60	-	2.80	2.80	2.60

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BoS (AD)

24EC609PE **INTRODUCTION TO INTERNET OF THINGS** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Assess the impact of IoT applications, architectures in real world
- Illustrate the infrastructure, protocols and integration requirements of deploying smart objects and connect them to network
- Study the prerequisites for implementing IoT based applications
- Absorb various IoT supporting technologies
- Infer the importance of setting-up smart environment, data Analytics and Security in IoT

UNIT I INTRODUCTION TO IoT **9**

Predecessors of IoT- Overview of Internet of Things: Emergence of IoT- IoT Networking Components- Addressing Strategies in IoT- IoT Sensing and Actuation: Sensors-Actuators IoT Processing Topologies and Types - IoT Connectivity Technologies.

UNIT II M2M TO IoT **9**

Infrastructure and ServiceDiscovery Protocols for IoT - Architecture - Protocols - Services – Discovery- Sensor and Actuator Networks- IoT device Integration; concepts, standards, Implementations-Protocols and Middleware.

UNIT III DEVELOPING IoT SOLUTIONS **9**

Interoperability in IoT- Introduction to Arduino Programming - Integration of Sensors and Actuators with Arduino - Introduction to Python programming and Raspberry Pi - Implementation of loT with Raspberry Pi.

UNIT IV ASSOCIATE IoT TECHNOLOGIES **9**

Software Defined Networking (SDN) - SDN for loT-Data Handling and Analytics-Cloud Computing: Fundamentals, service models, service management and security - Sensor-Cloud - Fog Computing.

UNIT V IoT SMARTER ENVIRONMENTS AND DATA ANALYTICS **9**

Smart cities and smart homes - Connected Vehicles - Smart Grid - IoT Data Analytics platform - Introduction to Industrial IoT, IIC and Industry 4.0-IIoT Analytics-Case studies: Analytics Agricultural IoT, Healthcare IoT and Activity IoT - Security Management in IoT – AAA Framework.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Interpret the impact and challenges posed by IoT networks leading to new architectural models
- Compare and contrast the deployment of smart objects and the technologies toconnect them to network

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- Appraise the basic requirements needed for designing real-time IoT based applications
- Develop novel IoT supporting technologies for real world entities
- Illustrate different sensor technologies for sensing different entities, data Analytics and Security in IoT

TEXT BBOKS:

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by PethuruRaj and Anupama C. Raman (2021, 2020).
2. Internet of Things: A Hands-on Approach, by ArshdeepBahga and Vijay Madisetti(Universities Press, 2020).

REFERENCES:

1. Introduction to loT by SudipMisra, Anandarup Mukherjee, Arijit Roy, CambridgeUniversity Press, 2021.
2. Raj Kamal, "Internet of Things: Architecture and Design Principles" 1st Edition,McGraw Hill Education, 2017.
3. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs63/

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	2	-	1	-	-	2	-	3	2
CO2	2	3	2	2	3	-	1	-	-	2	-	2	3
CO3	2	2	3	3	3	1	1	-	1	3	-	3	3
CO4	2	2	3	3	3	1	2	-	2	3	2	3	3
CO5	3	2	2	3	3	2	2	1	1	3	1	3	3

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BoS (ECE)

24AD604PE	PROMPT ENGINEERING	L T P C
	(COMMON TO AD, CSE AND IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

1. Understand the fundamentals of Large Language Models (LLMs) and the principles of prompt engineering
2. Demonstrate best practices for text and image generation using generative AI tools
3. Illustrate effective prompts for varied applications, including content creation and research
4. Implement advanced prompting techniques for building AI-powered applications
5. Develop guidelines for ethical, social, and technical considerations in AI-based generation

UNIT I INTRODUCTION TO LLM AND PROMPTING 9

Introduction to Large Language Models-What are Text Generation Models, Large Language Models are Magic, A Brief History of Language Models, LLMs in the Market, Understanding Prompting and Prompt Techniques-Five Principles of Prompting, Introducing LLM Prompts, How LLM Prompts Work, Types of Prompts, Components of an Prompt, Defining Personality in Prompts, Mix and Match Strategic Combination for Enhanced Prompts, Challenges and Limitations of Using Prompts.

UNIT II THE ART OF TEXT DATA GENERATION WITH GENAI 9

Standard Practices for Text Generation-Generating Lists, Explain It Like I'm Five, Universal Translation Through LLMs, Ask For Context, Text Style Unbundling, Identifying the Desired Textual Features, Generating New Content with the Extracted Features, Role Prompting, Analyzing Existing Prompts for Strengths and Weaknesses.

UNIT III AI FOR CONTENT CREATION & RESEARCH APPLICATIONS 9

Generating Text with AI for Content Creation-Using AI for Copywriting- Creating Social Media Posts- Writing Video Script- Using AI for Personalized Messaging, Creating Engaging and Tailored Content with AI, Prompting for Data Collection & Research -Techniques for Crafting Effective Prompts for Surveys - Assessments and Data Collection - Using Prompts in Research Methodology.

UNIT IV CRAFT IMAGE DATA WITH GEN AI 9

Diffusion Models for Image Generation - Principles of Designing Prompts for Image Generation, Available Models - OpenAI DALL-E, Midjourney, Stable Diffusion, Google Gemini, Text to Video, Model Comparison, Reverse Engineering Prompts, Negative Prompts, Prompt Re-Writing, Prompt Analysis.

UNIT V BUILDING AI POWERED APPLICATIONS 9

AI Blog Writing, Topic Research, Expert Interview, Generate Outline, Text Generation, Writing Style, Title Optimization, AI Blog Image creation, Developing user interfaces for AI tools , Ethical Considerations in AI-based Text and Image Generation.

