Kongunadu College of Engineering and Technology (Autonomous)
Affiliated to Anna University, Chennai
B.E. Electronics and Communication Engineering
Regulations: R2024
Choice Based Credit System
I to VIII Semesters Curricula & Syllabi
(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	24GE102	Engineering Graphics	ESC	3	0	2	4
7	24TA101	தமிழர் மரபு / Heritage of Tamils	HSMC	1	0	0	1
Practicals							
8	24GE104L	Engineering Practices Laboratory	ESC	0	0	4	2
9	24EEC101L	Interpersonal Communication Laboratory	EEC	0	0	2	1
			Total	**16**	**1**	**12**	**23**

Semester II							
S.No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	24EN201	Technical English	HSMC	3	0	0	3
2	24MA201	Vector Calculus and Numerical Analysis	BSC	3	1	0	4
3	24MC002	Universal Human Values – 2 Understanding Harmony	MC	2	1	0	3
4	24CY201	Environmental Sciences	BSC	3	0	0	3
5	24GE101	Computer Fundamentals and C Programming	ESC	3	0	0	3
6	24EC201	Electric Circuits and Electron Devices	PCC	3	0	0	3
7	24TA201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	1
Practicals							
8	24GE103L	C Programming Laboratory	ESC	0	0	3	1.5
9	24EC202L	Circuits and Devices Laboratory	PCC	0	0	3	1.5
10	24EEC201L	Professional Communication	EEC	0	0	2	1
			Total	**18**	**2**	**8**	**24**

CHAIRMAN
BOS/ECE
24/10/25

Semester III							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	24MA303	Transforms and Partial Differential Equations	BSC	3	1	0	4
2	24EC301	Analog Electronic Circuits Design	PCC	3	0	0	3
3	24EC302	Signals and Systems	PCC	3	1	0	4
4	24EC303	Digital Electronics	PCC	3	0	0	3
5	24IT302	Data Structures using C++	ESC	3	0	0	3
Practicals							
6	24EC305L	Analog Electronics Laboratory	PCC	0	0	3	1.5
7	24EC306L	Digital Electronics Laboratory	PCC	0	0	3	1.5
8	24IT303L	Data Structures using C++ Laboratory	ESC	0	0	2	1
9	24EEC301L	Soft Skills Development	EEC	0	0	2	1
			Total	**15**	**2**	**10**	**22**

Semester IV							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	24MA402	Probability and Random Processes	BSC	3	1	0	4
2	24EC401	Microprocessors and Microcontrollers	PCC	3	0	0	3
3	24EE301	Electromagnetic Theory	ESC	3	0	0	3
4	24EC402	Linear Integrated Circuits and Applications	PCC	3	0	0	3
5	24EC403	Analog and Digital Communication	PCC	3	0	2	4
6	24MC003	Constitution of India	MC	2	0	0	0
Practicals							
7	24EC404L	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1.5
8	24EC405L	Integrated Circuits Laboratory	PCC	0	0	3	1.5
9	24EEC401L	Life Skills and Personality Development	EEC	0	0	2	1
			Total	**17**	**1**	**10**	**21**

CHAIRMAN
BOS/ECE

Semester V							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	24EC501	IoT and Its Applications	PCC	3	0	0	3
2	24EC502	Digital Signal Processing	PCC	3	0	0	3
3	24EC503	Data Communication and Networks	PCC	3	0	2	4
4	24EC504	Transmission Lines and Waveguides	PCC	3	0	0	3
5		Professional Elective -I	PEC	3	0	0	3
6		Professional Elective -II	PEC	3	0	0	3
Practicals							
7	24EC505L	Internet of Things Laboratory	PCC	0	0	3	1.5
8	24EC506L	Digital Signal Processing Laboratory	PCC	0	0	3	1.5
9	24EC507L	Mini Project-I	EEC	0	0	2	1
10	24EEC501L	Professional Skills and Career Development	EEC	0	0	2	1
			Total	**18**	**0**	**12**	**24**

Semester VI							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	24EC601	Antenna and Wave Propagation	PCC	3	0	0	3
2	24EC602	VLSI Design	PCC	3	0	2	4
3	24EC603	Embedded Systems and Applications	PCC	3	0	0	3
4		Professional Elective-III	PEC	3	0	0	3
5		Open Elective-I	OEC	3	0	0	3
Practicals							
6	24EC604L	Embedded Laboratory	PCC	0	0	2	1
6	24EC605L	Mini Project-II	EEC	0	0	2	1
7	24EEC601L	Employability Skills	EEC	0	0	2	1
			Total	**15**	**0**	**8**	**19**

CHAIRMAN
BOS/ECE

Semester VII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	24EC701	Microwave and Light Wave Technologies	PCC	3	0	0	3
2	24ME708P	Principles of Management	HSMC	3	0	0	3
3		Professional Elective-IV	PEC	3	0	0	3
4		Professional Elective-V	PEC	3	0	0	3
5		Open Elective-II	OEC	3	0	0	3
Practicals							
6	24EC703L	Microwave and Light Wave Technologies Laboratory	PCC	0	0	3	1.5
7	24EC704L	Electronics Design Laboratory	PCC	0	0	3	1.5
			Total	**15**	**0**	**6**	**18**

Semester VIII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1		Professional Elective-VI	PEC	3	0	0	3
2		Professional Elective-VII	PEC	3	0	0	3
Practicals							
3	24EEC801L	Project Work	EEC	0	0	20	10
			Total	**6**	**0**	**20**	**16**

CHAIRMAN
BOS/ECE

Vertical I: Electronics Design

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24EC101PE	Industrial Electronics	PEC	3	0	0	3
2	24EC102PE	Industrial Instrumentation	PEC	3	0	0	3
3	24EC103PE	Display Technologies	PEC	3	0	0	3
4	24EC104PE	Nano Electronics	PEC	3	0	0	3
5	24EC105PE	MEMS Design	PEC	3	0	0	3
6	24EC106PE	PCB Design	PEC	2	0	2	3
7	24EC107PE	Measurements and Instrumentation	PEC	3	0	0	3
8	24EC108PE	Enclosure Design of Electronics Equipment	PEC	3	0	0	3

Vertical II: Signal and Image Processing

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24EC201PE	Digital Image Processing	PEC	3	0	0	3
2	24EC202PE	DSP Processors and Architectures	PEC	3	0	0	3
3	24CS104PE	Image and Video Analytics	PEC	3	0	3	3
4	24EC204PE	Speech Processing	PEC	2	0	2	3
5	24EC205PE	Software Defined Radio	PEC	3	0	0	3
6	24EC206PE	Digital Audio Processing	PEC	3	0	0	3
7	24EC207PE	Machine Learning for Image Analysis	PEC	3	0	0	3
8	24EC208PE	Signal Processing for MM Wave Communication for 5G and Beyond	PEC	3	0	0	3

CHAIRMAN
BOS/ECE

Vertical III: Bio Medical Systems

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24BM406PE	Assistive Technology	PEC	3	0	0	3
2	24BM501	Diagnostic and Therapeutic Equipment	PEC	3	0	0	3
3	24BM505PE	Brain Computer Interface and its Applications	PEC	3	0	0	3
4	24BM602PE	Wearable Systems	PEC	3	0	0	3
5	24BM604PE	Telehealth Technology	PEC	3	0	0	3
6	24BM105PE	Medical Optics	PEC	3	0	0	3
7	24BM605PE	Body Area Networks	PEC	3	0	0	3
8	24BM208PE	Microelectronics: Devices To Circuits	PEC	3	0	0	3

Vertical IV: Communication and Networks

S.No.	Course Code	Name of the Course	Course Category	No. of Hours /Week			Credit
				L	T	P	
1	24EC401PE	Radar Engineering	PEC	3	0	0	3
2	24EC402PE	Wireless Communication	PEC	3	0	0	3
3	24EC403PE	Adhoc and Wireless Sensor Networks	PEC	3	0	0	3
4	24EC404PE	Satellite Communication	PEC	3	0	0	3
5	24EC405PE	High Speed Systems	PEC	3	0	0	3
6	24EC406PE	5G Communication Networks	PEC	3	0	0	3
7	24EC407PE	Avionics Systems	PEC	3	0	0	3
8	24EC408PE	Introduction to Wireless and Cellular Communications	PEC	3	0	0	3

CHAIRMAN
BOS/ECE

Vertical V: Emerging Field & Diversified

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	24IT107PE	Blockchain Technologies	PEC	3	0	0	3
3	24AD401	Artificial Intelligence	PEC	3	0	0	3
4	24ME605PE	Drone Technologies	PEC	3	0	0	3
5	24ME705PE	Total Quality Management	PEC	3	0	0	3
6	24EE704PE	Intellectual Property Rights	PEC	3	0	0	3
7	24EE401PE	Electric Vehicles Architecture	PEC	3	0	0	3
8	24CS202PE	The Joy of Computing using Python	PEC	3	0	0	3

Vertical VI: Embedded Intelligence and IoT Systems

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24EC601PE	Advanced Microcontrollers	PEC	3	0	0	3
2	24EC602PE	Embedded Processors	EEC	3	0	0	3
3	24EC603PE	Programming for Embedded Systems	PEC	3	0	0	3
4	24EC604PE	ARM Based System Design	PEC	3	0	0	3
5	24EC605PE	IoT Architecture and Protocols	PEC	3	0	0	3
6	24EC606PE	Sensors for IoT Applications	PEC	3	0	0	3
7	24EC607PE	Transducer Engineering	PEC	3	0	0	3
8	24EE304PE	Introduction to Industry 4.0 and Industrial Internet of Things	PEC	3	0	0	3

CHAIRMAN
BOS/ECE

Vertical VII: Chip Design and Testing

S.No.	Course Code	Name of the Course	Course Category	No. of Hours / Week			Credit
				L	T	P	
1	24EC701PE	System on Chip Architecture	PEC	3	0	0	3
2	24EC702PE	Low Power VLSI Design	PEC	3	0	0	3
3	24EC703PE	Testing of VLSI Circuits	PEC	3	0	0	3
4	24EC704PE	ASIC and FPGA System Design	PEC	3	0	0	3
5	24EC705PE	Validation and Testing Technology	PEC	3	0	0	3
6	24EC706PE	Hardware-Software Co-Design	PEC	3	0	0	3
7	24EC707PE	RFIC Design	PEC	3	0	0	3
8	24EC708PE	Analog IC Design	PEC	3	0	0	3

CHAIRMAN
BOS/ECE

Vertical I Electronics Design	Vertical II Signal and Image Processing	Vertical III Bio Medical Systems	Vertical IV Communication and Networks	Vertical V Emerging Field & Diversified	Vertical VI Embedded Intelligence and IoT Systems	Vertical VII Chip Design and Testing
Industrial Electronics	Digital Image Processing	Wearable Systems	Radar Engineering	Augmented Reality/Virtual Reality	Advanced Microcontrollers	System on Chip Architecture
Industrial Instrumentation	DSP Processors and Architectures	Assistive Technology	Wireless Communication	Blockchain Technologies	Embedded Processors	Low Power VLSI Design
Display Technologies	Image and Video Analytics	Diagnostic and Therapeutic Equipments	Adhoc and Wireless Sensor Networks	Artificial Intelligence	Programming for Embedded Systems	Testing of VLSI Circuits
Nano Electronics	Speech Processing	Brain Computer Interface and its Applications	High Speed Systems	Drone Technologies	ARM Based System Design	ASIC and FPGA System Design
MEMS Design	Software Defined Radio	Body Area Networks	Satellite Communication	Total Quality Management	IoT Architectures and Protocols	Validation and Testing Technology
PCB Design	Digital Audio Processing	Telehealth Technology	5G Communication Networks	Intellectual Property Rights	Sensors for IoT Applications	Hardware-Software Co-Design
Electronic Measurements and Instrumentation	Machine Learning for Image Analysis	Medical Optics	Avionics Systems	Electric Vehicle Architecture	Transducer Engineering	RFIC Design
Enclosure design of electronics equipment	Signal Processing for MM Wave Communication for 5G and Beyond	Microelectronics: Devices To Circuits	Introduction to Wireless and Cellular Communications	The Joy of Computing using Python	Introduction to Industry 4.0 and Industrial Internet of Things	Analog IC Design

CHAIRMAN
BOS/ECE

KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

Namakkal - Trichy Main Road, Tholurpatti (Po), Thottiyam (Tk), Tiruchirappalli – 621 215.

(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai, Accredited by NBA (CSE, ECE and EEE) and NAAC with B++ Grade, Recognized by UGC with 2(f)& 12(b) & ISO 9001:2015 Certified Institution)

DEPARTMENT OF ELECTRONICS AND COMMUNICAION ENGINEERING

Annexure – III

Vertical for Minor Degree (In addition to all the verticals of other programmes)

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

Vertical I Fintech and Block Chain	**Vertical II** Entrepreneurship	**Vertical III** Public Administration	**Vertical IV** Business Data Analytics	**Vertical V** Environment and Sustainability
24M101 - Financial Management	24M201 - Foundations of Entrepreneurship	24M301 - Principles of Public Administration	24M401 - Statistics for Management	24M501 - Sustainable infrastructure Development
24M102 - Fundamentals of Investment	24M202 - Team Building and Leadership Management for Business	24M302 - Elements of public Administration	24M402 - Data mining for Business Intelligence	24M502 - Sustainable Agriculture and Environmental Management
24M103 - Banking, Financial Services and Insurance	24M203 - Creativity and Innovation in Entrepreneurship	24M303 - Public Personnel Administration	24M403 - Human Resource Analytics	24M503 - Sustainable Bio Materials
24M104 - Introduction to Blockchain and its Applications	24M204 - Principles of Marketing Management for Business	24M304 - Administrative Theories	24M404 - Marketing and Social Media Web Analytics	24M504 - Materials for Energy Sustainability
24M105 - Fintech Personal Finance and Payments	24M205 - Human Resource Management for Entrepreneurs	24M305 - Indian Administrative System	24M405 - Operation and Supply Chain Analytics	24M505 - Green Technology
24M106 - Introduction to Fintech	24M206 - Financing New Business Ventures	24M306 - Public Policy Administration	24M406 - Financial Analytics	24M506 - Environmental Quality Monitoring and Analysis
-	-	-	-	24M507 - Integrated Energy Planning for Sustainable Development
-	-	-	-	24M508 - Energy Efficiency for Sustainable Development

CHAIRMAN
BOS/ECE
24/10/25

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)

Open Elective I (Semester VI)

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24AD101OE	Introduction to Artificial Intelligence	OEC	3	0	0	3
2	24AD102OE	Introduction to Data Science	OEC	3	0	0	3
3	24AG101OE	Basics of Agriculture Engineering	OEC	3	0	0	3
4	24AG102OE	Farm Machinery	OEC	3	0	0	3
5	24BM101OE	Medical Instruments	OEC	3	0	0	3
6	24BM102OE	Food, Nutrition and Health	OEC	3	0	0	3
7	24CE101OE	Industrial Waste Management	OEC	3	0	0	3
8	24CE102OE	Ecological Engineering	OEC	3	0	0	3
9	24CS101OE	Python Programming for Data Science	OEC	3	0	0	3
10	24CS102OE	Programming and Data Structures	OEC	3	0	0	3
11	24EE101OE	Power Generation Systems	OEC	3	0	0	3
12	24EE102OE	Electrical Wiring and Lighting	OEC	3	0	0	3
13	24IT101OE	Fundamentals of Software Engineering	OEC	3	0	0	3
14	24IT102OE	Wireless Sensor Networks	OEC	3	0	0	3
15	24ME101OE	Production Technology	OEC	3	0	0	3
16	24ME102OE	Alternative Energy Fuels	OEC	3	0	0	3

CHAIRMAN
BOS/ECE
24/10/25

Open Elective II (Semester VII)

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24AD201OE	Basics of Visualization Tools	OEC	3	0	0	3
2	24AD202OE	Foundations of Machine Learning	OEC	3	0	0	3
3	24AG201OE	Introduction to Organic Farming	OEC	3	0	0	3
4	24AG202OE	Introduction to green House Technology	OEC	3	0	0	3
5	24BM201OE	Traditional Indian Foods	OEC	3	0	0	3
6	24BM202OE	Foundations of Cell and Molecular Biology	OEC	3	0	0	3
7	24CE201OE	Global Warming and Climate Change	OEC	3	0	0	3
8	24CE202OE	Building Services	OEC	3	0	0	3
9	24CS201OE	Fundamentals of Operating Systems	OEC	3	0	0	3
10	24CS202OE	Introduction to Database	OEC	3	0	0	3
11	24EE201OE	Energy Audit and Management	OEC	3	0	0	3
12	24EE202OE	Electronic Vehicles	OEC	3	0	0	3
13	24IT201OE	Introduction to Web Development	OEC	3	0	0	3
14	24IT202OE	Principles of Multimedia	OEC	3	0	0	3
15	24ME201OE	Basics of Automative Components	OEC	3	0	0	3
16	24ME202OE	Unconventional Machining Process	OEC	3	0	0	3

CHAIRMAN
BOS/ECE

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.

CHAIRMAN
BoS(S&H)

13/05

(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

CHAIRMAN
BoS(S&H)

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

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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.

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

24PH101	ENGINEERING PHYSICS (Common to All Branches)	L T P C 3 0 2 4

OBJECTIVES:

The students should be made to:

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

UNIT I MECHANICAL PROPERTIES OF SOLIDS 9

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

UNIT II ELECTRICAL PROPERTIES OF MATERIALS 9

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

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

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

UNIT IV QUANTUM PHYSICS 9

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

UNIT V NEW ENGINEERING MATERIALS 9

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

TOTAL: 45 PERIODS

CHAIRMAN
BoS (S&H) 19/02/25

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.

CHAIRMAN
BoS (S&H) 19/02/25

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.

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF THE EXPERIMENTS - CHEMISTRY LABORATORY

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

TOTAL: 30 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

CHAIRMAN
BoS (S&H) 19/02/25

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.

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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.

CHAIRMAN
(BoS) MECH

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

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

TOTAL: 75 (45+30) PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

Special points applicable to End Semester Examinations on Engineering Graphics:

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

Mapping of COs with POs

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

CHAIRMAN
(BoS / MECH)

24TA101	HERITAGE OF TAMILS (Common to All Branches)	L T P C 1 0 0 1

OBJECTIVES:

The students should be made to:

- Learn the extensive literature of classical Tamil.
- Analyze rock art paintings to modern art.
- Understand folk and martial arts.
- Apply the concepts of 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

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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.)

CHAIRMAN
BoS (S&H) 19/12/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
(BoS / EEE)

CHAIRMAN
(BoS / MECH)

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

CHAIRMAN
(BoS / EEE)

CHAIRMAN
(BoS / MECH)

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.

CHAIRMAN
(BoS / MECH) 31/05

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.

CHAIRMAN
(BoS / MECH)

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

CHAIRMAN
BoS(EEE) 26/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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	-	-

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF EQUIPMENTS
Requirements for a batch of 30 students

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

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS(S&H) 19/02/25

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	-	-

CHAIRMAN
BoS(S&H) 19/02/25

24MA202	VECTOR CALCULUS AND NUMERICAL ANALYSIS (Common to BME, EEE and ECE)	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.
- Differentiate the concepts of numerical differentiation and integration procedures, which have significant role in the field of engineering.
- Test the numerous approaches and strategies for resolving different kinds of ODEs.

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 NUMERICAL DIFFERENTIATION AND INTEGRATION **9+3**

Newton's forward and backward difference formulae – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9+3**

Single Step methods - Taylor's series method – Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne's predictor corrector methods for solving first order equations.

TOTAL: (45+15) PERIODS

CHAIRMAN
BoS (S&H) 20/02/25

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.
- Apply the different approaches and strategies for solving first- and second-order ordinary differential equations.
- Develop the multi-step methods for solving initial value problems.

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. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition New Delhi, 2013.
3. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pt.Ltd, 4th Edition, New Delhi, 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	1	-	-	-	-	-	2
CO2	3	3	3	3	2	2	-	-	-	-	2
CO3	3	3	3	-	3	-	-	-	-	-	1
CO4	3	3	2	2	2	1	-	-	-	-	2
CO5	3	3	2	3	2	-	-	-	-	-	2

CHAIRMAN
BoS (S&H) 19/12/25

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

CHAIRMAN
BoS (S&H) 02/07/25

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

CHAIRMAN
BoS (S&H)

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

CHAIRMAN
BoS (S&H) 19/02/25

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	-	-

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (IT)

27/11

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

Mapping of COs with POs:

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

N. Ramesh

CHAIRMAN
BoS (IT) 27/11

24EC201 ELECTRIC CIRCUITS AND ELECTRON DEVICES (Common to ECE and BME)

L	T	P	C
3	0	0	3

OBJECTIVES:

Student should be made to

- Understand the basic electrical quantities, circuit elements, and fundamental laws governing electrical circuits.
- Able to simplify electrical circuits using various network theorems and two-port parameter concepts.
- Learn the behavior of RL, RC, and RLC circuits under transient conditions using Laplace transform techniques.
- Provide insights into semiconductor diodes, their characteristics, and applications in electronic circuits.
- Explore the working principles of BJTs, JFETs, and MOSFETs, along with their role in amplification and switching circuits

UNIT I BASIC CIRCUIT ANALYSIS 9

Electrical Quantities -Basic Circuit Elements -Independent Voltage and Current Sources - Ohm's Law- Kirchhoff's Laws -Voltage and Current Division, Source Transformation Star Delta Conversion- Mesh analysis and Nodal analysis for DC Circuits - Fundamentals of AC Circuits.

UNIT II NETWORK THEOREMS AND TWO PORT NETWORKS 9

Network Theorems for DC Circuits: Thevenin's Theorem Norton's Theorem- Superposition Theorem Maximum Power Transfer Theorem Two Port Networks: Z Parameters – Y Parameters - h Parameters - Relationships between Network Parameters (Z, Y, h).

UNIT III TRANSIENT RESPONSE ANALYSIS 9

Introduction to Laplace transform for step, impulse and periodic functions-Transient Response of RL, RC and RLC Circuits using Laplace transform for DC input and AC sinusoidal input.

UNIT IV SEMICONDUCTOR DIODES AND DEVICES 9

Classification of Semiconductors – PN Junction Diode -Structure, Operation and V-I characteristics -Diode Current equation -Transition and Diffusion Capacitances Zener Diode LED-Photodiode-Solar Cell -UJT-SCR.

UNIT V TRANSISTORS 9

Bipolar Junction Transistor: Construction of BJT-Operation of NPN and PNP transistor - Input and Output characteristics of CB, CE, CC configuration- Field Effect transistor: JFET P Channel JFET and N Channel JFET Construction, Operation, Drain and Transfer characteristics MOSFET Depletion MOSFET and Enhancement MOSFET - Construction, Operation and characteristics.

TOTAL: 45 PERIODS

Chairman
BoS(ECE) 22/08/25

OUTCOMES:

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

- Recognize fundamental circuit laws and theorems to solve DC electrical circuits.
- Illustrate the use of Thevenin's, Norton's, and Superposition theorems for circuit simplifications.
- Interpret the behavior of RL, RC, and RLC circuits under DC and AC inputs using Laplace Transform techniques.
- Examine the characteristics and functions of diodes, Zener diodes, LEDs, photodiodes, solar cells, and thyristors.
- Categorize the working principles, characteristics, and applications of BJTs, JFETs, and MOSFETs in different circuit configurations.

TEXT BOOKS:

1. S. Salivahanan, "Circuit Theory Analysis and Synthesis", Pearson Education,1 st Edition,2021.
2. S. Salivahanan, "Electronic Devices", Tata McGraw Hill, 1st Reprint Edition, 2014.

REFERENCES:

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Sathesis", 5 thEdition, McGraw Hill, 2015.
2. Chakrabarti A, "Circuit Theory (Analysis and synthesis), Revised Edition, Dhanpath Rai & Sons, New Delhi, 2017.
3. Balbir Kumar, Shail. B. Jain, "Electronic devices and circuits", 2nd Edition PHI learning private limited, 2014.
4. David A. Bell, "Electronic devices and circuits", 5th Edition, Oxford University Higher education, 2008.
5. Sedra and Smith, "Microelectronic circuits", 7th Edition, Oxford University Press, 2017
6. Thomas L. Floyd, "Electronic devices" Conventional current version, 10th Edition, Pearson prentice hall, 2017.

Mapping of COs with POs

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

Chairman
BoS(ECE)

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.

CHAIRMAN
BoS (S&H) 19/02/25

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

CHAIRMAN
BoS (S&H) 19/02/25

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.

CHAIRMAN
BoS (S&H) 19/02/25

அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ் 3

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

TOTAL: 15 PERIODS

முடிவுகள்:

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன:

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

உரை மற்றும் குறிப்பு புத்தகங்கள்:

1. தமிழகவரலாறு - மக்களும்பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. 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.

CHAIRMAN
BoS (S&H) 19/12/25

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

CHAIRMAN
BoS (S&H) 19/12/25

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

CHAIRMAN
BoS (IT) 27/11

24EC202L	CIRCUITS AND DEVICES LABORATORY (Common to ECE and BME)	L P T C 0 0 3 1.5

OBJECTIVES:

The student should be made to:

- Learn and verify the voltage and current in the electrical circuit using Kirchhoff's laws.
- Apply circuit analysis concepts using network theorems.
- Analyze the operation of RLC circuits in series and parallel models.
- Evaluate the characteristics, behavior under varying conditions, and practical applications of diodes and transistors in electronic circuits and devices.
- Create a project using electronic components.

LIST OF EXPERIMENTS:

1. Verification of KVL and KCL
2. Verification of Thevinin's and Norton's Theorem
3. Verification of Super Position Theorem
4. Verification of Maximum Power Transfer Theorem
5. Simulation and Verification of Reciprocity Theorem
6. Determination of Resonance Frequency of Series and Parallel RLC Circuits
7. Characteristics of PN Junction Diode and Zener Diode
8. Input-Output Characteristics of CE Configuration
9. Simulation of LED Characteristics
10. Characteristics of FET

11 Characteristics of SCR

12 Mini Project

TOTAL: 45 PERIODS

Chairman
BoS(ECE) 22/08/25

OUTCOMES:

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

- Contrast Kirchhoff's laws to verify the voltage and current
- Determine the network theorems allows for the efficient solution of voltage, current or resistance in complex circuits.
- Illustrate the operation of RLC circuits in series and parallel models enables the analysis of resistive, inductive and capacitive components
- Implement the characteristics of semiconductor diodes and transistors
- Demonstrates the ability to design, assemble, and troubleshoot electronic circuits, showcasing problem-solving skills and practical application of electronic principles.

Mapping of COs with POs

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

Chairman
BoS(ECE)

Lab Requirements for a Batch of 30 Students

1.	BC 107, BC 148, BFW10	25 Each
2.	1N4007, SCR, Zener diodes	25 Each
3.	Resistors, Capacitors, Inductors	Adequate Quantities
4.	Digital Multimeter	10 Nos
5.	Bread Boards	15 Nos
6.	Voltmeter (0-15)V, (0-10)V	10 Nos
7.	Ammeter (0-20) mA, (0-250) μA	10 Nos
8.	CRO (30 MHz)	10 Nos
9.	Function Generators (3 MHz)	10 Nos
10.	Regulated Power Supplies (0-30) V	15 Nos
11.	Standalone desktops PCs with Multisim Software (Equivalent to any open source Software)	15 Nos

CHAIRMAN
BoS (ECE) 22/08/25

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.

CHAIRMAN
BoS (S&H) 19/02/25

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF EQUIPMENTS
Requirements for a batch of 30 students

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

CHAIRMAN
BoS (S&H) 19/02/25

24MA303 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
(Common to BME, CIVIL, EEE, ECE and MECH) 3 1 0 4

OBJECTIVES:

The Student should be made to:

- Understand the basic concepts of PDE for solving standard partial differential equations
- Remember the concepts of fourier series for solving problems in engineering disciplines
- Applying the standard techniques for solving boundary value problem
- Analyze Fourier transform techniques used in wide variety of situations
- Evaluate the Z transform techniques for discrete time systems

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations(single functions only) - Singular integrals -Solutions of standard types of first order partial differential equations(four types) - Lagrange's linear equation - Linear partial differential equations of second order with constant coefficients of homogeneous Equations.

UNIT II FOURIER SERIES 9+3

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

UNIT III FOURIER TRANSFORMS 9+3

Fourier transform pair - Fourier sine and cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

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

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties - Inverse Z-transform - Partial fraction - Convolution theorem (Statement and Examples) - Initial and final value theorems - Formation of difference equations - Solution of difference equations using Z-transform.

TOTAL: (45+15) PERIODS

OUTCOMES:

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

- Understand suitable concepts in solving first order and second order partial differential equations with constant coefficients
- Identify the Fourier series for standard periodic waveforms
- Apply the solutions of wave and heat equations using Fourier series
- Analyze the properties and techniques of Fourier transforms
- Evaluate the necessary Z transform techniques to solve the difference equations

CHAIRMAN
BoS (S&H) 4/10

TEXT BOOKS:

1. Veerarajan T., "Transforms and Partial Differential Equations", 3rd Edition, Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
2. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2017.

REFERENCES:

1. Bali N.P and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd., 9th Edition, 2016.
2. Ramana B V, "Higher Engineering Mathematics", New Delhi Tata McGraw- Hill Education India Private Limited., 2018.
3. Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, 2011.
4. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2011.

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	2	2	-	-	2	-	2	-	-	2
CO3	3	3	3	2	-	2	-	2	-	-	2
CO4	3	2	2	-	-	1	-	2	-	-	2
CO5	3	2	3	2	-	1	-	2	-	-	2

CHAIRMAN
BoS (S&H) 4/10

24EC301 ANALOG ELECTRONIC CIRCUITS DESIGN L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the basic biasing methods of BJT amplifier
- Understand the basics of amplifier structure and analysis of various feedback amplifiers.
- Develop various types of large signal power amplifiers and their performance.
- Examine positive feedback concept on oscillators and evaluate the stability characteristics of various oscillator.
- Analyze the functionalities of multivibrators and schmitt trigger circuit.

UNIT I BIASING OF DISCRETE BJT 9

Need for biasing - DC Load Line - AC Load Line and Bias Point - Thermal Runaway - Stability factor - Method of Transistor biasing - Fixed Bias - Collector to base bias - Self Bias - Bias compensation - Diode Compensation, thermistor and sensistor compensation.

UNIT II FEEDBACK AMPLIFIERS 9

Introduction - Basic Feedback concept - Effect of Negative feedback - Types of Negative feedback Connections - voltage series feedback, voltage shunt feedback, current series feedback and current shunt feedback - Method of identifying feedback Topology - Stability of feedback amplifier.

UNIT III LARGE SIGNAL POWER AMPLIFIERS 9

Introduction - Harmonic Distortion - Generation - Transformer Coupled Class A power amplifier - Class B - Complementary Symmetry - Push pull - Class AB amplifier-Class C amplifier-Distortion in amplifier.

UNIT IV OSCILLATORS 9

Classification of Oscillators - Barkhausen Criterion - General form an LC oscillator - Analysis of LC oscillators - Hartley Oscillator, Colpitts Oscillator, Clapp Oscillator - Analysis of RC oscillators , Wien bridge Oscillator , Crystal Oscillator - Miller and Pierce Crystal oscillators, frequency stability of oscillators.

UNIT V WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

Diode clippers, Clampers and Comparators - Multivibrators - Bistable multivibrator - Triggering methods for Bistable multivibrator - Monostable multivibrator - Astable multivibrator - Schmitt trigger. UJT Relaxation Oscillator.

TOTAL: 45 PERIODS

CHAIRMAN 15/03/25
BoS (ECE)

OUTCOMES:

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

- Understand the basic concepts of biasing and know the importance of bias compensation techniques.
- Gain knowledge on feedback amplifier and design the various amplifier circuits.
- Demonstrate the constraints in large signal power amplifiers when dealing with high frequency audio signal in practical applications
- Analyze the design procedure of oscillator circuits to implement them for communication applications.
- Create various types of multivibrator circuits and analyze their output response.

Text Books:

1. Salivahanan.S and Suresh Kumar.N, "Electronic Devices and Circuits", 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2017.

References:

1. Sedra / Smith, "Micro Electronic Circuits", Oxford University Press, 2004.
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education/PHI, 2002.
3. David A. Bell, "Solid State Pulse Circuits", Prentice Hall of India, 1992.
4. Millman J. and Taub H, "Pulse Digital and Switching Waveforms", TMH, 2000.
5. Millman and Halkias. C, "Integrated Electronics", TMH, 1991

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC302	SIGNALS AND SYSTEMS	L T P C 3 1 0 4

OBJECTIVES:

The Student should be made to:

- Understand the basic properties of signals & systems
- Learn the methods of characterization of Laplace transform and Fourier Transform
- Analyze LTI Continuous time systems using Laplace Transform
- Study the methods of characterization of Z transform and Fourier Transform
- Analyze LTI Discrete time systems using Z-Transform

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS **12**

Introduction to Signals and Systems - Continuous Time(CT) Signals - Discrete Time(DT) Signals - Standard Signals: Impulse, Step, Ramp, Exponential and Sinusoidal Signals- Basic operations on Signals: Amplitude Scaling, Signal Addition, Signal Multiplication, Time Shifting, Time Reversal and Time Scaling - Classification of CT and DT signals: Deterministic and Random, Periodic & Aperiodic, Even & Odd, Energy & Power, Causal & Non Causal- Classification of CT and DT systems: Static & Dynamic , Time Invariant & Time Variant, Linear & Nonlinear, Causal & Non Causal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS **12**

Introduction to Fourier Series –Dirichlets Condition-Trignometric form of Fourier Series - Laplace Transform- Region of Convergence (ROC) – Properties of Laplace Transform - Inverse Laplace Transform using Partial Fraction Expansion method- Continuous Time Fourier Transform(CTFT) – Properties of CTFT- Relation between Laplace transform and CTFT.

UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS **12**

Convolution using Graphical, Tabular, and Matrix methods – Convolution Integral using Analytical method - Solution of Differential equations using Laplace Transform - Analysis of LTI Continuous Time systems using Laplace Transform: Transfer function, Impulse response, Step response and Output response - Block diagram representation: Direct form-I, Direct form-II, Cascade and Parallel forms.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS **12**

Z-Transform - Region of Convergence (ROC) – Properties of Z-Transform - Inverse Z Transform using Partial Fraction Expansion and Power Series Expansion method-Discrete Time Fourier Transform(DTFT) - Properties of DTFT - Relation between Z-Transform and DTFT.

UNIT V LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS **12**

Impulse Response: Causality and Stability of LTI DT systems – Convolution Sum using Analytical, Graphical and Tabulation method - Solution of Difference equations using Z-Transform - Analysis of LTI Discrete Time systems using Z-Transform: Transfer function,

CHAIRMAN
BoS (ECE) 07/03/25

Impulse response, Step response and Output response - Block diagram representation: Direct form-I, Direct form-II, Cascade and Parallel forms-Introduction to Matlab Programming

TOTAL: 60 PERIODS

OUTCOMES:

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

- Classify and Identify the types of signals and systems based on their properties
- Apply Laplace transform and Fourier transform for CT signals
- Design the LTI CT systems using Laplace Transform and realize its structure.
- Apply Z-transform and Fourier transform for DT signals
- Solve the LTI DT systems using Z-Transform and realize its structure.

TEXT BOOKS:

1. Nagoor Kani.A, "Signals and Systems(Simplified)", Tata Mc Graw Hill, 2022.

REFERENCES :

1. Allan V.Oppenheim, Alan S.Wilsky and S.Hamid Nawab, "Signals and Systems", Second edition, Pearson, 2019.
2. B. P. Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford, 2009.
3. A.Anand Kumar, "Signals and Systems", 3rd edition, Prentice Hall India,2013
4. S.Palani, "Signals and Systems", First edition, Ane's Book Pvt. Ltd, 2009.
5. R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals &Systems - Continuous and Discrete", Pearson, 2015.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC303	DIGITAL ELECTRONICS (COMMON TO ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the Digital fundamentals, Boolean algebra, digital logic and simplification
- Study the circuit minimization techniques and its applications in digital systems
- understand the concepts of combinational logic circuits using logic gates
- Analyze the design procedures for synchronous sequential circuits with flipflop elements.
- Learn various semiconductor memories and related technology

UNIT I NUMBER SYSTEM AND BOOLEAN ALGEBRA **9**

Digital Systems- Binary Numbers-Number-Base Conversions- Octal and Hexadecimal Number-Complement- Signed Binary Numbers- Binary Code-Binary Storage and Registers-Binary Logic- Definition of Boolean Algebra- Basic Theorems and Properties of Boolean Algebra-Boolean Functions - Canonical and Standard Forms- Other Logic Operations- Digital Logic Gates- Integrated Circuit.

UNIT II MINIMIZATION TECHNIQUES **9**

The Map Method - Four-Variable Map- five variable Map-product-of-Sums Simplification-Don't-Care Conditions- NAND and NOR implementation- Other Two-level Implementation of exclusive OR Function- Hardware Description Language.

UNIT III COMBINATIONAL CIRCUITS **9**

Introduction- Combinational Circuit- Analysis Procedure- Design Procedures- Binary Adder -Subtractor Decimal Adder - Binary Multiplier -Magnitude Comparator – Decoder- Encoders-Multiplexer- HDL Models of Combinational Circuits.

UNIT IV SEQUENTIAL CIRCUITS **9**

Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip-Flops, SR,JK,D,T and Master slave, Characteristic Tables and Equations, Conversion from one type of Flip-Flop to another, Counters - Design of Mode Counter, Ripple Counter, Ring Counter, Shift Register, Ring counter using Shift Register

UNIT V MEMORY DEVICES AND PROGRAMMABLE LOGIC DEVICES **9**

Classification of memories – ROM : ROM organization, PROM, EPROM,EEPROM, RAM: RAM organization, Write operation, Read operation, Static RAM , Programmable Logic Devices: Programmable Logic Array(PLA),Programmable Array Logic, Implementation of Combinational Logic circuits using PROM,PLA,PAL.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE) 16/07/25

OUTCOMES:

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

- Discuss the significance of number systems, conversions, binary codes
- Apply different simplification methods for minimizing Boolean functions.
- Analyze the design concepts of various combinational circuits
- Analyze the concepts of sequential logic design
- Understand SRAM/DRAM organization and periphery circuitry, operation of SRAM cell, DRAM

TEXT BOOKS:

1. Morris Mano.M and Michael D. Ciletti,"Digital Design", 6th Edition, Pearson, 2019.

REFERENCES :

1. Charles H.Roth,"Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2021.
2. Thomas L. Floyd," Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
3. Salivahanan.S and Arivazhagan.S,"Digital Electronics", 1st Edition, Vikas Publishing House pvt Ltd, 2012.
4. Anil K.Maini," Digital Electronics: Principles, Devices and Applications " , John Wiley & Sons, Ltd, 2014.
5. A.Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited, 2016.
6. Soumitra Kumar Mandal,"Digital Electronics", McGraw Hill Education Private Limited, 2016.

MAPPING OF COs WITH POs AND PSOs:

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

CHAIRMAN
BoS (ECE)

24IT302	DATA STRUCTURES USING C++ (ECE only)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of C++ programming
- Learn the behavior of data structures – stack and queue
- Apply tree operations and balancing methods
- Explore graph traversal and hashing methods
- Learn various searching and sorting methods

UNIT I BASICS OF C++ 9

Introduction - Basics of C++ - Object - Class - Constructor - Destructor - Inheritance -Types - Overloading - function overloading - Operator overloading - Static Member Function – Constant Data Member – File Handling.

UNIT II BASIC DATA STRUCTURES 9

Abstract Data Type (ADT) - The list ADT - Types of linked list - Singly Linked List - Doubly Linked List - Circular Linked List - Applications of List - Stack - Queue - Implementation of stack and queue – Applications of Stack and Queue.

UNIT III TREES 9

Trees - Basic terminology - Binary Tree - Representation of tree - Binary tree traversals, threaded binary Tree - Binary Search Tree (BST) - AVL Tree - Heap - Min heap and Max heap.

UNIT IV GRAPHS AND HASHING 9

Graphs - Terminologies - Representation - Topological Sort - Types of Traversals - Depth First Traversal - Breadth First Traversal - Hashing - Collision Avoiding Techniques - Separate Chaining - Closed hashing - Extendible Hashing.

UNIT V SEARCHING AND SORTING 9

Searching: Linear and Binary Searching - Sorting: Insertion sort - Selection sort - Bubble sort - Radix sort - Merge sort - Quick sort.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (IT) 29/03/25

OUTCOMES:

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

- Explain fundamental C++ programming concepts, including object-oriented principles, overloading and file handling
- Demonstrate linked list, stacks, and queues with suitable applications
- Implement tree operations, including traversal and balancing techniques
- Utilize graph algorithms, hashing techniques, and collision resolution strategies
- Implement various searching and sorting techniques

TEXT BOOKS:

1. Data Structures using C++, Special Edition-MRCET, Tata McGraw-Hill Publishers, 2017.
2. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.