TOTAL: 45 PERIODS

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COURSE OUTCOMES:

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

- Explain the fundamentals of LLMs and the role of prompt engineering
- Apply standard practices to text using LLMs for specific purposes
- Implement effective prompts for content creation, surveys, and research activities
- Analyze image prompts and generated outputs for quality and relevance
- Design strategies to address ethical considerations and overcome limitations in generative AI applications

TEXT BOOKS

1. Dale R, "The Art of Prompt Engineering with ChatGPT: Crafting Effective Prompts for Superior AI Responses", Springer, 2024.
2. Paleyes A, "Prompt Engineering for Generative AI: Harnessing the Power of LLMs and Diffusion Models", Packt Publishing, 2024.

REFERENCES

1. White T, "Prompt Engineering: Ultimate Guide to Optimizing AI Responses", O'Reilly Media, 2024.
2. James Phoenix, Mike Taylor, "Prompt Engineering for Generative AI", O'Reilly, To Release in May 2024
3. Michael Ferguson, "Prompt Engineering: The Future of Language Generation", January 2023.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	3	-	-	2	-	-	-	3	2	2	2
CO2	3	3	3	2	3	2	-	2	2	3	-	3	2
CO3	3	3	2	3	3	-	2	-	2	-	3	3	2
CO4	3	3	2	3	3	-	-	2	-	3	2	2	2
CO5	3	2	2	3	-	-	3	1	-	2	3	3	2
Average	3	2.7	2.4	2.7	3	2	2.5	1.6	2	2.7	2.5	2.6	2

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24AD605PE	SOCIAL NETWORK ANALYSIS (COMMON TO AD AND IT)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the key components and structures of a social network
- Utilize appropriate tools and techniques to visualize social network graphs
- Familiarize with user patterns and community structures within a social network
- Review the evolution and dynamics of social networks over time
- Formulate social network-based applications to address real-world problems

UNIT I INTRODUCTION **9**

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

Unit II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III MINING COMMUNITIES **9**

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities - Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT IV EVOLUTION **9**

Evolution in Social Networks - Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation - Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction.

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UNIT V APPLICATIONS 9

Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain fundamental concepts, elements, and structures of social networks and their relevance to the Semantic Web
- Apply suitable tools, frameworks, and visualization techniques to construct, analyze, and interpret social network graphs
- Analyze user interactions and detect community structures using appropriate community mining algorithms
- Evaluate network evolution, influence propagation, and link prediction models to interpret social network changes
- Develop applications leveraging social network analysis techniques to address domain-specific challenges such as opinion mining, emotion detection, and expert location

TEXT BOOKS:

1. Matthew A. Russell (and Mikhail Klassen), "Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Instagram, GitHub, and More", 3rd Edition, O'Reilly Media, 2018.
2. Reza Zafarani, Mohammed Ali Abbasi, Huan Liu, "Social Media Mining: An Introduction", 1st Edition, Cambridge University Press, 2014.

REFERENCES:

1. Ian Mc Culloh, Hellen Armstrong, Anthony Johnson, "Social Network Analysis with Applications", 1st Edition, Wiley Publications, 2013.
2. John Scott, "Social Network Analysis", 3rd Edition, SAGE Publications, 2013.
3. Maksim Tsvetovat and Alexander Kouznetsov, "Social Network Analysis for Startups", 1st Edition, O'Reilly Media, 2011.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	-	-	3	3
CO2	2	3	3	2	3	-	-	2	3	-	-	3	3
CO3	2	3	3	3	3	-	-	2	3	-	-	3	3
CO4	1	3	3	3	3	-	-	2	3	-	-	3	3
CO5	2	3	3	3	3	2	-	3	3	3	3	3	3
Average	2.00	2.8	2.6	2.75	3	2	-	2.25	2.8	3	3	3	3

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BoS (AD)

24CS703PE	OPTIMIZATION TECHNIQUES (Common to AD, CSE & IT)	L T P C 2 0 2 3

OBJECTIVES:

The Student should be made to:

- Formulate and solve linear programming problems (LPP).
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain a solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models.

UNIT I LINEAR MODELS **6**

Introduction of Operations Research - mathematical formulation of LPP - Graphical Methods to solve LPP - Simplex Method - Two-Phase method.

UNIT II INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS 6

Integer programming: Branch and bound method - Transportation and Assignment problems - Traveling salesman problem.

UNIT III PROJECT SCHEDULING **6**

Project network - Diagram representation - Floats - Critical path method (CPM) - PERT - Cost considerations in PERT and CPM

UNIT IV CLASSICAL OPTIMIZATION THEORY **6**

Unconstrained problems - necessary and sufficient conditions - Newton-Raphson method, Constrained problems - equality constraints - inequality constraints - Kuhn-Tucker conditions.

UNIT V QUEUING MODELS **6**

Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

TOTAL THEORY: 30 PERIODS

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PRACTICALS

1. Solving simplex maximization problems using R programming.
2. Solving simplex minimization problems using R programming.
3. Solving mixed constraints problems - Big M & Two phase method using TORA.
4. Solving transportation problems using R.
5. Solving assignment problems using R.
6. Solving optimization problems using LINGO.
7. Studying Primal-Dual relationships in LP using TORA.
8. Solving LP problems using dual simplex method using TORA.
9. Sensitivity & post optimality analysis using LINGO.
10. Solving shortest route problems using optimization software
11. Solving Project Management problems using optimization software
12. Testing random numbers and random variates for their uniformity.
13. Testing random numbers and random variates for their independence
14. Solve single server queuing model using simulation software package.
15. Solve multi server queuing model using simulation software package.

TOTAL PRACTICAL: 30 PERIODS

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Formulate and analyze linear programming problems (LPP).
- Assess integer programming problems, transportation, and assignment models.
- Apply CPM and PERT techniques to solve network problems.
- Optimize functions subject to constraints using appropriate methods.
- Model and interpret problems under Markovian queuing systems.

TEXT BOOKs:

1. Hamdy A Taha: Operations Research: An Introduction, Pearson, 10th Edition, 2017.

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REFERENCES:

1. Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim: Essentials of Linear Programming, Vikas Publishing House Pvt.Ltd. New Delhi, 1994.
2. Ravindran A., Philip D.T., and Solberg J.J.: Operations Research, John Wiley, 2nd Edition,2007
3. ND Vohra: Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
4. J. K. Sharma: Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.
5. Hiller F.S, Liberman G.J: Introduction to Operations Research, 10th Edition McGraw Hill, 2017.