REFERENCES:

1. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson.
4. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
5. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

Mapping of COs with POs:

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

CHAIRMAN
BoS (IT)

24EC305L	ANALOG ELECTRONICS LABORATORY	L T P C
		0 0 3 1.5

OBJECTIVES:

The student should be made to:

- Understand the frequency response of various types of feedback amplifiers.
- Learn the design procedure of large signal power amplifier
- Apply the positive feedback concept for oscillators
- Analyze the Performance of wave-shaping circuits and multivibrators
- Evaluate the simulation performance of amplifiers, oscillators, wave-shaping circuits and multivibrators using SPICE tool

LIST OF THE EXPERIMENTS

1. Frequency Response of Voltage series and Voltage shunt amplifier
2. Frequency Response of Current series and Current shunt amplifier
3. Design and Analysis of Class A and Class B power amplifier
4. Design and Analysis of Hartley Oscillator
5. Design and Analysis of Colpitts Oscillator
6. Design and Analysis of RC-Phase shift Oscillator
7. Design and Analysis of Wein Bridge Oscillator
8. Design and Analysis of Clippers and Clampers
9. Design and Analysis of Bistable multivibrators
10. Design and Analysis Astable and Monostable multivibrators

SIMULATION

1. Analysis of BJT with Fixed bias and Voltage divider bias using Spice
2. Analysis of Class AB amplifier and Class C amplifier
3. Analysis of Schmitt trigger circuit with predictable hysteresis
4. Analysis of UJT relaxation oscillator.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Gain the skill on various types of feedback amplifiers.
- Apply the knowledge to design different type of large signal power amplifier.
- Examine the frequency generation ability of different type of oscillators circuits.
- Analyze the performance wave-shaping and multi-vibrator circuits.
- Simulate various types of amplifiers and oscillator circuits using SPICE tool.

CHAIRMAN
BoS (ECE) 15/03/25

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1.	CRO (Min 30MHz)	-	12 Nos
2.	Signal Generator /Function Generators (2 MHz)	-	12 Nos
3.	Dual Regulated Power Supplies (0 –30V)	-	12 Nos
4.	Digital Multimeter	-	12 Nos
6.	Standalone desktops PC	-	15 Nos
7.	Transistor/FET (BJT-NPN-PNP and NMOS/PMOS)	-	30 Nos
8.	Transistors, Resistors, Capacitors, diodes, Bread Boards, Transformers	-	30 Nos
9.	SPICE Circuit Simulation Software (any public domain or commercial software)	-	15 Nos

CHAIRMAN
BoS (ECE) 15/10

24EC306L **DIGITAL ELECTRONICS LABORATORY** **L T P C**

0 0 3 1.5

OBJECTIVES:

The student should be made to:

- Acquire the basic knowledge of digital circuits and simplification methods
- Understand the design of combinational logic circuits using basic gates
- Familiarize with the operation of flip flops utilized in the digital circuits
- Learn the design of synchronous and asynchronous counters using flip flops
- Impart knowledge on VHDL coding techniques for the design of combinational and sequential circuits

LIST OF THE EXPERIMENTS

1. Verification of DeMorgan's theorem
2. Realization of SOP and POS functions after K-map reduction
3. Design of adders and subtractors using gates
4. Implementation of 4-bit adder/Subtractor using IC7483
5. Design of Magnitude Comparators
6. Design of Code Converters (BCD, Gray & Excess-3)
7. Design and Implementation of Multiplexers and Demultiplexers
8. Realization of SR, T, D and JK Flip-flops using gates
9. Realization of Ripple up/down counter and Modulo-N Counters using flip flops
10. Implementation of combinational and sequential circuits using Verilog HDL

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply Boolean Algebra to simplify digital logic functions
- Implement adders and subtractors using logic gates
- Design comparators, code converters and multiplexers using logic gates
- Analyze the use of flip flops in the design of synchronous and asynchronous counters
- Design and Simulate combinational and sequential logic circuits using Verilog HDL

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE) 16/07/25

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1.	IC Trainer Kit	-	10 Nos
2.	Bread Boards	-	10 Nos
3.	Computer with HDL software	-	15 Nos
5	Multimeter	-	05 Nos
6	ICs 7400/ 7402 / 7404 / 7486 / 7408 / 7432 / 7483 / 74150 / 74151 / 74147 / 7445 / 7476/7491/ 555 / 7494 / 7447 / 74180 / 7485 / 7473 / 74138 / 7411 / 7474	-	30 Nos

CHAIRMAN
BoS (ECE)

24IT303L	DATA STRUCTURES USING C++ LABORATORY (ECE Only)	L T P C 0 0 2 1

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of C++ concepts
- Demonstrate object-oriented programming principles using C++
- Construct programs using file handling and templates
- Write the different data structures using C++ – ADT and trees
- Develop java programs using hashing and sorting techniques

LIST OF EXPERIMENTS:

1. Basic Programs for C++ Concepts.
2. Develop the classes for understanding objects, member functions & constructors
   a. Classes with primitive data members,
   b. Classes with arrays as data members
   c. Classes with pointers as data members
   d. Classes with constant data members
   e. Classes with static member functions
3. Write a C++ code to implement the polymorphism.
4. Write a C++ code to implement the file handling.
5. Array & Linked list implementation of List Abstract Data Type (ADT)
6. Stack and Queue - Array and linked list implementations.
7. Search Tree ADT - Binary Search Tree
8. Graph Traversal
9. Write a C++ code to implement hashing technique.
10. Write a C++ code to implement any one sorting algorithm.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Demonstrate the basic features of C++ programming
- Implement the object-oriented programming features such as class, object, data members and member functions
- Build programs for file handling for given problems
- Develop programs for ADT, stack, queue, BST and graph traversals
- Apply the principles of hashing and sorting to solve given problems

CHAIRMAN
BoS (IT) 29/03/25

List of Equipment for a batch of 30 Students:

1. Standalone desktops with C++ compiler 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	-	1	-	-	-	-	2	2	-	2	-
CO2	3	3	2	1	-	-	-	-	2	2	-	2	-
CO3	3	2	2	2	-	-	-	-	2	2	-	2	-
CO4	3	3	3	2	2	-	-	-	2	2	-	2	-
CO5	3	3	3	3	3	-	-	-	2	2	-	2	-

CHAIRMAN
BoS (IT)

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

24MA402	PROBABILITY AND RANDOM PROCESSES (ECE only)	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
- Remember basic concepts of Probability theory and random variables, how to deal with multiple random variables
- Understand the difference between time averages statistical averages
- Apply sums and integrals to compute probabilities and Expectations

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 TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and linear regression - Transformation of random variables - Central Limit theorem (for independent and identically distributed random variables).

UNIT IV RANDOM PROCESSES 9+3

Classification - Stationary process - Poisson process - Properties (without proof) – Markov process - Discrete parameter Markov chain - Chapman Kolmogorov Equation (statement only) - Limiting distributions.

UNIT V CORRELATION AND SPECTRAL DENSITIES 9+3

Auto correlation functions - Properties - Cross correlation - Power spectral density - Properties - Linear time invariant system - System transfer function - Power Spectral density of input and output.

TOTAL: (45+15) PERIODS

CHAIRMAN
BoS (S&H)

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
- Understand multiple and independent random variables, derived distributions, and conditional probability models
- Identify, formulate and solve problems in Gaussian, Poisson and Markov random processes
- Understand the response of random inputs to linear time invariant systems

TEXT BOOKS:

1. Athanasios P and Unnikrishna Pillai S, "Probability Random Variables and Stochastic Processes" 4th Edition, Chennai Tata McGraw Hill Education India Private Limited 2016.
2. Veerarajan T., "Probability Statistics & Random Processes with Queuing Theory & Queuing Networks" TMH Publications, 2018.

REFERENCES:

1. Ibe O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Indian Reprint, 2014.
2. Yates R.D. and Goodman. D.J., "Probability and Stochastic Processes" 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
3. Moorthy M.B.K, Subramani K and Santha A, "Probability Random Process and Queuing Theory" Scitech Publications (India) Pvt Ltd. 2013.
4. Cooper G.R. and McGillem. C.D., "Probabilistic Methods of Signal and System Analysis ", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H)

29/10/26

24EC401 MICROPROCESSORS AND MICROCONTROLLERS (COMMON TO ECE, EEE & BME) **L T P C 3 0 0 3**

OBJECTIVES:

The Student should be made to:

- Understand the evolution and features of the 8086 microprocessor.
- Analyse the role of various instruction sets in execution control.
- Design the semiconductor memory is interfaced with the 8086 microprocessor.
- Develop assembly language programs for data transfer, arithmetic, and logical operations in 8051
- Analysis the impact of waveform generation techniques on hardware control.

UNIT I ARCHITECTURE SIGNALS AND FEATURES **9**

Introduction: History of computers, Block diagram of a microcomputer, Intel 80x86 evolutions, Features of 8086 microprocessor, register organization of 8086,Architecture of 8086, Instruction queue and pipelining, Segmentation of memory used with 8086, Methods of generating physical address in 8086, Pin signals of 8086, Common signals, Minimum mode signals with timing diagram, Maximum mode signals with timing diagram

UNIT II PROGRAMMING IN 8086 **9**

Addressing modes of 8086, Data Transfer Instructions, Data Conversion Instructions, Arithmetic Instructions, Logical instructions and Processor control instructions, String instructions, Branch Instructions Example programs, Assembly Language Programming of 8086, Stack structure, Interrupt structure

UNIT III 8086 INTERFACING WITH MEMORY AND PROGRAMMABLE DEVICES **9**

Semiconductor memory interfacing, Dynamic RAM interfacing,Interfacing program memory and data Memory with 8086, Programmable Peripheral Interface 8255, ADC with programming,DAC with programming,8254 with programming,8259 with programming, 8279 with programming, 8251 USART, 8257, Stepper Motor interfacing

UNIT IV 8051 ARCHITECTURE AND ASSEMBLY PROGRAMMING **9**

Differences between microprocessor and microcontroller, 8-bit microcontrollers, and feature of 8051 microcontroller, Architecture of 8051, Signal descriptions of 8051, Register set of 8051, Operational features of 8051, Memory and I/O addressing, Interrupts and Stack, Addressing modes, Arithmetic and Logical Instructions, Data Transfer Instructions, Boolean Variable Instructions and Branch Instructions, Assembly Language Programming

UNIT V 8051 INTERACING AND EMBEDDED PRGOGRAMMING **9**

Parallel ports, Timer, Interrupts, serial port, Push-button,Matrix keypad, LED, 7- segment, LCD displays, DAC, ADC, DC motor, Stepper motor, Servo motor

TOTAL: 45 PERIODS

CHAIRMAN
BoS /ECE

OUTCOMES:

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

- Understand the architecture and features of the 8086 microprocessor
- Develop assembly language programs using 8086 instructions
- Interface 8086 with memory and peripheral devices
- Demonstrate the architecture and programming of the 8051 microcontroller
- Interface and control waveform generators and special function ICs

TEXT BOOKS:

1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051 - Microcontroller and Embedded systems", 7th Edition, Pearson Education, 2011.
2. Doughlas.V.Hall, "Microprocessor and Interfacing: Programming and Hardware", 3rd edition, McGraw Hill, 2015
3. Kenneth. J. Ayala, "8051 Microcontroller Architecture, Programming and Applications",3rd edition, Thomson, 2007

REFERENCES:

1. Subrata Ghoshal "8051 Microcontroller Internals Instructions, Programming and Interfacing",2nd edition Pearson, 2010
2. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer systems: The 8086/8088 family-Architecture, programming and design",2nd edition, Prentice Hall of India, 2007

MAPPING OF COs WITH POs

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

CHAIRMAN
BoS /ECE

24EE301	ELECTROMAGNETIC THEORY (COMMON TO ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Recall the fundamental mathematical concepts related to vector algebra and coordinate systems
- Understand the basic concepts of static electric fields and their significance in electromagnetism
- Interpret the behavior of conductors, dielectrics and their applications
- Learn the essential laws governing static magnetic fields and their applications
- Examine the principles of time-varying fields and formulate Maxwell's equations

UNIT I ELEMENTS OF VECTOR CALCULUS 9

Sources and effects of electromagnetic fields – Scalar and Vector Fields – Review of vector algebra. Different co–ordinate systems – Rectangular, Cylindrical, Spherical co–ordinate systems – Conversion of co–ordinate system. Gradient, Divergence and Curl – Divergence Theorem – Stoke's Theorem.

UNIT II STATIC ELECTRIC FIELD 9

Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Gauss's law and applications – Electric potential – Electric Dipole and flux lines – Energy density – Application: Electrostatic discharge and CRT.

UNIT III CONDUCTORS, DIELECTRICS AND CAPACITANCE 9

Electric field in free space, conductors – Dielectric polarization – Dielectric constant and Dielectric strength – Electric field in multiple dielectrics – Boundary conditions: Conductor – Dielectric, Conductor – Free space and Dielectric–Dielectric – Poisson's and Laplace's equations – Capacitance.

UNIT IV STATIC MAGNETIC FIELDS 9

Biot–Savart Law – Ampere's Law – Magnetic field due to straight conductors, circular loop, infinite sheet of current – Magnetic flux density (B) – Magnetization – Boundary conditions – Scalar and vector potential – Energy density – Applications.

UNIT V TIME VARYING FIELDS AND MAXWELL'S EQUATIONS 9

Faraday's laws – Transformer and motional EMF – Maxwell's equations (differential and integral forms) – Displacement current and conduction current. Derivation of generalized Wave Equations from Maxwell's equations – Poynting vector and theorem.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand various parameters in vector algebra and coordinate systems
- Apply the basic concepts of electrostatic fields to determine electric field intensity, electric potential, and energy density
- Describe the properties and behavior of electric fields in conductors and dielectrics
- Compute magnetic field intensity using fundamental laws of magnetism
- Formulate Maxwell's equations and the corresponding wave equations

CHAIRMAN
BoS (EEE) 16/10

TEXT BOOK:

1. Matthew N O Sadiku, and Kulkarani S V, "Principles of Electromagnetics", Oxford University Press, Sixth Edition, 2015.

REFERENCES:

1. William H Hayt and John A Buck, "Engineering Electromagnetics", Tata McGraw Hill, New Delhi, Ninth Edition, 2020.
2. Jordan E C and Balmain K G, "Electromagnetic Waves and Radiating Systems" Pearson Education/PHI, Second Edition, 2015.
3. Gangadhar K A and Ramanathan P M, "Electromagnetic Field Theory (Including Antennas and Wave Propagation)", Khanna Publishers, Eighth Edition, 2015.
4. Kraus Fleisch, "Electromagnetics with Applications", McGraw Hill International, Fifth Edition, 2017.
5. Sarwate V V, "Electromagnetic Fields and Waves", New age Publishers, Second Edition, 2018.

Mapping of COs with POs, PSOs:

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

CHAIRMAN
BoS (EEE)

29/10/25

24EC402 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS (COMMON TO ECE AND EEE) **L T P C 3 0 0 3**

OBJECTIVES:

The student should be made to:

- Study the basic structure, characteristics and performance of Op-amp.
- Understand the linear applications of operational amplifiers.
- Acquire the concepts and non-linear applications of Op-amp, analog multipliers and PLL.
- Explore the different types of A/D and D/A converters using op-amps.
- Design waveform generators using op-amp and study some special function ICs.

UNIT I BASICS OF OPERATIONAL AMPLIFIERS **9**

Introduction and Classification of ICs - Basic information about Op-amp - Symbol, Power Supply Connection, Ideal Operational Amplifier - Concept of Virtual Ground - Inverting Amplifier – Non-Inverting Amplifier- Voltage Follower - Differential Amplifier- Op-amp Block Diagram- DC Characteristics - AC Characteristics - Frequency Compensation - Open and Closed loop configurations.

UNIT II LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS **9**

Scale Changer - Summing Amplifier – Subtractor- Instrumentation Amplifier - Voltage to Current Converter - Current to Voltage Converter – Differentiator – Integrator – Low pass and high pass Butterworth filters - Band pass filters: Wide Band and Narrow Band.

UNIT III OP AMP NON-LINEAR CIRCUITS, ANALOG MULTIPLIER AND PLL **9**

Log amplifier - Antilog amplifier - Comparators - Schmitt Trigger - Precision Rectifier - Clippers - Clampers – Analog multiplier IC and Applications - Basic operation of PLL - Voltage Controlled Oscillator - Monolithic PLL IC 565 - Applications of PLL for Frequency Multiplication/Division, Frequency Translation, AM Detection, FM Detection, FSK Demodulation.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS **9**

Analog and Digital Conversions – Specifications of DAC - D/A Converters: Weighted Resistor type, R-2R Ladder type, Voltage Mode and Current Mode R-2R Ladder types – Basic Sample and Hold Circuit – Specifications of ADC - A/D Converters: Flash type, Successive Approximation type, Dual Slope type - Sigma Delta Modulator.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs **9**

Sine Wave Generators: RC Phase Shift Oscillator, Wien Bridge Oscillator - Multivibrators: Monostable and Astable -Triangular Wave Generator - ICL 8038 Function Generator – Timer IC 555: Functional Description, Monostable operation, Astable operation - IC Voltage Regulators - Fixed Voltage Series Regulator - IC 723 General Purpose Regulator - Optocouplers and Fibre Optic IC.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Explain the basic building blocks and characteristics of operational amplifiers.
- Apply the operational amplifiers in various linear applications.
- Analyze the behavior of non-linear applications of op-amps and PLL.
- Implement the different types of A/D and D/A Converters using operational amplifiers.
- Construct the waveform generators using operational amplifiers and special function ICs.

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., Fifth Edition, 2018.

REFERENCES:

1. S.Salivahanan & V.S. Kanchana Bhaskaran," Linear Integrated Circuits", Tata McGraw Hill, 2nd Edition,4th Reprint, 2016.
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th Edition, Tata McGraw-Hill, 2016
3. Ramakant A. Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Prentice Hall / Pearson Education, 2015.
4. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 5th Edition, 2009.
5. William D.Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education,4th Edition,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
CO2	3	2	2	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	1
CO4	3	2	3	2	-	-	-	-	-	-	1
CO5	3	2	3	2	-	-	-	-	-	-	1

CHAIRMAN
BoS (ECE)

24EC403 ANALOG AND DIGITAL COMMUNICATION

L	T	P	C
3	0	2	4

OBJECTIVES:

The students should be made to:

- Study the concepts of basic communication system and analog communication techniques
- Learn the angle modulation techniques and noise performance in communication.
- Understand the pulse modulation and multiplexing techniques.
- Acquire the knowledge on baseband transmission and digital modulation schemes.
- Know about various coding techniques and spread spectrum.

UNIT I AMPLITUDE MODULATION 9

Basic Communication System – Need for Modulation – Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC - Time Domain Representation, Modulation Index, Spectra, Power Relations and Bandwidth – AM Generation: Square Law and Switching Modulator – DSB-SC Generation: Balanced and Ring Modulator – SSB-SC Generation: Phase Shift Method – AM Detection: Envelope Detector – Superheterodyne Receiver.

UNIT II ANGLE MODULATION AND NOISE THEORY 9

Frequency Modulation and Phase Modulation - Time Domain Representation, Modulation Index and Bandwidth – FM Generation: Varactor Diode Modulator, Armstrong Method – FM Demodulation: Slope Detector, Foster Seely Discriminator – SNR – Noise Figure – Figure of Merit – Noise Performance in AM Receivers using Envelop Detection – Pre-emphasis and De-emphasis in FM.

UNIT III PULSE MODULATION AND MULTIPLEXING 9

Analog Pulse Modulation: PAM, PWM, PPM – Digital Pulse Modulation: PCM Generation & Reconstruction, DM and Adaptive DM – Multiplexing Techniques: TDM and OFDM.

UNIT IV BASEBAND TRANSMISSION AND DIGITAL MODULATION 9

Introduction to Baseband Transmission – Intersymbol Interference – Nyquist Criterion for Distortion less, Baseband Transmission – Eye Pattern – Digital Modulation Techniques: Generation, Detection, Signal Space Diagram, PSD & BER of BPSK, QPSK, QAM.

UNIT V CHANNEL CODING AND SPREAD SPECTRUM 9

Huffman Coding, Shannon - Fano Coding – Error Control Coding: Linear Block codes, Hamming codes, Convolutional codes, Viterbi Decoding algorithm – Introduction to Spread Spectrum – Pseudo Noise Sequence – Direct Sequence Spread Spectrum (DSSS) – Frequency Hopping Spread Spectrum (FHSS).

CHAIRMAN
BOS/ECE 14/07/25

LIST OF THE EXPERIMENTS

1. AM and FM Modulator and Demodulator
2. Signal Sampling and Reconstruction
3. PAM, PWM and PPM Modulation and Demodulation
4. Pulse Code Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Time Division Multiplexing
7. Simulation of ASK, FSK and PSK Schemes
8. Simulation of BPSK, QPSK and QAM Schemes

TOTAL: 75 PERIODS

OUTCOMES:

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

- Gain the knowledge on analog communication techniques
- Explore angle modulation and demodulation techniques.
- Demonstrate several pulse modulation schemes in data transmission.
- Apply the knowledge of ISI problems and access the performance of various digital modulation techniques.
- Implement various error control coding schemes over information bits.

TEXT BOOKS:

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley, 2006.
2. Wayne Tomasi, "Advanced Electronic Communication Systems", 6th Edition, Pearson Education, 2009
3. S. Haykin, "Digital Communication", John Wiley, 2005 (unit-III-V)

REFERENCES:

1. Proakis J.G. and Salehi M, "Communication Systems Engineering", Pearson Education, 2002.
2. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
3. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering", John Wiley, 1965.
4. HP Hsu, "Schaum Outline Series: Analog and Digital Communications", TMH 2006.
5. B.P Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press 2007.
6. Barry J. R., Lee E. A. and Messerschmitt D. G, "Digital Communication", Kluwer Academic Publishers, 2004.
7. Proakis J.G., "Digital Communications", 4th Edition, McGraw Hill, 2000.

CHAIRMAN
BOS/ECE

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BOS/ECE 14/07/25

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Kits for Signal Sampling, AM, FM, TDM, PAM, PWM, PPM, PCM, DM
2. CROs. (10 Nos)
3. MATLAB software package for simulation experiments.
4. PCs. (30 Nos)

CHAIRMAN
BOS/ECE

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)

24EC404L MICROPROCESSOR AND MICROCONTROLLER LABORATORY
(COMMON TO ECE,EEE & BME)

L	T	P	C
0	0	3	1.5

OBJECTIVES:

The student should be made to:

- Simulate and analyze 8086 programs using MASM
- Implement interfacing of peripheral devices with 8086
- Design and develop DAC, ADC, DC motor in 8086
- Design and implement assembly programming in 8051 for general-purpose computing
- Develop embedded C programs to interface peripheral devices with 8051/89s52

LIST OF THE EXPERIMENTS

1. Simulation of 8086 using MASM Software (Data Transfer Instructions, Data Conversion Instructions, Arithmetic Instructions, Logical instructions and Processor control instructions, String instructions)
2. Interfacing 8255 with 8086
3. Interfacing 8251 with 8086
4. Interfacing 8279 with 8086
5. Interfacing DAC & ADC with 8086.
6. Interfacing DC motor & stepper motor with 8086
7. General Purpose Programming in 8051(Arithmetic and Logical Instructions, Data Transfer Instructions, Boolean Variable Instructions)

Embedded C Programming

8. Interfacing LED, 7- segment with 8051/ 89s52
9. Interfacing input devices Matrix Keypad in 8051/89s52
10. Interfacing DC motor & stepper motor with 8051/ 89s52
11. Interfacing DAC & ADC with 8051/89s52
12. Programming Timer & Counter in 8051/89s52
13. Programming Serial Communication in 8051/89s52

TOTAL: 45 PERIODS

OUTCOME:

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

- Demonstrate the simulation of 8086 microprocessor instructions using MASM software and analyze its data processing capabilities.
- Interface and configure peripheral devices (8255, 8251, 8279, DAC, ADC, DC motor, and stepper motor) with the 8086 microprocessor and evaluate their performance.
- Develop and implement general-purpose programs using 8051 microcontroller instructions and Embedded C programming for various applications.
- Design and test interfacing of various input/output devices (LED, 7-segment display, matrix keypad, motors, ADC, DAC) with 8051/89s52 microcontrollers
- Analyze and implement timer, counter and serial communication programming in the 8051/89s52 microcontroller for real-time embedded applications.

CHAIRMAN
BOS/ECE

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

CHAIRMAN
BOS/ECE

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. 8086 microprocessor trainer -(10 Nos)
2. 8051 microcontroller trainer - (10 Nos)
3. 80s52 Micro controller trainer-(10 Nos)
4. Interface with 8251.8255 &8279 kits - (Each 2 Nos)
5. DAC \ ADC Interface - (2 Nos)
6. Stepper motor Interface- (2 Nos)
7. Standalone desktops PC - (15 Nos)
8. MASM Simulation Software: (any public domain or commercial software)

CHAIRMAN
BOS/ECE

24EC405L	INTEGRATED CIRCUITS LABORATORY	L T P C 0 0 3 1.5

OBJECTIVES:

The student should be made to:

- Understand the working principle of amplifiers, filters, oscillators using Op-amp.
- Analyze the working principle of multivibrators using Op-amp and Timer IC.
- Acquire the knowledge to design wave shaping circuits and voltage regulator.
- Learn and simulate the analog circuits using SPICE.
- Design and develop a mini project using analog ICs.

LIST OF THE EXPERIMENTS

1. Design of Inverting and Non-inverting amplifiers
2. Design of Integrator and Differentiator
3. Frequency Response analysis of Active Low Pass and High Pass filters
4. Design of Schmitt Trigger
5. Design of RC Phase Shift Oscillator
6. Design of Wien Bridge Oscillator
7. Design of Astable and Monostable multivibrators
8. Design of Astable Multivibrator using IC 555 Timer
9. Design of Voltage Regulator using LM723
10. Simulation of Differential and Instrumentation amplifiers
11. Simulation of Precision Rectifier and Analog Multiplier
12. Simulation of DAC and ADC
13. Simulation of Monostable Multivibrator using IC 555 Timer
14. Mini Project

TOTAL: 45 PERIODS

OUTCOMES:

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

- Demonstrate the working of linear and non-linear applications using Op-amp.
- Design and analyze the frequency response of active filters and voltage regulator for power management.
- Construct the oscillators and multivibrators using Op-amp and 555 timer IC.
- Simulate and verify the functionality of analog circuits using SPICE tool.
- Develop a mini project using analog ICs that demonstrates the integration of multiple circuit concepts.

CHAIRMAN
BOS/ECE 14/07/25

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BOS/ECE

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. CRO/DSO (Min 30MHz) - (15 Nos)
2. Signal Generator/Function Generators (2 MHz) - (15 Nos)
3. Dual Regulated Power Supplies (0-30V) -(10 Nos)
4. Digital Multimeter - (15 Nos)
5. IC Tester - (5 Nos)
6. Standalone desktops PC - (15 Nos)
7. **Components and Accessories (50 Nos):** Transistors, Resistors, Capacitors, diodes, Zener diodes, Bread Boards, Transformers, wires, Power transistors, Potentiometer, A/D and D/A convertors, LEDs
8. SPICE Circuit Simulation Software: (any public domain or commercial software)

Note:

Op-Amps UA741, LM 301, LM311, LM 324, LM317, L.M723, 7805, 7812, 2N3524, 2N3525, 2N3391, AD 633, LM 555, LM 565 may be used.

CHAIRMAN
BOS/ECE 14/07/25

24EEC401L	LIFE SKILLS AND PERSONALITY DEVELOPMENT (Common to All Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The students should be made to:

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

UNIT I CAREER PLANNING **6**

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

UNIT II ATTITUDE **6**

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

UNIT III ROLE PLAYING **6**

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

UNIT IV TEAM BUILDING **6**

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

UNIT V TIME MANAGEMENT **6**

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

TOTAL: 30 PERIODS

OUTCOMES:

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

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

CHAIRMAN 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

24EC501	IoT AND ITS APPLICATIONS (COMMON TO CSE, ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concepts, architecture, and components of IoT systems.
- Analyze domain-specific IoT applications and communication technologies used in modern IoT systems.
- Apply programming knowledge using Arduino and NodeMCU for sensor and actuator interfacing.
- Develop and implement IoT systems using Python programming on Raspberry Pi for real-time applications.
- Design IoT-based solutions for sustainable development and real-world case studies.

UNIT I FUNDAMENTALS OF IoT **9**

Introduction to IoT – Characteristics – Components of IoT – Things in IoT – IoT Functional Blocks - IoT Communication Models - IoT Enabling Technologies - IoT Levels and Deployment Templates – M2M – Cloud Models - Classification of Sensors and Actuators.

UNIT-II DOMAIN SPECIFIC IoTs , CONNECTIVITY TECHNOLOGIES AND PROTOCOLS **9**

Domain Specific IoTs : Home Automation, Smart Cities, Environment, Energy, Agriculture, Industry, Health and lifestyle – IoT Connectivity Technologies: Bluetooth, Wi-Fi , ZigBee, RFID - IoT Protocols: MQTT, CoAP.

UNIT-III IoT SYSTEM DESIGN USING ARDUINO AND NODEMCU **9**

Overview of Arduino - Arduino Uno Board - Arduino Communication Interfaces - Arduino IDE – Basic Commands for Arduino - Programming with Arduino: LED, Switch , PIR Sensor, Ultrasonic Sensor, Soil Moisture Sensor, MQ-2 Gas Sensor, LDR, DHT Sensor, DC Motor, Servo Motor – NodeMCU ESP8266 Board - Cloud Platforms: ThingSpeak and Blynk – IoT based Patient Health Monitoring using ESP8266 and Arduino.

UNIT IV PYTHON PROGRAMMING AND RASPBERRY PI FOR IoT SYSTEMS **9**

Introduction to Python - Python Datatypes and Data Structures - Control Flow Statements – Functions - Modules - Overview of Raspberry Pi - Raspberry Pi Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Basic Python Commands for Raspberry Pi - Programming Raspberry Pi with Python: Controlling an LED, Interfacing an LED and Switch, Interfacing a LDR.

UNIT V IoT CASE STUDIES FOR SUSTAINABLE DEVELOPMENT **9**

Case Studies on Sustainability Applications: Smart Lighting - Home Intrusion Detection – Smart Parking - Weather Monitoring - Air Pollution Monitoring - Forest Fire Detection - Smart Irrigation - Structural Health Monitoring.

TOTAL:45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Explain the characteristics, components and the physical and logical design of IoT systems.
- Investigate domain-specific applications, connectivity technologies and protocols for IoT.
- Examine IoT systems using Arduino and NodeMCU with sensors, actuators and cloud platforms.
- Build Raspberry Pi based IoT systems using appropriate I/O devices and sensors by applying Python programming concepts.
- Analyze and evaluate IoT-based sustainable solutions for real-world case studies.

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, " Internet of Things, A Hands-on-Approach", 1st Edition, Universities press Pvt. Ltd., India, 2015.
2. Jeeva Jose, "Internet of Things", Khanna Book Publishing House, New Delhi,2018.

REFERENCES:

1. Sudip Mishra, Anandarup Mukherjee and Arijit Roy, " Introduction to IOT", Cambridge University Press,2021.
2. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, and Mahendra Swain, "Internet of things with Raspberry pi and Arduino", CRC Press Taylor & Francis Group, 2020.
3. Peter Waher, "Learning Internet of Things", 1st Edition, Packt Publishing Ltd, UK, 2015.
4. Srinivasa K.G, Siddesh G.M & Hanumantha, Raju R, "Internet of Things", Cengage learning India, 2019.
5. RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, "Internet of Things", John Wiley and Sons, Second Edition, 2019.

ONLINE RESOURCES:

- https://www.electronicwings.com
- https://www.javatpoint.com/arduino
- https://www.theengineeringprojects.com
- https://nptel.ac.in/courses/108108098
- https://how2electronics.com/iot-patient-health-monitoring-with-esp8266-arduino/

MAPPING OF COs WITH POs

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

CHAIRMAN
BoS (ECE)

24EC502	DIGITAL SIGNAL PROCESSING (COMMON TO ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the principles of DFT and FFT for analyzing discrete-time signals.
- Apply various methods to design FIR and IIR filters using filter approximations.
- Analyze the effects of finite word length and quantization on the performance of digital systems.
- Explain DSP processor architectures including instruction sets and addressing modes.
- Study the digital signal processing techniques to analyze, process and enhance real-world applications.

UNIT I DFT AND FFT **9**

Basic Elements of DSP – Introduction to DFT - Computation of DFT and IDFT - Properties of DFT - Circular Convolution - Fast Fourier Transform(FFT) - Radix-2 FFT Algorithms: Decimation in Time and Decimation in Frequency FFT algorithms.

UNIT II FIR AND IIR DIGITAL FILTERS **9**

FIR Filters: Magnitude and Phase response of digital filters- Design of Linear Phase FIR filters- Fourier Series method - Windowing technique(Rectangular, Hamming and Hanning window)- Gibbs Phenomenon- FIR Filter Structures: Direct form, Cascade form, Linear Phase realization.

IIR Filters: Design of digital IIR filters from analog filters- Bilinear Transformation-Impulse Invariance method– Design of digital lowpass Butterworth Filter - Comparison of FIR and IIR filters.

UNIT III FINITE WORD LENGTH EFFECTS **9**

Fixed Point and Floating Point Number Representation – Quantization Noise – Derivation for Quantization Noise Power - Truncation and Rounding – Input Quantization Error – Coefficient Quantization Error - Product Quantization Error – Limit Cycle Oscillations – Dead band

UNIT IV DIGITAL SIGNAL PROCESSORS **9**

Introduction to Digital Signal Processors - Von Neumann architecture, Harvard architecture – VLIW architecture – MAC Unit - Pipelining – Architecture of TMS320C5x Digital Signal Processor- Instruction Set – Addressing Modes - Architecture of TMS320C67x Digital Signal Processor.

UNIT V APPLICATIONS OF DSP **9**

Channel Vocoder - Sub band coding of speech signals- Fetal ECG monitoring – Digital Hearing Aid - Ultrasound Imaging System - Adaptive Noise Cancellation - Adaptive Telephone Echo Cancellation – RADAR system.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Apply DFT and FFT techniques for discrete-time signal analysis in the frequency domain.
- Design and implement FIR and IIR digital filters using various methods and realize its structures.
- Analyze the impact of finite word length and quantization effects on the performance of DSP systems.
- Illustrate the architecture, functional units and operation of DSP processors such as TMS320C5X and TMS320C6748.
- Examine real-world applications of DSP techniques in areas such as speech processing, biomedical and communication systems.

TEXT BOOK:

1. S Salivahanan, A Vallavaraj, C Gnanapriya, "Digital Signal Processing", Second Edition, Tata McGraw Hill, 2016.

REFERENCES:

1. John G Proakis and Dimitris G Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Fourth edition, Pearson Education, 2017.
2. Sanjit K Mitra, "Digital Signal Processing-A Computer Based Approach", McGraw Hill Education, 2013.
3. B Venkataramani and M Bhaskar, "Digital Signal Processors, Architecture, Programming" Tata McGraw Hill 2002.
4. Emmanuel C. Ifeachor and Barrie W. Jervis, "Digital Signal Processing: A Practical Approach", 2nd Edition, Prentice Hall, 2013.
5. Nagoor Kani, "Digital Signal Processing", 2nd Edition, McGraw-Hill, New Delhi, 2017.

MAPPING OF COs WITH POs

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

CHAIRMAN
BoS (ECE)

24EC503	DATA COMMUNICATION AND NETWORKS	L T P C 3 0 2 4

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of data communication, networking concepts, and the OSI model.
- Analyze the functionalities of the data link layer including error detection, error correction and media access control techniques.
- Study the network layer protocols, IP addressing schemes and routing algorithms.
- Explore the transport layer protocols and understand mechanisms for flow control, congestion control and QoS.
- Learn application layer protocols and network security principles including cryptography and firewalls.

UNIT-I DATA COMMUNICATION AND PHYSICAL LAYER 9

Introduction to Data Communication: Characteristics, Components, Data Representation, Data Flow – Networks - Network Criteria - Types of Connections - Physical Topology - Network Types - The OSI Model – Transmission Impairments - Data Rate Limits - Performance - Transmission Modes -Transmission Media: Guided and Unguided Media.

UNIT -II DATA LINK LAYER 9

Introduction – Link Layer Addressing - Error Detection and Correction: Parity Check , CRC, Check Sum - Framing - Error Control Protocols: Stop and Wait ARQ, Go back-N ARQ, Selective Repeat ARQ - Media Access Control: Random Access , Controlled Access - Wired LANs: Standard Ethernet - Wireless LANs:Wi-Fi - Connecting Devices.

UNIT III NETWORK LAYER 9

Network Layer Services - IPv4 Addresses - Network Layer Protocols: IP, ICMPv4 –Unicast Routing Algorithms: Distance Vector Routing , Link State Routing -Unicast Routing Protocols: RIP, OSPF- IPv6 Addressing - Transition from IPv4 to IPv6.

UNIT IV TRANSPORT LAYER 9

Introduction – UDP: Segment Format, Services - TCP: Services , Features , Segment Format , Connection , Congestion Control- Quality of Service: Data Flow Characteristics, Flow Control to Improve QoS.

UNIT V APPLICATION LAYER AND NETWORK SECURITY 9

WWW - HTTP – DNS - Electronic Mail: SMTP, POP3 – Network Security: Goals, Attacks - Symmetric Key Cryptography – Asymmetric Key Cryptography - Firewalls.

CHAIRMAN
BoS (ECE)
24/10/25

LIST OF EXPERIMENTS **TOTAL: 30 PERIODS**

1. Network Topology - Star, Bus and Ring
2. Implementation of Error Detection Technique and Bit Stuffing
3. Implementation of CSMA/CD and CSMA/CA protocols
4. Implementation of Token Bus and Token Ring protocols
5. Implementation of Stop and Wait Protocol
6. Implementation of Go Back-N and Selective Repeat Protocols
7. Configuration of IP address using Cisco Packet Tracer
8. Develop a Chat Application using TCP Socket
9. Implementation of Distance Vector routing and Link State Routing Algorithms
10. Implementation of Encryption and Decryption

TOTAL: 75 PERIODS

OUTCOMES:

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

- Explain the basic concepts and characteristics of data communication networks and physical transmission media.
- Apply error detection, correction techniques and media access control mechanisms in the datalink layer.
- Implement various IP addressing schemes and routing algorithms in the network layer.
- Demonstrate the end-to-end delivery using transport layer protocols and optimize network performance through flow and congestion control.
- Examine the operation of application layer protocols and evaluate the effectiveness of various network security mechanisms.

TEXT BOOK:

1. Behrouz A. Forouzan, "Data communication and Networking", 5th Edition, Tata McGraw Hill, 2015.

REFERENCES:

1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", 8th Edition, Pearson Education, 2020.
2. William Stallings, "Data and Computer Communication", 8th Edition, Pearson Education, 2017.
3. Nader. F. Mir ,"Computer and Communication Networks", Pearson Prentice Hall Publishers, 2nd Edition, 2014.
4. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufmann Publishers, 2011.

CHAIRMAN
BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)
24/10/25

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1	C / Python / Java / Equivalent Compiler.	30 Nos
2	Standard LAN Trainer Kits	10 Nos
3	Network simulator like NS2 / NS3 / Glomosim / OPNET / Packet Tracer / Equivalent	30 Nos
4	Standalone Desktops	30 Nos

CHAIRMAN
BoS (ECE)
24/10/25

24EC504	TRANSMISSION LINES AND WAVEGUIDES	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce various types of transmission lines and analyse the lumped circuit model of a transmission line and their characteristics.
- Familiarize the evaluation of various parameters of transmission lines using Smith Chart.
- Impart the basic knowledge on designing different types of filters.
- Investigate the propagation of electromagnetic waves in parallel planes.
- Make depth knowledge on waveguides operating in Various modes and Resonators

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - General solutions - Characteristic impedance, propagation constant, attenuation and phase constants - Open circuited and short-circuited lines. The telephone cable, Reflection of line not terminated in Z_0 -Reflection coefficient - Distortion in transmission lines - Distortion less line

UNIT II IMPEDANCE MATCHING AND TUNING 9

Standing waves - nodes - standing wave ratio, impedance matching - Single stub matching. Half wavelength and Quarter wave transformer. Measurement of VSWR, impedance, Single stub and double stub matching problems using Smith chart

UNIT III PASSIVE FILTERS 9

Characteristic impedance of symmetrical networks - filter fundamentals, Design of filters: Constant K-Low Pass, High Pass, Band Pass, Band Elimination, m-derived sections - low pass, high pass, Composite filters.

UNIT IV GUIDED WAVES BETWEEN PARALLEL PLANES 9

Study of Waves between parallel planes of perfect conductor. Application of the restrictions to Maxwell's equations - Transmission of TM waves between Parallel planes - Transmission of TE waves between Parallel planes. Transmission of TEM waves between Parallel planes - Velocities of the waves.