COs - POs Mapping

COURSE OUTCOMES	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
1	3	3	2	1	1	-	-	2	1	1	2	3	2
2	3	1	2	2	3	-	-	3	2	3	1	2	2
3	2	3	3	2	2	-	-	3	3	1	3	1	2
4	2	2	1	1	3	-	-	2	1	3	1	2	2
5	2	1	1	3	2	-	-	3	3	1	3	3	2
Average	**2.40**	**2.00**	**1.80**	**1.80**	**2.20**	**-**	**-**	**2.60**	**2.00**	**1.80**	**2.00**	**2.20**	**2.00**

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24AD701PE	REINFORCEMENT LEARNING	L T P C
	(COMMON TO AD AND IT)	3 0 0 3

OBJECTIVES:

The student should be made to:

- Introduce the foundational concepts of Reinforcement Learning (RL) and its applications
- Explain value-based, policy-based, and bandit algorithms for decision-making under uncertainty
- Apply dynamic programming, Monte Carlo, and temporal-difference methods for solving RL problems
- Explore advanced topics including function approximation, deep RL, and hierarchical RL architectures
- Integrate mathematical tools to convergence, optimality, and performance guarantees of RL algorithms

UNIT I FUNDAMENTALS OF REINFORCEMENT LEARNING 9

Introduction to RL and Immediate RL, RL Framework and Applications-Bandit optimalities Value Function-based Methods - Bandit Algorithms-UCB 1, Concentration Bounds, UCB 1 Theorem - PAC Bounds, Median Elimination - Thompson Sampling - Contextual Bandits.

UNIT II POLICY GRADIENTS AND FULL RL FOUNDATIONS 9

Policy Search-REINFORCE - Full RL Introduction - Returns, Value Functions and MDPs MDP Modelling - Bellman Equations & Optimality, Cauchy Sequence and Green's Equation, Banach Fixed Point Theorem, Convergence Proofs.

UNIT III DYNAMIC PROGRAMMING, MONTE CARLO & TEMPORAL DIFFERENCE METHODS 9

Lpi Convergence - Value Iteration - Policy Iteration - Dynamic Programming - Monte Carlo Methods - Control in Monte Carlo - Off Policy MC – UCT - TD(0) and TD(0) Control - Q-Learning - Afterstate - Eligibility Traces: Backward View & Control.

UNIT IV FUNCTION APPROXIMATION & ADVANCED RL ARCHITECTURES 9

Function Approximation - Linear Parameterization- State Aggregation Methods - Function Approximation and Eligibility Traces - LSTD and LSTDQ - LSPI and Fitted Q - DQN and Fitted Q - Iteration- Policy Gradient with Function Approximation - Actor - Critic Methods and REINFORCE (cont'd).

UNIT V HIERARCHICAL RL, POMDPS & SUPPORTING MATHEMATICAL FOUNDATIONS 9

Hierarchical Reinforcement Learning - Types of Optimality - Semi-Markov Decision Processes (SMDPs) - Options and Learning with Options - Hierarchical Abstract Machines - MAXQ & MAXQ Value Function Decomposition - Option Discovery Bellman Equation - POMDP Introduction, Bellman Optimality Equation - Mathematical Foundations - Cauchy Sequence, Green's Equation, Banach Fixed Point Theorem, Convergence Proof.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Explain the RL framework, immediate RL, and bandit algorithms for solving decision problems
- Formulate RL problems using policy gradients, MDPs, and Bellman equations
- Develop solutions to RL tasks using dynamic programming, Monte Carlo, and TD methods
- Implement function approximation and deep RL approaches for large-scale problems
- Evaluate hierarchical RL and POMDP techniques with rigorous mathematical proofs of convergence and optimality

TEXT BOOKS:

1. Francisco S. Melo & Joao M. Lemos, "Reinforcement Learning: An Introduction to Computational Learning Theory, Springer, 2022.
2. Richard S. Sutton & Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition, MIT Press, 2018.

REFERENCES:

1. Randall Munroe & Dimitri P Bertsekas, "Dynamic Programming and Optimal Control " , 4th Edition, Athena Scientific, 2017.
2. Ian Goodfellow, Yoshua Bengio & Aaron Courville, "Deep Learning", MIT Press, 2016.
3. David Silver, Reinforcement Learning Lecture Notes, University College London, 2015.
4. Lucian Busoniu, Robert Babuka, Bart De Schutter, and Damien Ernst, □Reinforcement Learning and Dynamic Programming Using Function Approximators" , CRC Press, 2010.
5. Marco Wiering & Martijn van Otterlo (Eds.), "Reinforcement Learning: State-of-the-Art, Springer, 2012.
6. George F Simmons, "Differential Equations with Applications and Historical Notes, 2nd Edition, McGraw-Hill.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	1	-	2	2	2	-	2	2	3
CO2	3	3	2	2	2	-	-	2	1	1	2	3	2
CO3	3	3	3	2	3	-	-	1	1	2	2	2	1
CO4	3	2	3	2	3	-	2	2	2	2	3	2	2
CO5	3	3	2	3	2	-	-	1	2	2	3	3	3
Average	3.00	2.60	2.20	2.00	2.20	-	2	1.60	1.60	2.25	2.40	2.40	2.20

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24AD702PE	GAME THEORY	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concept of a game, its solution concepts, and core tools of game theory, including applications in electronic trading markets.
- Formalize strategic thinking and rational choice using game theory models, and applying these models to real-world scenarios.
- Draw connections between game theory, computer science, and economics especially by analysing key computational challenges at this intersection.
- Analyze contemporary topics at the crossroads of game theory, computer science, and economics.
- Model searching, auctioning, and trading contexts using game theory tools.

UNIT I INTRODUCTION **9**

Reasoning about Behavior in Game - Best responses and Dominant Strategies - Mixed Strategies - Pareto Optimality - Dominated strategies and dynamic strategies, Discrete static games - Continuous static games - Relation to other Mathematical Problems: Nonlinear optimization - Fixed point problems.

UNIT II GAMES WITH PERFECT INFORMATION **8**

Games with Perfect Information - Strategic games - prisoner's dilemma, matching pennies - Nash equilibria - mixed strategy equilibrium - zero-sum games.

UNIT III GAMES WITH IMPERFECT INFORMATION **9**

Games with Imperfect Information - Bayesian Games - Motivational Examples - General Definitions - Information aspects - Illustrations - Extensive Games with Imperfect - Information - Nash Equilibrium - Repeated Games - The Prisoner's Dilemma - Bargaining.

UNIT IV NON-COOPERATIVE GAME THEORY **10**

Non-cooperative Game Theory - Self-interested agents - Games in normal form - Analyzing games: from optimality to equilibrium - Computing Solution Concepts of Normal - Form Games - Computing Nash equilibria of two-player, zero-sum games - Computing Nash equilibria of two-player, general-sum games - Identifying dominated strategies.

UNIT V CASE STUDIES AND APPLICATIONS **9**

A salesman's Dilemma - Oligopoly in water management - A forestry management problem - International fishing - Water distribution problem- applications in Computer Science - Google's sponsored search - eBay auctions - K-armed bandits.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 23/10/25

OUTCOMES:

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

- Articulate foundational ideas and their application in electronic trading markets
- Devise game-theoretic models for real-world scenarios.
- Analyze the computational and strategic interplay across fields
- Evaluate modern developments like auctions and mechanism design
- Develop strategic market-based interactions using game theory tools

TEXT BOOKS:

1. Matsumoto A, Szidarovszky F, "Game Theory and Applications", 2nd Edition, Springer, 2025.
2. Machler M, Solan E, Zamir S, "Game Theory", Cambridge University Press, 2013.

REFERENCES:

1. Osborne M J, "An Introduction to Game Theory", Oxford University Press, 2012.
2. Nisan N, Rough garden T, Tardos E, and Vazirani V V, "Algorithmic Game Theory", Cambridge University Press, 2007.
3. Dixit A and Skeath S, "Games of Strategy", Second Edition, W W Norton & Co Inc, 2004.
4. ZhuHan, Dusit Niyato, Walid Saad, Tamer Basar and Are Hjorungnes, "Game Theory in Wireless and Communication Networks", Cambridge University Press, 2012.

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	-	-	1	2	2	2	2	2
CO2	3	3	2	3	2	-	-	1	3	-	3	3	3
CO3	3	3	3	3	3	-	2	2	3	2	3	2	2
CO4	3	2	3	2	3	-	-	2	3	-	3	1	-
CO5	3	3	3	3	3	-	2	2	3	-	3	-	2
Average	3.00	2.60	2.60	2.60	2.40	-	2.00	1.60	2.80	2.00	2.80	2.00	2.25

CHAIRMAN
BoS (AD)

24AD703PE	ETHICS AND AI (COMMON TO AD, CSE AND IT)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce morality and ethics in AI
- Familiarize with ethical initiatives, frameworks, and regulations
- Understand AI standards and responsible system design
- Analyze ethical and social issues in robotics
- Explore challenges and opportunities in ethical AI applications

UNIT I INTRODUCTION 9

Definition of morality and ethics in AI-Impact on society - Impact on human psychology - Impact on the legal system - Impact on the environment and the planet - Impact on trust.

UNIT II ETHICAL INITIATIVES IN AI 9

International ethical initiatives - Ethical harms and concerns - Comparative study of Western AI ethics frameworks vs Indic ethical perspectives - Case study: healthcare robots, Autonomous Vehicles, Warfare and weaponization.

UNIT III AI STANDARDS AND REGULATION 9

Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems - Data Privacy Process - Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems.

UNIT IV ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS 9

Robot - Roboethics - Ethics and Morality - Moral Theories - Ethics in Science and Technology - Ethical Issues in an ICT Society - Harmonization of Principles - Ethics and Professional Responsibility - Roboethics Taxonomy - AI Alignment and Value Alignment in Robotics - Ethics in Human - Robot Interaction (HRI) - Ethics in Autonomous Decision-Making - Indian Ethical Traditions in Professional Responsibility and Technology.

UNIT V AI AND ETHICS - CHALLENGES AND OPPORTUNITIES 9

Challenges - Opportunities - Ethical issues in artificial intelligence - Societal Issues Concerning the Application of Artificial Intelligence in Medicine - Decision-making role in industries - National and International Strategies on AI - AI Governance and Regulation - AI in Public Services.

TOTAL: 45 PERIODS

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BoS (AD) 23/10/25

OUTCOMES:

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

- **Explain** morality and ethics in AI and their societal impacts
- **Analyze** ethical harms and international AI initiatives
- **Apply** AI standards/regulations for safe, fair systems
- **Evaluate** ethical and social issues in robotics and HRI
- **Assess** challenges/opportunities and propose ethical AI strategies

TEXT BOOKS:

1. Eleanor Bird Y, Jasmin Fox - Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield, "The ethics of artificial intelligence: Issues and initiatives", EPRS European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 - March 2020.
2. Patrick Lin, Keith Abney, George A Bekey, "Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press - January 2014.

REFERENCES:

1. Paula Boddington, "Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms)", November 2017.
2. Mark Coeckelbergh, "AI Ethics", The MIT Press Essential Knowledge series, April 2020.