UNIT V GUIDED WAVES IN RECTANGULAR AND CIRCULAR WAVEGUIDES 9

Applications of Maxwell's equations to the rectangular waveguide. TM waves in rectangular waveguide. TE waves in rectangular waveguide - Dominant mode in rectangular waveguide - The TEM wave coaxial lines - Excitation modes - Guide termination and resonant cavities. TM and TE waves in Circular waveguides.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Acquire knowledge on different types of transmission lines and able to explain the concepts of reflection.
- Demonstrate the different types of measurement on basic transmission line parameters like reflection coefficient, standing wave ratio, and impedance using smith chart.
- Design different types of prototype filters and m derived filters.
- Deduce the field configurations of parallel plane in different modes.
- Analyse different modes in the rectangular, circular waveguides and resonators.

TEXT BOOK:

1. John D Ryder, "Networks lines and fields",Prentice Hall of India,New Delhi,2005

REFERENCES:

1. EE.C.Jordan, K.G. Balmain, "E.M.waves & Radiating Systems", Pearson Education, 2006.
2. G.S.N. Raju, "Electromagnetic Field Theory & Transmission Lines", Pearson Education, 2006.
3. R. K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill Publications, 2006.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC505L	INTERNET OF THINGS LABORATORY	L T P C 0 0 3 1.5

OBJECTIVES:

The students should be made to:

- Understand the fundamentals of Arduino programming for simulation using Tinkercad/ Proteus.
- Design sensor-based automation systems using Arduino for solving real-world problems.
- Acquire knowledge on controlling actuators such as DC motors and servo motors for IoT applications.
- Develop skills in designing IoT systems by interfacing sensors with cloud platforms using NodeMCU.
- Demonstrate interfacing of sensors and I/O devices using Raspberry Pi.

LIST OF THE EXPERIMENTS:

1. Simulation of LED, Push Button and Buzzer Interfacing using Arduino
2. Simulation of Gas Detection and Temperature Monitoring using Arduino
3. Motion Detection based Buzzer Alert using Arduino
4. Soil Moisture based Automatic Pump Control using Arduino
5. Automatic Light Control using LDR and Arduino
6. DC Motor Control using Arduino
7. Servo Motor Control using Arduino
8. Obstacle Detection using IR Sensor with NodeMCU
9. LED control using NodeMCU and Blynk
10. DHT Sensor Interfacing with NodeMCU and ThingSpeak
11. Switch Controlled LED using Raspberry Pi
12. Interfacing of Ultrasonic Sensor with Raspberry Pi

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply knowledge of Arduino programming to simulate and interface basic electronic components and sensors.
- Build sensor-based automation systems using Arduino for real-world applications.
- Analyze and control actuators such as DC motor and servo motor using Arduino for control applications.
- Design IoT-based systems using NodeMCU by interfacing sensors with cloud platforms for real-time monitoring and control.
- Develop interfacing of I/O devices and sensors with Raspberry Pi.

CHAIRMAN
BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Arduino UNO Board with cable	15 Nos
2. NodeMCU ESP 8266 with cable	15 Nos
3. Raspberry Pi Board with cable	15 Nos
4. 37 in 1 Sensor Module	15 Nos
5. PIR Sensor	2 Nos
6. Soil Moisture Sensor	2 Nos
7. DHT11 Sensor	2 Nos
8. IR Sensor	2 Nos
9. LDR	2 Nos
10. Ultrasonic Sensor	2 Nos
11. Water Pump	2 Nos
12. DC Motor	2 Nos
13. Servo Motor	2 Nos
14. LED, Buzzer, Resistors, Jumper Wires, Potentiometer, Switch	Adequate quantities
15. PCs	30 Nos

CHAIRMAN
BoS (ECE)

20EC506L **DIGITAL SIGNAL PROCESSING LABORATORY** L T P C
0 0 3 1.5

OBJECTIVES:

The students should be made to

- Understand the generation and manipulation of discrete-time signals.
- Analyze discrete-time signals using convolution and Discrete Fourier Transform.
- Develop FIR and IIR filters to implement their characteristics in signal processing.
- Implement DSP techniques to real-world applications such as adaptive noise cancellation, image enhancement and audio signal processing.
- Apply the functionalities of DSP processor to perform basic waveform generation and arithmetic operations.

LIST OF THE EXPERIMENTS

MATLAB/EQUIVALENT SOFTWARE PACKAGE

1. Generation of Elementary Discrete-Time Signals
2. Basic Operations on Signals
3. Linear and Circular Convolution
4. Computation of DFT and IDFT
5. Design of FIR Filters
6. Design of IIR Filters
7. Image Enhancement and Segmentation Techniques
8. FFT analysis of Image and Audio Signals
9. Adaptive Noise Cancellation

DSP PROCESSOR

10. Study of Digital Signal Processor and Testing of On-Board LEDs
11. Waveform Generation
12. Basic Arithmetic Operations
13. Up Sampling and Down Sampling

TOTAL: 45 PERIODS

OUTCOMES:

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

- Execute the generation and manipulation of discrete-time signals, including operations such as scaling, addition, and shifting.
- Compute convolution and DFT to analyze signals in time and frequency domains.
- Design and implement FIR and IIR filters for signal processing applications and evaluate their performance.
- Analyze the application of DSP techniques in areas such as image processing, audio signal processing, and adaptive noise cancellation.
- Demonstrate knowledge of DSP processor architecture and execute arithmetic operations, sampling and waveform generation.

CHAIRMAN
BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

1.	Fixed/Floating point DSP Processors (Kit/Add-on Cards)	15 Nos
2.	PCs with Code Composer Studio or equivalent software	15 Nos
3.	MATLAB with Simulink ,Signal Processing Tool Box and Image Processing Tool Box or Equivalent Software in desktop systems.	15 Nos
4.	DSO (100MHz)	5 Nos

CHAIRMAN
BoS (ECE)

24EC507L	MINI PROJECT-I	L T P C 0 0 2 1

OBJECTIVES:

- Apply the knowledge acquired in core and elective courses to identify, formulate, and analyze an engineering problem.
- Design and implement hardware/software-based solutions using appropriate tools and technologies.
- Develop teamwork, communication, and project management skills through collaborative project execution.
- Encourage innovation, research thinking, and exposure to emerging technologies.
- Prepare for larger, industry-relevant final year projects and professional practice.

GUIDELINES

- Each project team shall consist of 3 students.
- Each group will be associated with a subject Incharge/ mini project mentor.
- The group should meet with the concerned faculty during laboratory hours and the progress of work discussed must be documented
- The project should address a real-time engineering problem or emerging technology challenge or sustainability
- A project report in standard format must be submitted at the end of the semester.
- The students must understand the
    - Concept
    - Importance
    - Interdisciplinary
    - Challenges
    - Various applications/smart objects
    - Major Players/Industry, Standards.
- The students may do will visit different websites to identify their topic for the miniproject.
- Each group will identify the Hardware and software requirement for their mini project problem statement.
- Each group along with the concerned faculty shall identify a potential problem statement, on which the study and implementation is to be conducted.
- Each group may present their work in various project competitions and paper presentations.
- A detailed report is to be prepared as per guidelines given by the concerned faculty.
- Oral Exam: An Oral exam will be held based on the Mini Project and Presentation.

TOTAL: 30 PERIODS

CHAIRMAN
BoS/ECE
24/10/25

OUTCOMES:

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

- Identify and define an engineering problem relevant to ECE applications.
- Apply appropriate hardware and software tools to design the proposed system.
- Integrate interdisciplinary knowledge to develop a prototype or simulation model.
- Demonstrate teamwork, leadership, and professional ethics during project execution.
- Present and document the project outcomes effectively in written and oral formats.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS/ECE

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

OBJECTIVES:

The student should be made to:

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

UNIT I INTRODUCTION TO BASIC ARITHMETIC AND PERSONALITY TRAITS **6**

Aptitude - Numbers, Average, Percentage, Profit and loss, Picture pattern.
Soft skills - Personality development, Professional ethics, Perception insights, attitude and behavioral changes.

UNIT II CONCEPT OF PROPORTIONALITY & INTERPERSONAL SKILLS **6**

Aptitude - Time and work, Pipes and cisterns, Series completion, Critical reasoning.
Soft skills - Developing self - esteem, Significance of interpersonal behaviour and interpersonal relationships.

UNIT III AN APPROACH TO COGNITIVE APTITUDE AND LEADERSHIP SKILLS **6**

Aptitude - Time, speed and distance, Boats and streams, Races and games, Syllogism.
Soft skills - Leadership skills - Characteristics and importance of leadership, Roles and responsibilities of a good Leader

UNIT IV CONTEMPORARY APTITUDE AND SITUATIONAL RESPONSES **6**

Aptitude - Crypt arithmetic, Ranking, Logarithms, Cubes, Analogy.
Soft skills - Decision making - Processes and challenges, Creative and Critical thinking.

UNIT V NON-VERBAL 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
BoS (S&H) 18/03/26

TEXT BOOKS:

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

REFERENCES:

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

Useful Weblinks:

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

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H)

24EC601 ANTENNA AND WAVE PROPAGATION **L T P C**
3 0 0 3

OBJECTIVES:
The Student should be made to:

- Understand the fundamental principles of electromagnetic wave generation and radiation mechanisms.
- Explain antenna parameters and terminologies used in antenna analysis and design.
- Analyze the radiation characteristics of basic antennas and antenna arrays.
- Examine antennas used for special applications in communication systems.
- Evaluate different wave propagation mechanisms and their impact on communication systems.

UNIT I BASIC ELECTROMAGNETIC THEORY **9**

Physical concept of generation of EM Wave- Static electric & magnetic field of steady electric current-Electromagnetic field and its radiation from a center fed dipole. Elementary radiator: Hertzian dipole; Power radiated by elementary dipole -Half-wave dipole,

UNIT II ANTENNA TERMINOLOGIES **9**

Basic parameters: Antenna Impedance, Radiation Resistance, Radiation Pattern, Beam area and Beam Efficiency, Directivity and Gain, Radiation Intensity, Half Power BW, Polarization, Antenna Efficiency, Affective Aperture, Effective length of antenna, Antenna Temperature, Front to Back Ratio, Antenna Field Zones.

UNIT III BASIC ANTENNAS AND ARRAYS. **9**

Radiation characteristics of wire antennas: Rhombic Antenna - Folded dipole - Antenna Arrays: Two Element Array, Uniform linear array, Broad side array, End fire array -Yagi-Uda Antenna.

UNIT IV ANTENNAS FOR SPECIAL APPLICATIONS **9**

VHF/UHF antennas: Helical antenna, Parabolic reflector antenna, Horn antenna, Micro strip (patch) antenna, Slot antenna. Terrestrial mobile communication antennas: Base station antennas, Mobile station antennas-Smart Antennas: Need & Applications-DTH receiver system: outdoor unit, antenna system and indoor unit.

UNIT V WAVE PROPAGATION **9**

Ground Wave propagation, Ionosphere Layers and Sky wave propagation: Virtual Height, Critical frequency, Maximum usable frequency (MUF), Skip distance, Lowest Usable frequency (LUF), Optimum Usable frequency (OUF)- Space Wave propagation: Tropospheric scattered propagation, Duct Propagation.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Explain EM wave generation and radiation from dipole antennas.
- Calculate antenna parameters such as gain, directivity, radiation resistance, efficiency, and polarization.
- Analyze radiation characteristics of basic antennas and antenna arrays.
- Evaluate and select antennas for special applications (VHF/UHF, mobile, smart antennas, DTH)
- Analyze wave propagation mechanisms and compute MUF, LUF, skip distance, etc.

TEXT BOOKS:

1. Antennas and Wave Propagation, Kraus John D, Marhefka Ronald J. and Khan Ahmad S Tata McGraw-Hill Education, 5th Edition,2017.
2. Antenna and Wave propagations Prasad, K.D. and Handa, Deepak Satya Prakashan, New Delhi, 3rd edition 2003.

REFERENCES:

1. Antennas and Wave Propagation, Raju, G. S. N. Pearson Education India, 3rd edition 2016.
2. Antenna and Wave propagations Das, Sisir and DAS, Tata McGraw-Hill Education, 2013

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC602	VLSI DESIGN	L T P C 3 0 2 4

OBJECTIVES:

The students should be made to:

- Understand the fundamentals of MOS transistor characteristics and CMOS logic design.
- Demonstrate the Combinational logic circuits using various CMOS logic styles.
- Study the operation of sequential logic circuits, timing issues and memory architectures used in digital systems.
- Apply the various methods to design arithmetic building blocks used in digital systems.
- Develop the digital logic circuits using Verilog HDL and learn the implementation Strategies.

UNIT I MOS TRANSISTOR THEORY AND CMOS LOGIC **9**

Introduction - Moore's Law - VLSI Design flow-**MOS Transistor**: nMOS and pMOS Transistors - Ideal I-V Characteristics - Non Ideal I-V Characteristics - DC Transfer Characteristics of CMOS Inverter – **CMOS Logic:** Inverter, NAND Gate, NOR Gate - Compound Gates - Pass Transistors - Transmission Gates - Stick Diagrams - Layout Diagrams.

UNIT II DESIGN OF COMBINATIONAL LOGIC CIRCUITS **9**

Static CMOS Logic - Ratioed Logic - Pseudo nMOS Logic - Cascode Voltage Switch Logic - Dynamic CMOS Logic- Issues in Dynamic Design - Cascading Dynamic Gates - Domino CMOS Logic - Dual Rail Domino Logic - Static and Dynamic Power Dissipation.

UNIT III DESIGN OF SEQUENTIAL LOGIC CIRCUITS AND MEMORY **9**

Static Latches and Registers: Bistability Principle, Multiplexer based Latches, Master-Slave Edge Triggered Register - **Dynamic Latches and Registers**: Dynamic Transmission Gate Edge Triggered Registers, C^2MOS Register, True Single Phase Clocked Register - Pipelining- **Timing Issues:** Timing Classification of Digital Systems - Clock Skew - Clock Jitter - Clock Distribution Techniques - **Memory Architectures**: N-word, Array Structured, Hierarchical and Content Addressable Memory Architecture - **Memories**: 6T SRAM Cell and 1T DRAM Cell.

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS **9**

Datapath Circuits - Ripple Carry Adder – Carry Bypass Adder – Linear Carry Select Adder – Square Root Carry Select Adder - Carry Save Adder – Accumulator - Array Multiplier - Carry Save Multiplier -Wallace Tree Multiplier – Vedic Multiplier - Barrel Shifter.

UNIT V VERILOG HDL AND IMPLEMENTATION STRATEGIES **9**

Verilog HDL: Overview of Verilog HDL – Module - Identifiers – Keywords - Number Specifications - Data Types - Operators - Gate Level , Dataflow and Behavioral Modeling – Verilog HDL Programs of Digital Logic Circuits - **Implementation Strategies:** Introduction to ASIC - ASIC Design Flow- Full Custom ASICs and Semi Custom ASICs - Basic Building Blocks of FPGA – Classification of FPGA Architectures.

THEORY :45 PERIODS

CHAIRMAN
BoS (ECE)

LIST OF EXPERIMENTS:

1. Design and Simulation of CMOS Logic Gates
2. Design and Simulation of Pass Transistors and Transmission Gates
3. Design and Simulation of Multiplexer and Demultiplexer
4. Design and Simulation of Encoder and Decoder
5. Design and Simulation of Counters and Shift Registers
6. Design and Simulation of Finite State Machine
7. Design and Simulation of Ripple Carry Adder and Array Multiplier
8. Study of FPGA Board and Testing On-Board LEDs and Switches
9. Design and Implementation of ALU using FPGA Board
10. Design and Implementation of Magnitude Comparator using FPGA Board

PRACTICAL: 30 PERIODS

TOTAL :75 PERIODS

OUTCOMES:

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

- Apply the principles of MOS transistors to construct CMOS logic gates and transmission gate-based circuits.
- Investigate the different design approaches of combinational circuits and their impact on power consumption.
- Examine the design of sequential logic circuits along with timing issues and memory architectures in digital systems.
- Analyze the operation of arithmetic circuits including adders and multipliers with appropriate design techniques.
- Design and develop the digital circuits using Verilog HDL and implement them through ASIC and FPGA design methodologies.

TEXT BOOKS:

1. Jan M. Rabaey,Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits: A Design perspective", Second Edition, PHI, 2016.
2. Neil H.E. Weste, David Money Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", Fourth Edition, Pearson Addison-Wesley, 2015.

REFERENCES:

1. Palnitkar Samir, "Verilog HDL: Guide to Digital Design and synthesis", Second Edition, Pearson Education, 2003.
2. M.J.S. Smith, "Application Specific Integrated Circuits", Pearson Education, 2003.
3. Douglas A.Pucknell and Kamran Eshraghian, "Basic VLSI Design", Third Edition, PHI,2017.

CHAIRMAN
BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1.	Xilinx ISE / Vivado / Modelsim / Equivalent EDA Tools	30 Nos
2.	Xilinx Spartan 3E / EDGE Spartan 7 / EDGE Artix 7 / EDGE Zynq / Equivalent FPGA Boards	15 Nos
3.	Cadence / Tanner / SPICE / Equivalent EDA Tools	20 Nos
4.	Personal Computers	30 Nos

CHAIRMAN
BoS (ECE)

24EC603 **EMBEDDED SYSTEMS AND APPLICATIONS** **L T P C**
3 0 0 3

OBJECTIVES:

The students should be made to

- Understand the fundamentals of embedded systems, their design process, processor selection, memory organization, and bus structures.
- Study the embedded computing platform design including performance, energy, power, and program optimization techniques.
- Build the architecture and programmer's model of ARM processors.
- Examine knowledge of STM32L15XXX ARM Cortex M3/M4 microcontroller architecture and its peripherals.
- Discover embedded system concepts in real-world applications through detailed case studies.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS AND BUS STRUCTURES **9**

Introduction to Embedded Systems – Embedded system design process – Design example: Model train controller selection of Embedded processor – DMA- memory devices – Memory management methods-memory mapping, cache replacement policies- Port and Bus-Based I/O, Arbitration, Serial Protocols, I2C, CAN and USB, Parallel Protocols – PCI and ARM Bus.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN **9**

Designing with computing platforms-Components for embedded programs-Models of programs - Assembly, linking and loading compilation techniques- Program level performance analysis - Software performance optimization-Program level energy and power analysis and optimization Analysis and optimization of program size Program validation and testing.

UNIT III ARM ARCHITECTURE **9**

ARM Architecture – memory organization – addressing modes –The ARM Programmer's model -Registers – Pipeline - Interrupts – Coprocessors – Interrupt Structure.

UNIT IV STM32L15XXX ARMCORTEX M3/M4 MICROCONTROLLER **9**

STM32L15XXX ARM CORTEX M3/M4 Microcontroller-Memory and Bus Architecture, Power Control, Reset and Clock Control, STM32L15XXX Peripherals-GPIOs, System Configuration Controller, NVIC, ADC, Comparators, GP Timers, USART.

UNIT V CASE STUDIES **9**

Digital Camera, Smart Card Reader, Automated Meter Reading System, Adaptive Cruise control in vehicle, Automated Teller Machine, Automated fare collection systems.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Gain knowledge on embedded system design flow, processor selection criteria, memory management methods, and bus communication protocols
- Perform program-level performance analysis using profiling and benchmarking techniques
- Describe ARM architecture, registers, pipeline operation, interrupts, and addressing modes.
- Develop embedded applications using STM32L15XXX microcontroller peripherals such as **GPIO**, ADC, Timers, and USART.
- Implement embedded solutions for real-time applications like smart cards, automated systems, and automotive control systems.

TEXT BOOKS::

1. Shibu.K.V, "Embedded Systems" 3rd Ed., Tata McGraw Hill Education Private Ltd. 2013 .
2. Marilyn Wolf, "Computers as Components Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCES:

1. Shibu.K.V, "Embedded Systems" 3rd Ed., Tata McGraw Hill Education Private Ltd. 2013 .
2. Marilyn Wolf, "Computers as Components Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
3. Steve Furber, 'ARM system on chip architecture', Addison Wesley,2010.
4. Andrew N Sloss, Dominic Symes, Chris Wright, ARM System Developers Guide Designing and Optimizing System Software, Elsevier, 2006.
5. Frank Vahid and Tony Gwargie, "Embedded System Design", John Wiley & sons, 2002.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC604L	EMBEDDED LABORATORY	L T P C 0 0 2 1

OBJECTIVE:

The students should be able to

- Understand the architecture and peripheral modules of ARM/STM32 microcontrollers.
- Develop embedded programs to interface input and output devices such as ADC, DAC, LCD, LED, keypad, EEPROM, and relay.
- Apply communication protocols such as I2C and ZigBee in embedded systems.
- Implement PWM techniques and motor control concepts for stepper motor and buzzer interfacing.
- Analyze the embedded system applications using appropriate development tools and simulation environments.