CO/PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	1	2	3	2	1	2	3
CO2	3	3	2	2	2	3	3	2	2	2	3
CO3	3	3	3	3	2	3	3	2	2	3	3
CO4	2	3	3	3	3	3	3	2	2	3	3
CO5	2	2	3	3	3	3	3	2	3	3	3
Avg	**2.6**	**2.6**	**2.6**	**2.6**	**2.2**	**2.8**	**3.0**	**2.0**	**2.0**	**2.6**	**3.0**

CHAIRMAN
BoS (AD)

24AD704PE	AGILE METHODOLOGIES	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Provide students with a theoretical and practical understanding of Agile software development practices
- Familiarize students with Agile frameworks, processes, and project management approaches
- Demonstrate Agile development and testing techniques through case studies and exercises
- Analyze the benefits and challenges of working in Agile teams and organizations
- Apply Agile principles to requirements engineering, knowledge management, and quality assurance

UNIT I AGILE METHODOLOGY 9

Theories for Agile Management - Agile Software Development - Traditional Model vs. Agile Model Classification of Agile Methods - Agile Manifesto and Principles - Agile Project Management - Agile Team Interactions - Ethics in Agile Teams - Agility in Design, Testing - Agile Documentations - Agile Drivers, Capabilities and Values.

UNIT II AGILE PROCESSES 9

Lean Production - SCRUM, Crystal, Feature Driven Development - Adaptive Software Development Extreme Programming: Method Overview - Life cycle - Work Products, Roles and Practices - Scaled Agile Frameworks (SAFe, LeSS) - Kanban Methodology.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile Information Systems - Agile Decision Making - Earl's Schools of KM - Institutional Knowledge Evolution Cycle - Development, Acquisition, Refinement, Distribution, Deployment, Leveraging - KM in Software Engineering - Managing Software Knowledge - Challenges of Migrating to Agile Methodologies - Agile Knowledge Sharing - Role of Story - Cards - Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING 9

Impact of Agile Processes in RE-Current Agile Practices - Variance - Overview of RE Using Agile Managing Unstable Requirements - Requirements Elicitation - Agile Requirements Abstraction Model - Requirements Management in Agile Environment, Agile Requirements Prioritization - Agile Requirements Modeling and Generation - Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE 9

Agile Product Development - Agile Metrics - Feature Driven Development (FDD) - Financial and Production Metrics in FDD - Agile Approach to Quality Assurance - Test Driven

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BoS (AD) 25/09/25

Development - Agile Approach in Global Software Development - Continuous Integration and Continuous Deployment (CI/CD) in Agile.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Perform iterative software development processes: how to plan them, how to execute them
- Point out the impact of social aspects on software development success
- Develop techniques and tools for improving team collaboration and software quality
- Perform Software process improvement as an ongoing task for development teams
- Show how agile approaches can be scaled up to the enterprise level

TEXT BOOKS:

1. David J Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Pearson Education, Limited, 2021.
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

REFERENCES:

1. Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.
2. Kevin C Desouza, "Agile Information Systems: Conceptualization, Construction and Management", Butter worth-Heinemann, 2007.

CO/PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	2	2	1	2	3	2
CO2	3	3	3	2	2	3	2	2	3	3	3
CO3	2	3	3	2	2	3	3	3	3	3	3
CO4	2	2	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	2	2	3	3	3	3	3
Avg	**2.6**	**2.8**	**2.8**	**2.4**	**2.0**	**2.6**	**2.6**	**2.4**	**2.6**	**3.0**	**2.8**

CHAIRMAN
BoS (AD)

24EE701PE	SOFT COMPUTING TECHNIQUES (Common to ADS, CSE, EEE and IT)	L T P C 3 0 0 3

COURSE OBJECTIVES:

The students should be made to:

- Explain the structure and learning process of artificial neural networks
- Describe the use of selection, crossover and mutation in genetic algorithms to optimize solutions
- Illustrate the role of fuzzy logic in handling uncertainty in decision-making and control systems
- Summarize the principles of swarm intelligence algorithms like ACO and PSO
- Identify practical applications of soft computing methods

UNIT I ARTIFICIAL NEURAL NETWORK 9

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – Online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

UNIT II GENETIC ALGORITHM 9

Working principle – Various encoding methods – Fitness function – GA operators – Reproduction, Crossover, Mutation, Convergence of GA – Bit wise operation in GA – Multi-level optimization.

UNIT III FUZZY SYSTEMS 9

Fuzzy set theory – Fuzzy versus crisp set – Fuzzy relation – Fuzzification methods – Min-Max composition – Defuzzification methods – Fuzzy Logic – Fuzzy rule-based systems – Predicate logic – Fuzzy decision making – Fuzzy control systems – Fuzzy classification.

UNIT IV SWARM INTELLIGENCE 9

Ant Colony Optimization (ACO) – Foraging behaviour – Pheromone update – Variants of ACO – Applications. Particle Swarm Optimization (PSO) – Particle representation – Velocity and position update – Variants of PSO – Applications. Bacterial Foraging Optimization (BFO) – Chemotaxis, Swarming, Reproduction, Elimination-Dispersal – Applications.

UNIT V APPLICATIONS 9

Artificial Neural Network (ANN) – Pattern recognition, Image/Speech processing, Classification of soil, Hot extrusion of steel. Genetic Algorithm (GA) – Optimization and scheduling. Structural Engineering Fuzzy systems – Control, Decision making, Diagnosis, Classification and Pattern recognition –Swarm Intelligence – Routing, Traveling Salesman Problem (TSP), Scheduling, Power systems, Clustering and Robotics.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (EEE) 15/11/25

COURSE OUTCOMES:

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

- Understand neural network models for solving basic pattern recognition problems
- Implement a simple genetic algorithm to address an engineering optimization task
- Design a fuzzy rule-based system for a real-world classification or control problem
- Apply a swarm intelligence technique to solve a clustering or scheduling problem
- Select appropriate soft computing techniques to solve a real-world problem

TEXT BOOKS:

1. Rajsekaran S and Vijayalakshmi Pai G A, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India, 2020.
2. Bijaya Ketan Panigrahi, Yuhui Shi and Meng-Hiot Lim, "Handbook of Swarm Intelligence: Concepts, Principles and Applications", Springer, 2013.

REFERENCES:

1. Miller W T, Sutton R S and Webrose P J, "Neural Networks for Control", MIT Press, 1996.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", Third Edition, Wiley, 2020.
3. George J Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Pearson Education India, 2020.
4. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw Hill, 2017.
5. David E Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Pearson Education, 2009.

Mapping of COs with POs:

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

CHAIRMAN
BoS (EEE)

24AD705PE	GENETIC ALGORITHMS	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Familiarize with Mathematical foundations for Genetic algorithm, operators
- Study the Applications of Genetic Algorithms
- Understand and analyze the Genetic based machine learning and its applications
- Provide a broad introduction to the field of Genetic Algorithms
- Apply Evolutionary Computation techniques to solve problems in their fields of study

UNIT I META HEURISTIC ALRORITHM IN SCIENTIFIC MODELS 9

A brief history of evolutionary computation - Elements of genetic algorithms - A simple genetic algorithm - Applications of genetic algorithms - Evolving computer programs - Data analysis and prediction - Evolving neural networks - Modeling interaction between learning and evolution - Modeling sexual selection - Measuring evolutionary activity.

UNIT II THEORETICAL FOUNDATION OF GENETIC ALGORITHM 9

Schemas and Two - Armed and k-armed problem - royal roads - exact mathematical models of simple genetic algorithms - Statistical - Mechanics Approaches.

UNIT III COMPUTER IMPLEMENTATION OF GENETIC ALGORITHM 9

Data structures - Reproduction-Crossover and mutation - Mapping objective functions to fitness form- fitness scaling - Coding - Multiparameter - Mapped-fixed point coding - Discretization and constraints.

UNIT IV APPLICATIONS OF GENETIC ALGORITHMS 9

Risks and Limitations of Genetic Algorithms - De Jong and Modern Benchmark Functions (CEC, BBOB) for Function Optimization - Advancements in Basic Techniques (Hybrid GAs, Adaptive Parameter Control, Parallel Implementations) - Current Applications of Genetic Algorithms in AI-driven Design, Bioinformatics, Neural Architecture Search, Evolutionary Robotics, Smart Grid Optimization, and Sustainable Engineering.

UNIT V ADVANCED OPERATORS AND TECHNIQUES IN GENETIC SEARCH 9

Dominance - Duplicity and Abeyance - Inversion and other Reordering Operators - other Micro Operators - Niche and Speciation - Multi Objective Optimization - Knowledge Based Techniques - Genetic Algorithms and Parallel Processors - Dynamic Optimization and Adaptive Gas - Hybrid Genetic Algorithms.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD) 25/09/25

OUTCOMES:

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

- Explain principles of Evolutionary Computation and Genetic Algorithms
- Apply evolutionary methods to solve complex problems
- Analyze parameter choices and summarize current research
- Implement evolutionary algorithms using code or tools
- Conduct optimization experiments and report results effectively

TEXTBOOKS:

1. David E Goldberg, "Genetic algorithms in search, optimization and Machine Learning", by Pearson Education, 2013.

REFERENCES:

1. Melanle Mitchell, "An introduction to genetic algorithms", by PHI, 1998.
2. Michael D Vose, "The simple genetic algorithm foundations and theory", by PHI, 2004.

CO/PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	3	3	2	2	2	2	2
CO2	2	3	3	2	3	3	2	2	2	2	2
CO3	3	3	3	2	3	3	2	2	2	2	2
CO4	2	2	2	3	3	3	2	2	2	3	2
CO5	3	3	3	2	3	3	2	2	2	2	2
Avg	2.6	2.6	2.6	2.2	3.0	3.0	2.0	2.0	2.0	2.2	2.0

CHAIRMAN
BoS (AD)

24BM101OE MEDICAL INSTRUMENTS L T P C
3 0 0 3

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

24BM102OE **FOOD, NUTRITION AND HEALTH** L T P C
3 0 0 3

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

Chairman
BoS/BME

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

28.10.25

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 –Rotatary 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)

28.10.25

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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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)

24EC101OE **PRINCIPLES OF SIGNAL PROCESSING** **L T P C**
3 0 0 3

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, 4 th 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)

29/10/25

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 Owen, 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)

24EE101OE	POWER GENERATION SYSTEMS	L	T	P	C
		3	0	0	3

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)

24EE102OE	ELECTRICAL WIRING AND LIGHTING	L	T	P	C
		3	0	0	3

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

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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)

24ME101OE	PRODUCTION TECHNOLOGY	L	T	P	C
		3	0	0	3

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) 28/10/25

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)

24ME102OE	ALTERNATIVE ENERGY FUELS	L	T	P	C
		3	0	0	3

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)

24AG101OE	BASICS OF AGRICULTURE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn how biological and environmental factors affect crop growth
- Understand proper plant spacing and nursery techniques for better crop establishment
- Plan and manage water, nutrients, crop protection, fertigation and harvesting effectively
- Identify the main causes of post-harvest losses in cereals, pulses and oilseeds
- Evaluate cleaning and grading equipment based on their efficiency and performance for different crops

UNIT I AGRICULTURE AND CROP PRODUCTION 9

Introduction to agriculture and its crop production sub-sectors – field crop production and Horticulture – Factors affecting crop growth and production: genetic (internal) and environmental (external) factors – Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices.

UNIT II CROP SELECTION AND ESTABLISHMENT 9

Regional and seasonal selection of crops – Systems of crop production – Competition among crop plants – Spacing and arrangement of crop plants – Establishment of an adequate crop stand and ground cover – including selection and treatment of seed and nursery growing.

UNIT III CROP MANAGEMENT 9

Crop water Management – Crop nutrition management – need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients including fertigation scheduling – Integrated methods of managing water, nutrients and plant protection – Types and methods of harvest.

UNIT IV POST HARVESTING 9

Post harvest technology – introduction – objectives – post harvest losses of cereals, pulses and oilseeds – importance – optimum stage of harvest. Threshing – traditional methods mechanical threshers – types - principles and operation - moisture content.