LIST OF THE EXPERIMENTS

1. Interfacing ADC and DAC.
2. Interfacing LED and PWM.
3. Interfacing keyboard and LCD.
4. Implementing ZigBee protocol with ARM.
5. LED blinking using STM32.
6. Interfacing LCD 2x16 using STM32.
7. Interfacing EEPROM and I2C Comunication using STM32.
8. Interfacing ADC volume controller using STM32.
9. Interfacing DAC using STM32.
10. Interfacing stepper motor using STM32.
11. Interfacing buzzer using STM32.
12. Interfacing relay using STM32.

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Gain the Knowledge on ARM/STM32 microcontrollers and their peripherals such as ADC and DAC
- Apply the coding skills to interface and program input/output devices such as LED, LCD, Keypad, EEPROM, relay, and buzzer using STM32
- Examine communication protocols such as I2C and ZigBee for embedded applications.
- Design and develop embedded applications involving PWM generation and stepper motor control.
- Evaluate the performance of embedded system applications using appropriate development tools and hardware platforms

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Embedded trainer kits with ARM board/STM32
2. Embedded trainer kits with STM32
3. Embedded trainer kits suitable for wireless communication.
4. Adequate quantities of Hardware, software and consumables

CHAIRMAN
BoS (ECE)

24EC605L	MINI PROJECT-II	L T P C
		0 0 2 1

OBJECTIVES:

- Apply the knowledge acquired in core and elective courses to identify, formulate, and analyze an engineering problem.
- Design and implement hardware/software-based solutions using appropriate tools and technologies.
- Develop teamwork, communication, and project management skills through collaborative project execution.
- Encourage innovation, research thinking, and exposure to emerging technologies.
- Prepare for larger, industry-relevant final year projects and professional practice.

GUIDELINES

- Each project team shall consist of 3 students.
- Each group will be associated with a subject Incharge/ mini project mentor.
- The group should meet with the concerned faculty during laboratory hours and the progress of work discussed must be documented
- The project should address a real-time engineering problem or emerging technology challenge or sustainability
- A project report in standard format must be submitted at the end of the semester.
- The students must understand the
  - Concept
  - Importance
  - Interdisciplinary
  - Challenges
  - Various applications/smart objects
  - Major Players/Industry, Standards.
  - Applications of Sustainable Development Goals
- The students may do will visit different websites to identify their topic for the miniproject.
- Each group will identify the Hardware and software requirement for their mini project problem statement.
- Each group along with the concerned faculty shall identify a potential problem statement, on which the study and implementation is to be conducted.
- Each group may present their work in various project competitions and paper presentations.
- A detailed report is to be prepared as per guidelines given by the concerned faculty.
- Oral Exam: An Oral exam will be held based on the Mini Project and Presentation.

TOTAL: 30 PERIODS

CHAIRMAN
BoS/ECE

OUTCOMES:

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

- Identify and define an engineering problem relevant to ECE applications.
- Apply appropriate hardware and software tools to design the proposed system.
- Integrate interdisciplinary knowledge to develop a prototype or simulation model.
- Demonstrate teamwork, leadership, and professional ethics during project execution.
- Present and document the project outcomes effectively in written and oral formats.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS/ECE

24 EC701 MICROWAVE AND LIGHTWAVE TECHNOLOGIES L T P C
3 0 0 3

OBJECTIVES:
The Student should be made to:

- Understand the working principles of microwave amplifiers and oscillators.
- Study microwave passive components and measurement techniques.
- Analyze optical fiber propagation characteristics and transmission impairments.
- Understand optical transmitters, receivers, and their operating principles.
- Design and evaluate optical communication links using system design concepts

UNIT I MICROWAVE AMPLIFIERS AND OSCILLATORS 9

Introduction to microwave transmission – Application and limitation – Klystron amplifier – Reflex Klystron Oscillator – TWT amplifiers – Magnetron Oscillator – Gunn oscillator.

UNIT II MICROWAVE COMPONENTS 9

Directional coupler – E plane Tee, H- plane Tee – Magic Tee – Circulators – Isolators – Attenuators – Phase Shifters – Avalanche breakdown devices, PIN diode and TUNNEL diode. Power,VSWR, Impedance Measurement.

UNIT III INTRODUCTION TO OPTICAL FIBERS AND TRANSMISSION CHARACTERISTICS 9

The propagation of light in optical waveguides – Classification of optical fibers – Numerical aperture, Step index and Graded index fiber – Modes in cylindrical fiber – Linearly polarized modes, Attenuation: Absorption, Scattering, Bending losses. Modal dispersion and chromatic dispersion – Single mode fiber - waveguide dispersion– MFD – PMD.

UNIT IV OPTICAL TRANSMITTERS AND RECEIVERS 9

Optical Sources: - Light source materials – LED homo and hetero structures – surface and edge emitters – Quantum efficiency – Injection Laser Diode – Modes and threshold condition – Structures and Radiation Pattern. Optical detectors: – Physical principles – PIN and APD diodes – Photo detector noise.

UNIT V OPTICAL COMMUNICATION SYSTEMS AND DESIGN 9

Transmitter module: Signal formats – Electronic driving circuit – Modulation circuit – external modulators. Amplifier: EDFA, Semiconductor Optical Amplifier. Receiver Module: Optical front end – Quantizer – Decision circuit. Optical Link Design: Point- to- point links – System considerations – Link Power budget – Rise time budget.

TOTAL: 45 PERIODS

CHAIRMAN
BoS/ECE

OUTCOMES:

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

- Explain microwave transmission principles and their applications.
- Measure microwave parameters such as power, VSWR, and impedance.
- Classify optical fibers and calculate numerical aperture.
- Evaluate noise mechanisms in optical receivers.
- Describe optical amplifiers such as EDFA and Semiconductor Optical Amplifiers.

TEXT BOOKS:

1. Samuel Y. Liao, "Microwave Devices and Circuits", 3rd edition, Pearson education, 2011 reprint.
2. Keiser G, "Optical Fiber Communication Systems", 4th edition, Tata McGraw Hill. Edition, 2010.
3. Collin.R.E, "Foundations for Microwave Engineering", 2nd edition, Tata McGraw Hill, 2006.

REFERENCES:

1. Djafar.K. Mynbaev Lowell and Scheiner, "Fiber Optic Communication Technology", Pearson Education Asia, 9th impression, 2011.
2. John Powers, "An Introduction to Fiber optic Systems", 2nd edition, Tata-McGraw Hill, 2010.

MAPPING Of COs WITH POs AND PSOs

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

CHAIRMAN
BoS/ECE

24EC703L	MICROWAVE AND LIGHT WAVE TECNOLOGIES LABORATORY	L T P C 0 0 3 1.5

OBJECTIVE:

The students should be made to

- Be familiar with basic microwave and optical measurements.
- Understand the working principle of optical sources, detector, fibers and microwavecomponents
- Learn about the characteristics and measurements in optical fiber
- Understand the characteristics of Gunn diode or reflex klystron tube
- Know about the behavior of microwave components.

LIST OF THE EXPERIMENTS

I. MICROWAVE EXPERIMENTS

1. Reflex klystron or Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2. Directional Coupler Characteristics.
3. Radiation Pattern of Horn Antenna.
4. S-parameter Measurement of the following microwave components (Isolator,Circulator, E plane Tee, H Plane Tee, Magic Tee)
5. Attenuation and Power Measurement.

II. OPTICAL EXPERIMENTS

1. DC Characteristics of LED and PIN Photo diode
2. Measurement of connector and bending losses
3. Fiber optic Analog and Digital Link- frequency response (Analog) and eye diagram(Digital)
4. Numerical Aperture determination for Fibers
5. Attenuation Measurement in Fibers

TOTAL: 45 PERIODS

CHAIRMAN
BoS/ECE

OUTCOMES:

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

- Analyze the performance of simple optical link.
- Test microwave and optical components.
- Analyze the Characteristics of Directional coupler and calculate the wave guide parameter(Frequency, VSWR, Reflection coefficients)
- Implement multi-hole directional coupler and magic tee in different microwave platforms
- Understanding the concept and characteristics of reflex klystron or Gunn diode

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS/ECE

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S No	Name of the Equipment	Quantity
1	Kit for Measuring Numerical Aperture and Attenuation of Fiber	02 Nos
2	LEDs with ST / SC / E2000 receptacles 650 / 850nm	02 Nos
3	Microwave Test Bench at X Band and Antenna Turn Table to Measure Radiation Pattern of Horn Antenna 2 Horn Antennas	02 Nos
4	Microwave Test Bench at X Band to Determine Directional Coupler Characteristics	02 Nos
5	Microwave Test Bench at X Band to Determine VSWR for Isolator and Circulator, VSWR Meter, Isolator, Circulator, E Plane Tee, H Plane Tee	02 Nos
6	Microwave Test Bench at X Band Variable Attenuator and Detector	02 Nos
7	Optical Power meter	02 Nos.
8	Trainer kit for analyzing Analog and Digital link Performance, 2Mbps, PRBS data Source, 10MHz Signal Generator,	02 Nos
10	Trainer kit for carrying out LED and PD Diode	01 No
11	Trainer Kit for Determining the mode Characteristics, Losses in Optical Fiber	02 Nos
12	Cathode ray Oscilloscope	5 Nos
13	MM/SM Glass and Plastic Fiber Patch Chords with ST/SC/E2000 Connectors	02 Nos
14	PiN PDs with ST / SC / E2000 receptacles - 650 850nm	02 Nos

CHAIRMAN
BoS/ECE

24EC704L ELECTRONIC DESIGN LABORATORY

L	T	P	C
0	0	3	1.5

OBJECTIVES:

The Student should be made to:

- Provide practical knowledge in power electronics circuits and converters.
- Develop skills in designing and implementing electronic systems using SCR, converters, and controllers.
- Enable students to design sensor-based and microcontroller-based applications.
- Familiarize students with PCB design and CAD tools.
- Enhance problem-solving, teamwork, and documentation skills

LIST OF EXPERIMENTS:

1. DC power supply design using buck –boost converters
2. DC power supply design using fly back converter
3. Design of RTD Transmitter
4. Design of AC/DC voltage regulator using SCR
5. Set up a DC motor speed control circuit using SCR and verify the output
6. Design of process control timer
7. Design of wireless data modem
8. Microcontroller based systems design
9. Sensor interfacing (Temperature / LDR / IR).
10. PCB layout using CAD.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design and analyze DC-DC converters and power electronic circuits.
- Implement SCR-based voltage regulators and motor control systems.
- Design and develop sensor interfacing and transmitter circuits.
- Develop microcontroller-based embedded systems and wireless applications.
- Design PCB layouts using CAD tools and demonstrate teamwork and documentation skills.

CHAIRMAN
BOS/ECE

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BOS/ECE

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS

S No	Name of the Equipment	Quantity
1	SCR	25 each
2	Resistors, Capacitors, Inductors	Sufficient quantities
3	Digital Multimeter	10 Nos
4	Bread Boards	15 Nos
5	Voltmeter(0-15)V, (0-10)V	10 Nos
6	Ammeter (0-20)mA, (0-250)μA	10 Nos
7	CRO (30MHz)	10 Nos.
8	Function Generators (3 MHz)	10 Nos.
10	Dual Regulated Power Supplies (0 – 30V)	15 Nos
11	Standalone desktops PCs with Multisim Software(Equivalent to any open source Software)	15 Nos

CHAIRMAN
BOS/ECE

24EC801L	PROJECT WORK	L T P C
		0 0 20 10

OBJECTIVES:

- Apply the knowledge acquired in core and elective courses to identify, formulate, and analyze an engineering problem.
- Design and implement hardware/software-based solutions using appropriate tools and technologies.
- Develop teamwork, communication, and project management skills through collaborative project execution.
- Encourage innovation, research thinking, and exposure to emerging technologies.
- Prepare for larger, industry-relevant final year projects and professional practice.

GUIDELINES

- Each project team shall consist of 3 students.
- Each group will be associated with a subject Incharge/ mini project mentor.
- After interactions with project guides/industry experts, based on a comprehensive literature survey/ Industry requirements analysis, the student shall identify the title and define the aim and objectives of a project.
- The student is expected to work on details specifications, methodology, resources required, critical issues in design and implementation, and submit the project proposal at the starting of semester
- The group should meet with the concerned faculty during project hours and the progress of work discussed must be documented.
- The students must understand the
  - Concept
  - Importance
  - Interdisciplinary
  - Challenges
  - Various applications/smart objects
  - Major Players/Industry, Standards.
  - Applications of Sustainable Development Goals
- The student is expected to work on the design, development, and testing of the proposed project work as per the schedule.
- The project should address a real-time engineering problem or emerging technology challenge or sustainability
- A project report in standard format must be submitted at the end of the semester.
- Oral Exam: An Oral exam will be held based on the Mini Project and Presentation. contributions, and innovations in project work.

TOTAL: 300 PERIODS

CHAIRMAN
BoS/ECE

OUTCOMES:

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

- Identify a problem statement from a rigorous literature survey or the industry requirements analysis.
- Simulate and design a solution for the identified problem by applying acquired technical knowledge.
- Develop and test the prototype/algorithm to solve the complex engineering problem.
- Accomplish all objectives of the project in an allocated period with efficient teamwork.
- Present project work orally and through a comprehensive report.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS/ECE

24AD101OE	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L T P C
	(COMMON TO AGE, BME, CIVIL, EEE, ECE AND MECH)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the concept of intelligent agents and their interaction with environments
- Explore local search approaches in continuous spaces
- Study knowledge engineering approaches within first-order logic
- Examine planning graphs and their role in efficient planning
- Apply the role of knowledge representation in the learning process

UNIT I INTRODUCTION 9

Intelligent Agents - Agents and environments - good behavior - The nature of environments - Structure of agents - Problem Solving - Problem solving agents - Uniformed search strategies - Avoiding repeated states-Searching with partial information.

UNIT II SEARCHING TECHNIQUES 9

Informed search and exploration - Informed search strategies - heuristic function - Local search algorithms and optimization problems - Local search in continuous spaces - Online search agents and unknown environments - Constraint satisfaction problems (CSP) - Backtracking search and Local search for CSP.

UNIT III KNOWLEDGE REPRESENTATION 9

First order logic - Representation revisited - Syntax and semantics for first order logic - Using first order logic - Knowledge engineering in first order logic - Inference in First order logic - Prepositional versus first order logic - Unification and lifting - Forward chaining - Backward Chaining-Ontological Engineering.

UNIT IV PLANNING 9

Planning problem- Planning with state space search - Partial order planning - Planning graphs - Planning with proportional logic - Time, Schedules, and Resources - Hierarchical task Planning - Conditional Planning - Execution monitoring and re planning - Continuous planning.

UNIT V LEARNING 9

Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning - Logical formulation of learning - Explanation based learning - Learning using relevant information-Statistical Learning Methods - Case Study on AI-Assisted X-Ray Analysis.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD)

OUTCOMES:

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

- Apply the concept of problem-solving agents to real-world problem domains
- Implement local search algorithms to solve optimization
- Demonstrate knowledge engineering processes using FOL
- Utilize planning graphs to represent and solve planning tasks
- Analyze the role of knowledge in supporting effective learning

TEXT BOOKS:

1. Stuart J Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 4th Edition, 2023.
2. George F Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Pearson Education, 6th Edition, 2021.

REFERENCES:

1. Engene Charniak and Drew Mc Dermott, "Introduction to Artificial Intelligence", Addison Wesley, 2013.
2. Nils J Nilsson, "Principles of Artificial Intelligence", Narosa Publishing House, 2002.
3. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, Books 3rd Edition, 2000.

Mapping of COs with POs:

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

CHAIRMAN
BoS (AD)

24AD102OE	INTRODUCTION TO DATA SCIENCE	L T P C
	(COMMON TO AGE, BME, CIVIL, EEE, ECE AND MECH)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamental concepts of data science, its lifecycle, and applications
- Acquire, preprocess, and manage different types of data
- Apply probability and statistical techniques for analyzing data
- Develop predictive models using regression analysis
- Analyze networks and social data using graph theory

UNIT I FUNDAMENTALS OF DATA SCIENCE 9

Introduction to Data Science - Data Science Lifecycle - Applications of Data Science in Various Domains - Types of Data: Structured, Unstructured, Semi-Structured - Characteristics of Big Data - Roles in Data Science - Challenges in Data Science - Data Ethics and Privacy Issues - Future Trends in Data Science.

UNIT II DATA COLLECTION AND PREPROCESSING 9

Sources of Data - Data Acquisition Methods - Data Integration and Transformation - Handling Missing Values - Identifying and Removing Duplicates - Data Normalization and Standardization - Outlier Detection and Handling - Exploratory Data Analysis (EDA) - Case Study Using EDA.

UNIT III PROBABILITY AND STATISTICS FOR DATA SCIENCE 9

Introduction to Probability - Probability Distributions - Random Variables - Sampling Methods - Central Limit Theorem - Hypothesis Testing - Confidence Intervals - Correlation and Regression - Statistical Significance - Applications of Statistics in Data Science

UNIT IV REGRESSION ANALYSIS 9

Regression Analysis, Regression: Linear Regression Simple Linear Regression, Multiple & Polynomial Regression, Sparse Model - Unsupervised Learning, Clustering, Similarity and Distances, Quality Measures of Clustering - Case Study.

UNIT V NETWORK ANALYSIS 9

Network Analysis - Graphs - Social Networks - Centrality - Drawing centrality of Graphs - PageRank - Ego-Networks - Community Detection.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD)

OUTCOMES:

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

- Perform Exploratory Data Analysis to summarize data and gain insights
- Apply probability, statistical methods, and hypothesis testing to solve data-related problems
- Build and evaluate regression models for prediction and analysis
- Implement clustering techniques and evaluate clustering quality for unsupervised learning tasks
- Analyze complex networks and social graphs using centrality measures, PageRank, and community detection techniques

TEXT BOOK:

1. Foster Provost & Tom Fawcett, "Data Science for Business" 1st Edition, O'Reilly Media, 2013.

REFERENCES:

1. Wes McKinney "Python for Data Analysis" , 2nd Edition, O'Reilly, 2017.
2. Peter Bruce, Andrew Bruce "Practical Statistics for Data Scientists", 2017.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining 2nd Edition, Pearson, 2019.
4. Albert-László Barabási, "Network Science" – Cambridge University Press, 2016.

Mapping of COs with POs:

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

CHAIRMAN
BoS (AD)

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

CHAIRMAN
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)

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.

CHAIRMAN
BoS (CIVIL)

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.

CHAIRMAN
BoS (CIVIL)

UNIT V CASE STUDIES AND ENVIRONMENTAL SUSTAINABILITY 9

Case studies of integrated ecological engineering systems - Planning -Measuring Sustainability - Carrying Capacity and its limits - Concept of Ecological Foot print.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the development and evolution of ecosystem.
- Summarize the structure and function of natural ecosystems and biological magnification.
- Utilize ecological engineering principles into sustainable Practices.
- Organize ecological effects of exploration and industrialization.
- Analyze integrated ecological engineering systems.

TEXT BOOKS:

1. Jainul Alam, "Ecological Engineering", Discovery Publishing House, 2025
2. Geoff Gurr, Miguel A Altieri, Steve Wratten, "Ecological Engineering for Pest Management: Advances in Habitat Manipulation for Arthropods", CABI Publishing, 2004.

REFERENCES:

1. Majeti Narasimha Vara Prasad, "Handbook of Ecological and Ecosystem Engineering", Wiley; 1st edition,2021.
2. Theodore Sudia, "Ecological Engineering of the City: The Urban Ecosystem", Forgotten Books, 2018
3. Patrick Kangas, "Ecological Engineering: Principles and Practice", CRC Press Inc, 1st edition, 2003.

Mapping of COs with POs

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

CHAIRMAN
BoS (CIVIL)

24CS101OE	PYTHON PROGRAMMING FOR DATA SCIENCE (Common to AGE, CIVIL, BME, ECE, EEE & MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Familiarize with the data science work environment, including IPython and Jupyter.
- Learn the ndarray object for efficient storage and manipulation of dense data arrays in Python using NumPy.
- Explore the DataFrame object for handling labeled/columnar data in Python using Pandas.
- Perform data visualizations in Python using Matplotlib.
- Apply machine learning algorithms in Python using Scikit-Learn.