UNIT V CLEANING AND GRADING 9

Principles – air screen cleaners – adjustments – cylinder separator – spiral separator – magnetic separator – colour sorter – inclined belt separator – length separators – effectiveness of separation and performance index.

TOTAL: 45 PERIODS

V. GOPE

CHAIRMAN
BoS (AGE) 28.10.25

OUTCOMES:

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

- Understand genetic and environmental factors influencing crop growth
- Apply engineering knowledge for crop selection, spacing and cropping system design
- Develop integrated water, nutrient and plant protection management for sustainability
- Solve agricultural problems using research, experiment design and data analysis
- Analyze cleaning and grading equipment based on efficiency and performance indices

TEXT BOOK:

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
3. Chakraverty A, "Post harvest technology for Cereals, Pulses and oil seeds", Oxford & IBH publication Pvt Ltd, New Delhi, 3rd Edition, 2019

REFERENCES:

1. Crop Production Guide, Tamil Nadu 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. 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, 2012

Mapping of COs with POs

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

CHAIRMAN
BoS (AGE)

24AG102OE	FARM MACHINERY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the classification of tractors and the operation of tractor engines
- Identify the concepts and functions of various engine systems
- Apply the principles and methods of operation for sowing and fertilizing equipment
- Analyze the types and performance of equipment used for weeding and plant protection
- Examine the working principles and operational efficiency of harvesting machinery

UNIT I TRACTORS 9

Classification of tractors – Tractor engines – construction of engine blocks, cylinder head and crankcase – features of cylinder, piston, connecting rod and crankshaft – firing order combustion chambers - Electronics and Guidance System of Tractor.

UNIT II ENGINE SYSTEMS 9

Valves – inlet and outlet valves – valve timing diagram. Air cleaner – exhaust – silencer. Cooling systems – lubricating systems – fuel system – governor – electrical system.

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 – dry land star weeder – wetland conoweeder 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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BoS (AGE) 28.10.25

OUTCOMES:

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

- Understand tractor engine components, electronics and guidance systems
- Apply knowledge of engine operation, valves and electrical systems
- Operate and maintain sowing and fertilizing equipment through seed/fertilizer metering and calibration
- Evaluate weeding and plant protection equipment based on atomization, droplet size and spray parameters
- Analyze efficiency and performance of harvesting machinery

TEXT BOOK:

1. Jain S C and Rai C R, "Farm Tractor Maintenance and Repair", Standard Publishers and Distributors, New Delhi, 3rd Edition,2 013
2. Jagdishwar Sahay, "Elements of Agricultural Engineering", Standard Publishers Distributors, New Delhi, 2020
3. Michael and Ohja, "Principles of Agricultural Engineering volume-1", Jain brothers, New Delhi, 14th Edition, 2021

REFERENCES:

1. Black P O, "Diesel Engine Manual", D B Taraporevala Sons & Co Pvt Ltd, Mumbai, 1996
2. Kepner RA, "Principles of Farm Machinery", CBS Publishers and Distributers, New Delhi, Kindle Edition, 2018
3. Harris Pearson Smith, "Farm machinery and equipment", Tata McGraw-Hill publication, New Delhi, Kindle Edition, 2017

Mapping of COs with POs

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

CHAIRMAN
BoS (AGE)

28.

24BM201OE	TRADITIONAL INDIAN FOODS	L T P C 3 0 0 3

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 TRADIONAL 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

24BM202OE FUNDAMENTALS OF CELL AND MOLECULAR BIOLOGY

L T P C
3 0 0 3

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

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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

28.10.25

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.

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UNIT V ATMOSPHERIC HUMIDITY AND RAINFALL 9

Atmospheric humidity and rainfall - Human induced climate change (anthropogenic causes) - Weather and climate parametèrs measuring instruments - UNEP - United Nations Environment Programme - Concept of Carbon sequestration - Wind circulation - Global radiance balance of climate system – thermometer - hygrometer or psychomotor 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)

28.10.25

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.

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BoS (CIVIL)

UNIT V FIRE SAFETY INSTALLATION 9

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)

24EC201OE	BASICS OF VIRTUAL INSTRUMENTATION	L T P C 3 0 0 3

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

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BoS (ECE) 24/10/25

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)

24EC202OE	TELECOMMUNICATIONS FOR SOCIETY	L T P C 3 0 0 3

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

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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)

24EE201OE	ENERGY AUDIT AND MANAGEMENT	L	T	P	C
		3	0	0	3

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) 28/10/25

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)

24EE202OE	ELECTRIC VEHICLES	L T P C
		3 0 0 3

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

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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)

24ME201OE	BASICS OF AUTOMOTIVE COMPONENTS	L	T	P	C
		3	0	0	3

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

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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)

24ME202OE	UNCONVENTIONAL MACHINING PROCESSES	L	T	P	C
		3	0	0	3

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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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 Processesing 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)

24AG201OE	INTRODUCTION TO ORGANIC FARMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Explain the basic concepts, principles and components of organic farming
- Demonstrate the use of organic nutrient sources
- Implement organic pest and disease management using botanical pesticides
- Compare crop management practices in organic and conventional farming
- Evaluate quality standards, certification and marketing of organic products

UNIT I INTRODUCTION TO ORGANIC FARMING **9**

Organic farming: Introduction – Concepts and principles of organic farming – Components of organic farming – Types of farming – Cropping systems and its types.

UNIT II SOURCES OF NUTRIENTS IN ORGANIC FARMING **9**

Input management; Organic manure – FYM / Rural compost and city composts – Oil cakes – Animal wastes – Vermicompost – Green manure – Green leaf manure – Other nitrogen contributing plants – Biofertilizers.

UNIT III ORGANIC PEST AND DISEASE MANAGEMENT **9**

Different types of pests and their classification – Botanical pesticides and its types – Integrated pest management – Inorganic pesticides, disadvantages of their use – Control of pests and diseases of important crops / vegetables.