UNIT I IPYTHON: BEYOND NORMAL PYTHON 9

Shell and Notebook- Help and Documentation in IPython - Keyboard Shortcuts in the IPython Shell - IPython Magic Commands- Input and Output History - IPython and Shell Commands- Errors and Debugging- Profiling and Timing Code.

UNIT II INTRODUCTION TO NUMPY 9

Understanding Data Types in Python - The Basics of NumPy Arrays - Computation on NumPy Arrays: Universal Functions – Aggregations - Computation on Arrays - Comparisons, Masks, and Boolean Logic - Fancy Indexing - Sorting Arrays - Structured Data.

UNIT III DATA MANIPULATION WITH PANDAS 9

Installing and Using Pandas- Introducing Pandas Objects- Data Indexing and Selection- Operating on Data in Pandas- Handling Missing Data - Hierarchical Indexing- Combining Datasets - Aggregation and Grouping - Pivot Tables - Vectorized String Operations - Working with Time Series - High-Performance Pandas.

UNIT IV VISUALIZATION WITH MATPLOTLIB 9

General Matplotlib Tips - Simple Line Plots - Simple Scatter Plots - Visualizing Errors - Density and Contour Plots - Histograms, Binnings, and Density - Customizing Plot Legends - Customizing Colorbars - Multiple Subplots - Text and Annotation - Customizing Ticks - Customizing Matplotlib - Three-Dimensional Plotting in Matplotlib - Geographic Data with Basemap - Visualization with Seaborn.

CHAIRMAN
BoS (CSE)

UNIT V MACHINE LEARNING WITH SCIKIT-LEARN **9**

Machine Learning - Introducing Scikit – Learn - Hyper parameters and Model Validation - Feature Engineering - Naive Bayes Classification - Linear Regression - Support Vector Machines - Decision Trees and Random Forests - Principal Component Analysis - k-Means Clustering - Gaussian Mixture Models - Application: A Face Detection Pipeline.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Leverage IPython and Jupyter for streamlined development and interactive data analysis.
- Utilize NumPy's ndarray for optimized storage and manipulation of numerical data.
- Manage and analyze structured datasets effectively using Pandas DataFrame.
- Design clear and impactful data visualizations using Matplotlib in Python.
- Implement machine learning models in Python using Scikit-Learn for analytical problem-solving.

TEXT BOOK:

1. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2023.

REFERENCE:

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", 3rd Edition, O'Reilly, 2022.
2. John Paul Mueller, Luca Massaron, Wiley, "Python for data science for dummies", 3rd Edition, 2023.

COs – POs Mapping

COURSE OUTCOMES	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	1	1	3	1	1	1	1	2	1
2	3	3	2	1	3	1	1	1	1	2	1
3	3	3	2	2	3	1	1	1	2	2	1
4	2	2	2	1	2	2	1	1	2	1	1
5	3	3	3	2	3	2	1	1	2	3	2

CHAIRMAN
BoS (CSE)

26/10/25

24CS102OE	PROGRAMMING AND DATA STRUCTURES (Common to AGE, CIVIL, BME, ECE, EEE & MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Explain the basic concepts, syntax, and flow of C programming.
- Apply advanced features of C for problem-solving.
- Demonstrate the concepts and applications of linear data structures.
- Analyze the representation and use of non-linear data structures.
- Illustrate fundamental techniques in searching, sorting, and hashing.

UNIT I C PROGRAMMING BASICS 9

Structure of C program - Data Types - Storage classes – Variables - Constants - Keywords - Operators - Input/output statements, Assignment statements - Decision making statements - Switch statement - Looping statements - Introduction to Arrays: Declaration, Initialization - One dimensional array - Two dimensional arrays.

UNI II FUNCTIONS, POINTERS AND STRUCTURES 9

Introduction to functions: Function prototype, function definition, function call, Recursion - Pointers - Pointer operators - Pointer arithmetic - Array of pointers - Parameter passing: Pass by value, Pass by reference. Structure - Nested structures - Pointer and Structures - Array of structures - Self-referential structures - Dynamic memory allocation.

UNIT III LINEAR DATA STRUCTURES 9

List -Singly Linked lists - Application of List - Polynomial addition - Linked list implementation of Stacks - Applications of Stack - Evaluating arithmetic expressions - Linked list implementation of Queues - Application of Queue.

UNIT IV NON-LINEAR DATA STRUCTURES 9

Trees - Binary Trees - Binary tree representation and traversals - Binary Search Trees - Applications of trees. Graph and its representations - Graph Traversals - Topological Sort - Applications of graphs.

C. Saravanan

CHAIRMAN
BoS (CSE)

UNIT V SEARCHING, SORTING AND HASH TABLE 9

Linear Search - Binary Search. Bubble Sort - Insertion sort - Merge sort - Quick sort - Hashing functions - Hash tables - Introduction to Overflow handling.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Construct programs using the fundamental concepts of C programming.
- Employ advanced features of C to solve computational problems.
- Select and apply appropriate linear data structures for effective problem solving.
- Design and implement non-linear data structures such as trees and graphs for application development.
- Evaluate and compare various searching, sorting algorithms, and hashing techniques.

TEXTBOOK:

1. Reema Thareja, "Data Structures Using C", Third Edition, Oxford University Press, 2023.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Fourth Edition, Pearson Education, 2013.

COs - POs Mapping

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

CHAIRMAN
BoS (CSE)

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

CHAIRMAN
BoS (EEE) 28/10/25

COURSE OUTCOMES:

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

- Describe the types of wiring systems, wiring materials, tools and safety standards
- Apply knowledge of wiring methods to residential, commercial and industrial installations
- Understand the fundamentals of residential, commercial and industrial wiring systems
- Explain lighting principles, light sources, accessories and energy-efficient lighting systems
- Design wiring and lighting installations and perform estimation and maintenance

TEXT BOOK:

1. Uppal S L, "Electrical Wiring, Estimation and Costing", Sixth Edition, Khanna Publishers, 2025.

REFERENCES:

1. Raina K B and Bhattacharya S K, "Electrical Design, Estimating and Costing", Second Edition, New Age International Private Limited, 2017.
2. Gupta J B, "A Course in Electrical Installation Estimating and Costing", Ninth Edition, S K Kataria and Sons, 2022.
3. Giridharan M K, "Electrical Systems Design", Second Edition, I K International Publishing Housing Private Limited, 2016.
4. Sharma Br, "Electrical Estimating and Costing", First Edition, Satya Prakashan Publishers, 2010.
5. National Building Code of INDIA 2016 - Bureau of Indian Standards.

Mapping of COs with POs

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

CHAIRMAN
BoS (EEE)

28/10/24

24IT101OE FUNDAMENTALS OF SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand various software engineering life cycle models to real-world projects.
- Perform software requirements analysis and develop clear, structured specifications.
- Acquire knowledge of system analysis and design concepts.
- Understand software testing strategies, maintenance approaches, and quality assurance practices.
- Explore project management techniques, including scheduling using modern tools.

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT **9**

Introduction to Software Engineering - Software Process - Perspective and Specialized - Process Models - Introduction to Agility - Agile Process - Extreme Programming - XP Process.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION **9**

Requirement Analysis and Specification - Requirements Gathering and Analysis - Software Requirement Specification - Formal System Specification - Finite State Machines - Petri Nets - Object Modeling using UML: Use Case Model - Class Diagrams - Interaction Diagrams - Activity Diagrams - State Chart Diagrams - Functional Modeling - Data Flow Diagram.

UNIT III SOFTWARE DESIGN **9**

Software Design: Design Process - Design Concepts - Coupling - Cohesion - Functional Independence - Design Patterns: Model View Controller - Publish - Subscribe - Adapter - Command - Strategy - Observer - Proxy - Facade - Architectural Styles - Layered - Client Server - Tiered - Pipe and Filter- User Interface Design.

UNIT IV SOFTWARE TESTING AND MAINTENANCE **9**

Testing: Unit Testing - Black box testing - White box Testing - Integration and System Testing - Regression Testing - Debugging: Program Analysis - Symbolic Execution - Model Checking - Case Study.

CHAIRMAN
BoS (IT)

UNIT V PROJECT MANAGEMENT **9**

Software Project Management - Software Configuration Management - Project Scheduling - DevOps: Motivation - Cloud as a Platform - Operations - Deployment Pipeline: Overall Architecture Building and Testing - Deployment - Tools - Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Compare and select appropriate Software Development Lifecycle Models
- Evaluate project management approaches as well as cost and schedule estimation strategies.
- Perform formal analysis on software specification.
- Use UML diagrams effectively for system analysis and design.
- Design software systems using architectural styles and design patterns.

TEXT BOOKs:

1. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, 1st Edition, McGraw-Hill, 2014.
2. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering: Using UML, Patterns and Java. 3rd Edition, Pearson Education, 2009.

REFERENCES:

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd Edition, PHI Learning Pvt. Ltd., 2010.
2. Len Bass, Ingo Weber and Liming Zhu, - DevOps: A Software Architect's Perspective, Pearson Education, 2016.
3. Rajib Mall, Fundamentals of Software Engineering, 3rd Edition, PHI Learning Pvt. Ltd., 2009.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	2	2	1	2	2	-	-	-	1	1	2
2	3	3	2	3	2	-	-	-	2	3	2
3	3	3	2	2	1	-	-	-	2	3	2
4	2	3	2	1	3	-	-	-	2	3	2
5	2	3	1	1	2	-	-	-	-	-	1

CHAIRMAN
BoS (IT)

28/10/25

24IT102OE **WIRELESS SENSOR NETWORKS** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the concepts of wireless sensor networks.
- Get exposure on WSN environment.
- Know the layered approach in sensor networks.
- Understand the use of suitable protocol for WSN.
- Explore knowledge on performance analysis of WSN.

UNIT I INTRODUCTION TO WIRELESS SENSOR NETWORKS **9**

Data Communications - Networks - Networks Types - Network Models: TCP/IP Protocol suite - The OSI Model. Digital-to-Digital Conversion: Line coding - Line Coding Schemes - Transmission Modes - Transmission media: Guided - Unguided media.

UNIT II WSN ARCHITECTURE **9**

Data Dissemination - Flooding and Gossiping - Data Gathering Sensor Network Scenarios - Optimization Goals and Figures of Merit - Design Principles for WSNs - Gateway Concepts - Need for Gateway - WSN and Internet Communication - WSN Tunneling.

UNIT III MEDIA ACCESS CONTROL **9**

Fundamentals of MAC protocols - Low Duty Cycle Protocols and Wakeup Concepts - Contention Based Protocols - Schedule-based Protocols - SMAC - BMAC - Traffic -Adaptive Medium Access Protocol - IEEE 802.15.4 MAC Protocol.

UNIT IV TRANSPORT LAYER **9**

Circuit Switching - Packet Switching - Concept of IPV4 - IPV6 - 6LOWPAN and IP - IP based WSN - 6LOWPAN based WSN - IOT.

UNIT V TOOLS FOR WSN **9**

TinyOS: Introduction - NesC - Interfaces - Modules - Configuration - Programming in TinyOS using NesC - TOSSIM - Contiki - Structure - Communication Stack - Simulation environment - Cooja simulator - Programming.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (IT)

OUTCOMES:

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

- Explore the fundamentals of wireless sensor network models.
- Explore knowledge in devising layers in WSN.
- Able to design energy efficient WSNs.
- Design application dependent suitable for infrastructure-less networks.
- Implement various protocols in TinyOS and Contiki.

TEXT BOOKs:

1. Holger Karl, Andreas Willig, Protocols and Architectures for Wireless Sensor Networks. 1st Edition, John Wiley & Sons, New Jersey, 2011.
2. Jun Zheng, Abbas Jamalipour, Wireless Sensor Networks: A Networking Perspective. 1st Edition, Wiley-IEEE Press, 2014.

REFERENCES:

1. Waltenegus W. Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks: Theory and Practice. 1st Edition, John Wiley & Sons, 2014.
2. Ian F. Akyildiz, Mehmet Can Vuran, Wireless Sensor Networks. 1st Edition, John Wiley & Sons, 2011.
3. Zach Shelby, Carsten Bormann, 6LoWPAN: The Wireless Embedded Internet. 1st Edition, John Wiley & Sons, 2009.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	3	2	-	-	-	-	-	-	-
2	3	2	3	2	-	3	-	-	-	-	-
3	3	3	3	3	-	3	3	-	2	2	-
4	3	3	3	3	-	3	3	3	2	2	2
5	3	3	3	3	3	3	-	-	2	2	-

CHAIRMAN
BoS (IT)

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)

24AD201OE	BASICS OF VISUALIZATION TOOLS	L T P C
	(COMMON TO AGE, BME, CIVIL, EEE, ECE AND MECH)	3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain a comprehensive understanding of the core concepts in data visualization
- Learn the operational principles of different information visualization tools
- Identify and address common issues encountered in data representation
- Master the use of Tableau for effective data visualization
- Develop expertise in creating real-time, interactive visualization systems

UNIT I INTRODUCTION **9**

Context of data visualization - Definition, Methodology, Visualization design objectives - Key Factors - Purpose, visualization function and tone, visualization design options - Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tool - Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs

UNIT II VISUALIZATION TECHNIQUES FOR TIME-SERIES, TREES & GRAPHS **9**

Mapping - Time series - Connections and correlations - Indicator-Area chart - Pivot table - Scatter charts, Scatter maps - Tree maps, Space filling and non-space filling methods - Hierarchies and Recursion - Networks and Graphs - Displaying Arbitrary Graphs-node link graph - Matrix representation for graph s - Info graphics

UNIT III TEXT AND DOCUMENT VISUALIZATION **9**

Acquiring data - Where to Find Data, Tools for Acquiring Data from the Internet, Locating Files for Use with Processing, Loading Text Data, Dealing with Files and Folders, Listing Files in a Folder ,Asynchronous Image Downloads, Web Techniques, Parsing data - Levels of Effort, Tools for Gathering Clues, Text Markup Languages, Regular Expressions, Grammars and BNF Notation, Compressed Data, Vectors and Geometry, Binary Data Formats, Advanced Detective Work.

UNIT IV INTERACTIVE DATA VISUALIZATION **9**

Drawing with data - Scales - Axes - Updates, Transition and Motion - Interactivity - Layouts - Geo-mapping - Exporting, Framework - D3.js, Tableau Dashboards.

UNIT V SECURITY IN DATA VISUALIZATION **9**

Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization - Attacking and defending visualization systems - Creating secured visualization system.

TOTAL: 45 PERIODS

OUTCOMES:

CHAIRMAN
BoS (AD)

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

- Apply mathematics and basic science knowledge for designing information visualizing System
- Collect data ethically and solve engineering problem in visualizing the information.
- Implement algorithms and techniques for interactive information visualization
- Conduct experiments by applying various modern visualization tool and solve the space layout problem
- Analyze and design system to visualize multidisciplinary multivariate Data individually or in teams

TEXT BOOKS:

1. Robert Spence, "Information Visualization an Introduction", Third Edition, Pearson Education, 2014.
2. Colin Ware, "Information Visualization Perception for Design", Third edition, Margon Kaufmann Publishers, 2012.
3. Robert Spence, "Information Visualization Design for Interaction", Second Edition, Pearson Education, 2006.
4. Benjamin B. Bederson and Ben Shneiderman, "The Craft of Information Visualization", Morgan Kaufmann Publishers, 2003.

REFERENCES:

1. Thomas Strothotte, "Computational Visualization: Graphics, Abstraction and Interactivity", Springer, 1998.
2. Matthew O. Ward, George Grinstein, Daniel Keim, "Interactive Data Visualization: Foundation, Techniques and Applications", Second Edition, A. K. Peters/CRC Press, 2015.
3. Joerg Osarek, "Virtual Reality Analytics", Gordon's Arcade, 2016.

Mapping of COs with POs:

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

CHAIRMAN
BoS (AD)

28.10.24

24AD202OE	FOUNDATIONS OF MACHINE LEARNING	L T P C
	(COMMON TO AGE, BME, CIVIL, EEE, ECE AND MECH)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand mathematical foundations relevant to machine learning (linear algebra, statistics, VC dimension, PAC learning)
- Grasp different supervised learning algorithms, their assumptions, strengths, and weaknesses
- Learn how ensemble methods and unsupervised learning work and when they are useful
- Understand neural networks in depth: from basic architecture to deep learning practices, and the challenges involved
- Design, perform, and analyse machine learning experiments properly, including model evaluation and statistical comparison

UNIT I INTRODUCTION TO MACHINE LEARNING **9**

Review of Linear Algebra for machine learning - Introduction and motivation for machine learning - Examples of machine learning applications - Vapnik-Chervonenkis (VC) dimension - Probably Approximately Correct (PAC) learning - Hypothesis spaces - Inductive bias - Generalization - Bias-variance trade-off.

UNIT II SUPERVISED LEARNING **9**

Linear Regression Models - Least squares, single & multiple variables - Bayesian linear regression - gradient descent. Linear Classification Models: Discriminant function - Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model - Naive Bayes - Maximum margin classifier - Support vector machine - Decision Tree - Random Forests.

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING **9**

Combining multiple learners - model combination schemes, voting - Ensemble Learning - bagging, boosting, stacking - Unsupervised learning: K-means; Instance Based Learning: KNN - Gaussian mixture models and Expectation maximization.

UNIT IV NEURAL NETWORKS **9**

Multilayer perceptron - activation functions - network training - gradient descent optimization - stochastic gradient descent - error backpropagation from shallow networks to deep networks - Unit saturation (aka the vanishing gradient problem) - ReLU - hyperparameter tuning - batch normalization - regularization; dropout.

CHAIRMAN
BoS (AD)

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 9

Guidelines for machine learning experiments; Cross Validation (CV) and resampling - K-fold CV, bootstrapping - measuring classifier performance - assessing a single classification algorithm and comparing two classification algorithms - *t* test, McNemar's test, K-fold CV paired *t* test.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the concepts of hypothesis spaces, inductive bias, generalization, and bias-variance trade-off in machine learning.
- Implement linear regression, logistic regression, SVM, decision trees, and random forests, and evaluate their performance.
- Apply unsupervised learning techniques like K-means and Gaussian mixture models and use ensemble methods (bagging, boosting, stacking).
- Design neural network models, tune hyperparameters, apply regularization methods, and handle training issues like vanishing gradients.
- Plan and conduct experiments using cross-validation, bootstrapping; compare classifier performance using statistical tests like *t* test and McNemar's test.

TEXT BOOK:

1. Tom M. Mitchell, "Machine Learning", First Edition, McGraw-Hill Education, Latest Reprint 2023.

REFERENCES:

1. Ethem Alpaydin, "Introduction to Machine Learning", Fourth Edition, MIT Press, 2020.
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", 2nd Edition, MIT Press, 2023.
3. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", Third Edition, O'Reilly Media, 2023.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Second Edition, Springer, 2023 (Corrected reprint).
5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, Latest Reprint 2024.

Mapping of COs with POs:

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

CHAIRMAN
BoS (AD)

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

CHAIRMAN
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

CHAIRMAN
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

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

Chairman
BoS/BME

REFERENCES:

1. Gerson and Gerson - Technical Communication: Process and Product, 7th Edition, Prentice Hall (2012)
2. Virendra K. Pamecha - Guide to Project Reports, Project Appraisals and Project Finance (2012)
3. Daniel Riordan - Technical Report Writing Today (1998)
4. Darla-Jean Weatherford - Technical Writing for Engineering Professionals (2016) Penwell Publishers

Mapping of COs with POs

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

Chairman
BoS/BME

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.

CHAIRMAN
BoS (CIVIL)

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.

CHAIRMAN
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)

24CS201OE	FUNDAMENTALS OF OPERATING SYSTEMS (Common to AGE, CIVIL, BME, ECE, EEE & MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Illustrate the fundamental concepts and functions of operating systems.
- Discuss the management of processes and threads.
- Examine process synchronization, inter-process communication, and deadlock situations.
- Implement memory management strategies, including virtual memory.
- Assess file systems, disk scheduling, and I/O management techniques.

UNIT I INTRODUCTION **9**

Introduction to Operating Systems - Operating System Operations - Resource Management - Operating System Services – Virtualization - User and Operating System Interface - System Calls - Operating System Structures - Building and Booting an Operating System.