UNIT IV 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 V QUALITY 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

V. Gopal

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BoS (AGE) 28.10.25

OUTCOMES:

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

- Understand the principles of organic farming for sustainable agriculture
- Apply organic nutrients for sustainable crop production
- Implement organic pest and disease management using botanical pesticides and IPM approaches
- Analyze and compare organic crop and livestock management practices
- Evaluate organic food quality and certification for health and sustainability

TEXTBOOKS:

1. Sharma A, "Hand book of Organic Farming", Agrobios, 2016
2. Somasundram E D, Udhaya Nandhini and Meyappan M, "Principles of Organic farming (Theory and Practical)", CRC press, 1st Edition, 2021

REFERENCES:

1. Gupta S K, "Organic vegetable production", Rajat Publications, New Delhi, 2008
2. Singh S K, R B Yadav, Jagdish singh and Bijendra singh, "Organic Farming in Vegetables", ICAR Technical Publication, New Delhi, 2017

Mapping of COs with POs

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

CHAIRMAN
BoS (AGE)

24AG202OE INTRODUCTION TO GREEN HOUSE TECHNOLOGY

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Know the importance, types and uses of greenhouses
- Use land survey and foundation methods in greenhouse design
- Practice installation of greenhouse structures and coverings
- Check and analyze maintenance needs of greenhouse structures
- Evaluate safety measures and emergency procedures in greenhouse operation

UNIT I GENERAL CONCEPTS OF GREEN HOUSE 9

Introduction to green house – Scope and Importance – Types of Green houses – Potential crop for green house.

UNIT II GREEN HOUSE DESIGN AND LAYOUT 9

Land survey and levelling – Assessment of structural strength, foundation specifications.

UNIT III INSTALLATION OF GREEN HOUSE 9

Erection of greenhouse structures – Covering with nets and shades – Types of glazing material and its characteristics – Checking of gutters.

UNIT IV MAINTENANCE OF GREEN HOUSE 9

Maintenance of erected structures – Maintenance of operational elements of the greenhouse for periodic checking, tightening, greasing etc.

UNIT V HEALTH AND SAFETY 9

Understanding about basic safety checks – Operation of all machinery and vehicles and hazards – Render appropriate emergency procedures.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the scope, importance, types of greenhouses and their suitable crops
- Apply foundation principles for greenhouse design and layout
- Demonstrate installation of greenhouse structures, including glazing, nets and shades
- Analyze maintenance needs of greenhouse structures and operations for efficiency
- Evaluate safety measures and emergency procedures in greenhouse management

V.Gopal

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BoS (AGE)

28.10.25

TEXTBOOKS:

1. Prasad S and Kumar U, "Greenhouse Management of Horticultural Crops, Agrobios, 2nd Edition", 2010
2. Bose T K and Som G M, "Vegetable Crops in India", Naya Prokash, Kolkata, 1986

REFERENCES:

1. Roger Marshall, "The Greenhouse Gardener's Manual", Timber press, 2014

Mapping of COs with POs

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

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BoS (AGE)

28/10/25

24M101	FINANCIAL MANAGEMENT	L	T	P	C
	(Common to all Branches)	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

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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

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BoS (IT)

28/10/24

24M102	FUNDAMENTALS OF INVESTMENT	L	T	P	C
	(Common to all Branches)	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/ 05/ 25

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

CHAIRMAN
BoS (IT)

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	-	-	-	-	-

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BoS (IT)

28/10/24

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 Madisetti, 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 Cryptocrrencies - 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

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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

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BoS (IT)

24M201	FOUNDATIONS OF ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

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

CHAIRMAN
(BoS / MECH)

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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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

CHAIRMAN
(BoS / MECH)

24M206	FINANCING NEW BUSINESS VENTURES	L	T	P	C
		3	0	0	3

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 Hardymon, "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 Webe

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, NewDelhi: 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/ECE

24M302	ELEMENTS OF PUBLIC ADMINISTRATION	L T P C
	(COMMON TO ALL BRANCHES)	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; Pubic 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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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
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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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. raining 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

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24M306	PUBLIC POLICY ADMINISTRATION (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

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 – Publicpolicy 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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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

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BOS/ECE

24M401	STATISTICS FOR MANAGEMENT	L T P C
		3 0 0 3

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

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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)

24M402	DATA MINING FOR BUSINESS INTELLIGENCE	L T P C 3 0 0 3

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

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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 Publishers2006
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

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BoS (AD)

24M403	HUMAN RESOURCE ANALYTICS	L T P C
		3 0 0 3

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 ANLYTICS 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

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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 profilin

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 Metrices", 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

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24M404 MARKETING AND SOCIAL MEDIA WEB ANALYTICS **L T P C**
3 0 0 3

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

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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
CO1	3	2	1	2	3	1	-	2	2	2	2
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

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24M405 OPERATION AND SUPPLY CHAIN ANALYTICS **L T P C**
3 0 0 3

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

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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
CO1	2	2	2	2	-	-	-	2	1	2	2
CO2	2	2	2	2	-	-	-	1	1	2	2
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

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24M406	FINANCIAL ANALYTICS	L T P C
		3 0 0 3

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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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

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28.10.25

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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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, 4thEdition, 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	-

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28.10.25

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	-	-	-	-	-

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08.10.24

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 NANOBIOMATERIALS **9**

Meatllic 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, Sodiated 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, flow field 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 – Cadium 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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28.10.24

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-HillCompanies, Inc.
2. Handbook of environmental analysis: chemical pollutants in the air, water, soil, and soild 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

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

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28.10.25

24M507	INTEGRATED ENERGY PLANNING FOR SUSTAINABLE DEVELOPMENT	L	T	P	C
		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, Incomeand 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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28.10.22

24M508	ENERGY EFFICIENCY FOR SUSTAINABLE DEVELOPMENT	L	T	P	C
		3	0	0	3

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 CONSERVTION 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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UNIT V SUSTAINABLE DEVELOPMENT 9

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 (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 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 IndiaPublishing 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.

Mapping of COs with POs

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

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