UNIT II PROCESSES AND THREADS **9**

Process Concept - Process Scheduling - Operations on Processes - Interprocess Communication - IPC in Shared - Memory Systems - IPC in Message - Passing Systems - Examples of IPC Systems - Threads - Overview - Multithreading models - Pthreads

UNIT III PROCESS MANAGEMENT AND SYNCHRONIZATION **9**

Basic Concepts of CPU Scheduling - Scheduling Criteria - Scheduling Algorithms - The Critical - Section Problem - Peterson's Solution - Synchronization Hardware - Mutex Locks - Semaphores - Classic Problems of Synchronization - Monitors - Deadlocks - Prevention - Avoidance – Detection - Recovery

UNIT IV MEMORY MANAGEMENT **9**

Contiguous Memory Allocation - Paging - Structure of the Page Table - Segmentation - Swapping - Example Architectures - Demand Paging - Page Replacement - Allocation of Frames - Thrashing

UNIT V STORAGE MANAGEMENT **9**

File Concept - Access Methods - Directory Structure - Protection - Directory Implementation - Allocation Methods – Free - Space Management – Mass - Storage Structure - HDD Scheduling

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CSE)

Mech

OUTCOMES:

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

- Understand the structure, services, and basic functionalities of operating systems.
- Analyze process and thread creation, management, and inter-process communication.
- Design scheduling algorithms and apply synchronization and deadlock handling techniques.
- Evaluate and compare memory management schemes like paging and segmentation.
- Analyze file systems, disk scheduling, and I/O management in storage systems.

TEXT BOOKS:

1. Abraham Silberschatz, Greg Gagne and Peter B. Galvin. "Operating System Concepts", 10th Edition, John Wiley & Sons Inc., 2018.

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2. D. M. Dhamdhere. "'Operating Systems: A Concept– Based Approach"', 3rd Edition, Tata McGrawHill, 2017.
3. William Stallings. "Operating Systems: Internals and Design Principles", 9th Edition, Pearson, 2017.
4. Andrew S. Tanenbaum, Herbert Bos. "Modern Operating Systems", 5th Edition, Pearson, 2023.
5. Douglas Comer, "Operating System Design: The Xinu Approach", 2nd Edition, CRC Press, 2023.

COs - POs Mapping

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

CHAIRMAN
BoS (CSE)

24CS202OE	INTRODUCTION TO DATABASE (Common to AGE, CIVIL, BME, ECE, EEE & MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Describe the fundamentals of database systems and conceptual data modeling.
- Use the principles of the relational model to construct SQL queries.
- Develop database applications and design relational schemas.
- Examine transaction processing, concurrency control, and recovery mechanisms.
- Assess the role of Distributed Databases and NoSQL systems in modern applications.

UNIT I INTRODUCTION TO DATABASE SYSTEMS **9**

Introduction to Databases - File System Vs Database System - Data Models - Schemas and Instances - DBMS Architecture - Centralized - Client Server - Database Applications - ER Models - ER to Relational Mapping

UNIT II RELATIONAL MODELS **9**

Relational Model - Constraints - Keys - Dependencies - Relational Algebra - Unary, Binary, Set and Extended Relational Algebra operations - SQL - Data Definition - Data Manipulation and Retrieval Queries - Nested Queries - Joins - Views - Cursors - Procedures - Functions - Triggers - Embedded and Dynamic SQL

UNIT III RELATIONAL DATABASE DESIGN **9**

Database Design - Functional Dependencies - Normalization - 1 NF - 2 NF - 3 NF - BCNF - Multivalued Dependency (4 NF) - Join Dependency (PJNF)

UNIT IV TRANSACTIONS AND RECOVERY **9**

Transaction processing concepts - Need for concurrency control and recovery - ACID Properties - Recoverability - Serializability - Concurrency Control - Two phase locking Techniques - Timestamp based protocol - Graph based protocol - Deadlock handling - Log based recovery - Two Phase Commit Protocol

UNIT V QUERY PROCESSING AND ADVANCED DATABASES **9**

Indexing and Hashing Techniques - Query Processing and Optimization - Sorting and Joins - Database Tuning - Introduction to Spatial and Temporal Databases - OO Databases - NoSQL.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CSE)

OUTCOMES:

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

- Describe the basic database concepts and construct ER models for simple applications.
- Formulate SQL queries to manage and retrieve data from relational databases.
- Apply programming and design techniques to enhance database structure through normalization.
- Implement transactions using concurrency control and recovery methods.
- Analyze and evaluate Distributed and NoSQL databases for varied application needs.

TEXT BOOKS:

1. Jagdish Chandra Patni, Hitesh Kumar Sharma, Ravi Tomar, Avita Katal, "Database Management System An Evolutionary Approach", 2022.

REFERENCES:

1. Narain Gehani and Melliyal Annamalai, "The Database Book: Principles and Practice Using the Oracle Database System", Universities Press, 2012.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2014.
3. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson/Addison, Wesley, 2016.
4. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.
5. Andreas Meier, Michael Kaufmann, "SQL & NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management", First Edition 2019.

COs - POs Mapping

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

CHAIRMAN
BoS (CSE)

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

CHAIRMAN
BoS (EEE) 28/10/25

COURSE OUTCOMES:

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

- Describe the components, history and environmental significance of electric and hybrid vehicles
- Explain the fundamentals of vehicle motion, propulsion power and tire-road force mechanics
- Examine different electric and hybrid vehicle architectures and their transmission assemblies
- Summarize the configuration of various electric motor drives used in hybrid and electric vehicles
- Analyse various energy storage techniques and the sizing of propulsion motors for hybrid and electric vehicles

TEXT BOOKS:

1. Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", Second Edition, CRC Press, 2003.
2. Ali Emadi, "Advanced Electric Drive Vehicles", First Edition, CRC Press, 2017.

REFERENCES:

1. Mehrdad Ehsani, Yimi Gao, Sebastian E Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.
2. James Larminie and John Lowry, "Electric Vehicle Technology Explained", John Wiley and Sons, 2003.
3. Seth Leitman and Bob Brant, "Build Your Own Electric Vehicle", Third Edition, McGraw Hill, 2013.
4. Shashank Arora, Alireza Tashakori Abkenar, Shantha Gamini Jayasinghe and Kari Tammi, "Heavy-duty Electric Vehicles from Concept to Reality", Elsevier Science, 2021.
5. Rabiul Islam Md, Rakibuzzaman Shah Md and Hasan Ali Mohd, "Emerging Power Converters for Renewable Energy and Electric Vehicles: Modeling, Design and Control", First Edition, CRC Press, 2021.

Mapping of COs with POs:

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

CHAIRMAN
BoS (EEE)

28/10/25

24IT201OE	INTRODUCTION TO WEB DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Learn the fundamentals of Internet, World Wide Web, protocols, browsers, and web servers.
- Understand design structured, interactive, and user-centric web pages using HTML, CSS, and JavaScript.
- Explore skills to manipulate the DOM and implement client-side scripting for dynamic web content.
- Familiarize with XML, PHP, and integration of PHP with databases using MySQL.
- Acquire knowledge to plan, implement, and publish complete web applications.

UNIT I WEB BASICS AND DESIGN **9**

Introduction: Concept of WWW - Internet Vs. WWW - HTTP Protocol - Request and Response - Web Browsers and Web Servers - Features of Latest Version of Web. Web Design: Concepts of Effective Web Design - Browser Compatibility - Bandwidth - Cache - Display Resolution: Look and Feel of the Website - Page Layout - and Linking - User-centric Design: Sitemap - Planning and Publishing a Website.

UNIT II HTML AND CSS **9**

HTML: Basics of HTML - Text Formatting - Fonts - Commenting Code - Colors - Hyperlinks - Lists - Tables - Images - Forms - XHTML - Meta Tags - Character Entities - Frames and Frame sets - Browser Architecture and Website Structure - Overview of Latest HTML version Features. CSS: Need - Introduction - Syntax and Structure - Backgrounds - Colors - Text Styling - Fonts - Borders - Boxes - Margins -Padding - Lists.

UNIT III JAVASCRIPT AND DHTML **9**

JavaScript: Client-side scripting - Variables - Functions - Conditional Statements - Loops and Repetition - Pop-up boxes and alerts - Advanced JavaScript: Objects - JavaScript's Built-in Objects - DOM - Web Bowser Environments - DOM manipulation - Forms - Validations.

UNIT IV XML AND PHP BASICS **9**

XML: Introduction - Uses - Simple XML - Key Components - DTD and Schema - XML with applications - Transforming XML using XSL and XSLT.

CHAIRMAN
BoS (IT)

PHP: Introduction and basic syntax - Decision-making and looping - PHP and HTML integration - Arrays and Functions - Browser control and detection - Strings, - Form Processing - File Handling - Advanced features: Cookies and Sessions.

UNIT V PHP AND MYSQL **9**

PHP - MySQL integration: Basic commands - Connection to server - Creating Databases and Tables - Selecting Databases - Listing Databases and Table Names - Insertion - Update - Delete data and Tables - Handling Database Errors - Database Management - Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Able to explain web fundamentals, protocols, browsers, and server concepts.
- Design structured, interactive, and user-centric web pages using HTML and CSS.
- Implement dynamic client-side functionality using JavaScript and DHTML.
- Develop server-side scripts using PHP and integrate them with XML and MySQL databases.
- Implement and publish functional web applications using PHP-MySQL.

TEXT BOOKs:

1. HTML 5 Black Book - Web Technologies: HTML, XHTML, CSS, XML, JavaScript, AJAX, PHP and MySQL, 2nd Edition, Dreamtech Press, 2016.

REFERENCES:

1. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl, CGI, PHP, and MySQL, BPB Publications, 2020.
2. Achyut S. Godbole & Atul Kahate, Web Technologies: TCP/IP to Internet Application Architectures, McGraw Hill, 2018.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	1	-	1	-	-	-	-	-	2
2	2	2	3	-	2	1	-	1	2	-	2
3	2	2	3	-	3	-	-	1	2	-	2
4	3	3	3	2	3	1	-	1	2	1	3
5	3	3	3	2	3	1	1	2	3	2	3

CHAIRMAN
BoS (IT)

28/10/25

24IT202OE	PRINCIPLES OF MULTIMEDIA	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Provide an understanding of multimedia systems, applications, and underlying principles.
- Introduce various multimedia data types such as text, audio, image, video, and animation.
- Explain data compression techniques for efficient storage and transmission.
- Familiarize students with multimedia authoring tools, software, and design principles.
- Explore applications of multimedia in communication, education, entertainment, and the web.

UNIT I INTRODUCTION TO MULTIMEDIA **9**

Multimedia: Introduction - Definitions - Components - Text - Audio - Video - Graphics and Animation - Multimedia Applications: Education, Entertainment - Training - Kiosks and Presentations - Multimedia System Architecture - Multimedia Hardware: Input/ Output Devices - Storage Devices - Multimedia Software: Authoring Tools - Presentation Tools - Virtual Reality and Multimedia.

UNIT II TEXT, AUDIO AND IMAGE **9**

Text: Types of Text - Unicode Standards - Text Compression Techniques - Audio: Acoustics - Digital Representation of Sound - Waveform and MIDI Audio - Audio Compression Techniques - Audio Standards - Image: Digital Image Representation - Color Models - Sampling and Quantization - Image Formats - Image Compression Standards.

UNIT III VIDEO AND ANIMATION **9**

Video: Analog and Digital Video - Video Formats - Characteristics of Video Signals – Digitization - Video Compression Standards - Animation: Types of Animation - Principles of Animation - Animation Techniques - Morphing - Motion Capture - Animation Software Tools.

UNIT IV MULTIMEDIA DATA COMPRESSION **9**

Need for compression - Lossless Compression Techniques: Run Length Encoding - Huffman Coding - Arithmetic Coding - Dictionary Based Compression - Lossy Compression Techniques: Transform coding - JPEG, MPEG Compression - Comparison of Compression Techniques and their Applications in Multimedia Systems.

CHAIRMAN
BoS (IT)

UNIT V MULTIMEDIA TOOLS AND APPLICATIONS 9

Multimedia Authoring Tools: Authoring Metaphors - Card-Based - Timeline-Based - Icon-Based and Object-Oriented Authoring - Multimedia Databases - Multimedia Applications in Education - Business - Entertainment and the Web - Designing Multimedia Applications - Multimedia and the Internet - Future Trends in Multimedia Technology.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Describe the fundamentals, architecture, and applications of multimedia systems.
- Understand representation, storage, and processing of text, audio, and images.
- Explain video and animation concepts with related standards and techniques.
- Apply compression algorithms for efficient multimedia storage and transmission.
- Use authoring tools to design simple multimedia applications for real-world domains.

TEXT BOOKs:

1. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Springer, 2nd Edition, 2021.

REFERENCES:

1. Ralf Steinmetz and Klara Nahrstedt, Multimedia: Computing, Communications and Applications, Pearson Education, 2019.
2. Tay Vaughan, Multimedia: Making It Work, 9th Edition, McGraw Hill, 2018.
3. Prabhat K. Andleigh and Kiran Thakrar, Multimedia Systems Design, PHI, 2020.
4. Fred T. Hofstetter, Multimedia: Basics, Technology, and Future, Pearson, 2019.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	2	1	-	1	1	-	-	-	-	2
2	3	2	2	1	2	-	-	-	-	-	2
3	2	2	3	-	2	1	-	-	-	-	2
4	3	3	2	2	3	-	-	-	-	-	2
5	2	2	3	1	3	1	1	2	2	2	3

CHAIRMAN
BoS (IT)

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

CHAIRMAN
(BoS / MECH) 28/10/25

OUTCOMES:

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

- Describe the construction, function, and operation of major engine components.
- Explain the working and application of transmission components such as clutch, gearbox, propeller shaft, and differential.
- Compare different automobile layouts, chassis designs, and evaluate their impact on vehicle aerodynamics
- Summarize the design and performance of steering systems, suspension arrangements, and braking mechanisms, including modern safety systems
- Develop the suitability of ignition systems, and explain the principles of hybrid vehicle.

TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering", Vol. 1 and 2, Seventh Edition, Standard Publishers, New Delhi, 14th Edition 2017.
2. Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill, 4th Edition, 2018.

REFERENCES:

1. Joseph Heitner, "Automotive Mechanics," East-West Press, Second Edition, 1999.
2. Jain K K and Asthana R B, "Automobile Engineering", Tata McGraw Hill Publishers, New Delhi, 2002.
3. Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals", The Good Heart-Will Cox Company Inc, USA, 1978.

Mapping of COs with POs

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

CHAIRMAN
(BoS / MECH)

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.

CHAIRMAN
(BoS / MECH) 28/10/25

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES 9

Recent developments in non-traditional machining processes - their working principles - equipments, effect of process parameters – applications - advantages and limitations – Comparison of non-traditional machining processes.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Recognize the need for unconventional machining processes and their classification.
- Contrast various thermal energy and electrical energy based unconventional machining processes.
- Explain various chemical and electrochemical energy-based unconventional machining processes.
- Discuss various nano-abrasive-based unconventional machining processes.
- Differentiate various recent trends in unconventional machining processes.

TEXT BOOKS:

1. Vijay K Jain, "Advanced Machining Processes", Allied Publishers Pvt. Ltd., New Delhi, 2007.
2. Pandey P C and Shan H S, "Modern Machining Processes", Tata McGraw Hill, New Delhi, 2011.

REFERENCES:

1. Benedict GF, "Non traditional Manufacturing Processes", Taylor and Francis Limited, 2019
2. Mc Geough, "Advanced Methods of Machining", Chapman and Hall, London, 1988.
3. Ernest Paul De Garmo, Black J T and Ronald A Kohser, "Material and 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)

24EC101PE	INDUSTRIAL ELECTRONICS	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Understand the working principles of power semiconductor devices fundamentals and its applications
- Explore the operations of regulated power supplies and voltage multiplier circuits.
- Analyze the characteristics of SCR-based controlled rectifier circuits and inverters.
- Learn the techniques and applications of electric heating including resistance, induction, and dielectric heating.
- Study various motor control methods including PWM, phase control, and PLL-based control used in industrial systems.

UNIT I POWER SEMICONDUCTOR DEVICES **9**

Thyristor, Thyristor characteristics, Thyristor turn-on methods, Thyristor protection, Series and parallel operation of thyristors, Thyristor commutation, Characteristics of Diac and Triac, Power diode,Power transistor, Power MOSFET,IGBT.

UNIT II POWER SUPPLIES AND VOLATGE MULTIPLIERS **9**

Block diagram of regulated power supply – Principle and working of switch mode power supply Half wave voltage doubler-Full wave voltage doubler-Voltage Tripler circuit diagram and working mentioning of applications of voltage multipliers.

UNIT III PHASE CONTROLLED CONVERTERS AND INVERTERS **9**

SCR as inverter parallel and series circuits.Single-phase voltage source inverters, Modified McMurray half-bridge and full-bridge inverter, McMurray-Bedford half-bridge and full-bridge inverter, Pulse-width modulated inverters

UNIT IV ELECTRIC HEATING **9**

Electric Heating-Introduction to electric heating-Advantages of electric heating, Resistance heating, Temperature control of furnaces, Induction and dielectric heating.

UNIT V APPLICATIONS OF INDUSTRIAL ELECTRONICS **9**

Voltage control at constant frequency-PWM control-Synchronous tap changer,-Phase control of DC motor-Servomechanism-PLL control of a DC motor, Classification of chargers based on charging levels, Renewable Energy based Electric Vehicle Charging Station.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

TEXT BOOK:

1.M.H. Rashid, "Power Electronics: Circuits, Devices and Applications", 4th Edition, Pearson Education, 2013.

REFERENCES:

1. G.K. Mithal & Manoj Gupta, Industrial and Power Electronics, Khanna Publishers, 2013.
2. P.S. Bimbhra, Power Electronics,7th Edition, Khanna Publishers, 2022.

OUTCOMES:

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

- Examine working functions of thyristor family such as SCR,DIAC and TRIAC.
- Explain the functionality and applications of SMPS and voltage multiplier circuits.
- Demonstrate the operation of SCR-based rectifiers and inverters with waveform analysis.
- Identify and explain the methods of electric heating and their advantages in industrial systems.
- Apply different motor control techniques and understand servomechanism and PLL-based motor control used in automation.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC102PE	INDUSTRIAL INSTRUMENTATION	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce the fundamental concepts and components of industrial instrumentation systems.
- Provide knowledge on the measurement of physical parameters like pressure, temperature, flow, level, and force.
- Familiarize students with various sensors, transducers, and signal conditioning techniques used in industry.
- Develop skills in analyzing measurement system performance using calibration and error analysis.
- Explore practical applications of instrumentation in process control, automation, and smart industrial systems.

UNIT I FUNDAMENTALS OF INDUSTRIAL INSTRUMENTATION 9

Need and scope of industrial instrumentation – Functional elements of measurement systems – Static and dynamic characteristics – Classification of errors – Performance terms: accuracy, precision, repeatability, sensitivity – Calibration concepts – Standards and traceability – Signal conditioning basics – Data acquisition and display systems.

UNIT II MEASUREMENT OF FORCE, TORQUE, VELOCITY AND ACCELERATION 9

Strain gauges: types, gauge factor, strain measurement techniques – Load cells – Torque measurement using strain gauge and torsion bars – Velocity measurement: magnetic pickups, photoelectric sensors, stroboscope – Accelerometers: piezoelectric, capacitive, and strain gauge types – Rotational speed sensing.

UNIT III PRESSURE, TEMPERATURE AND FLOW MEASUREMENT 9

Pressure measurement: manometers, Bourdon tube, diaphragm, bellows gauges – Pressure transducers and transmitters – Temperature measurement: thermocouples, RTDs, thermistors, pyrometers – Flow measurement: orifice, venturi, flow nozzle, turbine flow meters, electromagnetic and ultrasonic flow meters – Calibration and error sources.

UNIT IV LEVEL, DENSITY, VISCOSITY AND HUMIDITY MEASUREMENT 9

Level measurement: sight glass, float, capacitive, ultrasonic, radar methods – Density measurement using hydrometer, displacer, vibrating element – Viscosity measurement: capillary tube, rotational and falling sphere methods – Humidity sensors: dry and wet bulb psychrometers, capacitive and resistive sensors – Opto electronic Sensor-Flapper Nozzle Systems.

UNIT V SIGNAL TRANSMISSION, CONDITIONING AND INDUSTRIAL APPLICATIONS 9

Analog and digital signal transmission – 2-wire and 4-wire transmitters – Telemetry systems – Data acquisition and logging – Signal conditioning: amplifiers, filters, ADC/DAC – Industrial

CHAIRMAN
BoS (ECE)
24/10/25

instrumentation applications: process industries, automation, control systems – Recent trends: smart sensors, wireless instrumentation, IIoT-based systems-Bio Process Instrumentation and dissolved oxygen sensor

TOTAL :45 PERIODS

OUTCOMES:

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

- Identify and explain the functional elements and characteristics of industrial measurement systems.
- Select appropriate transducers and techniques for measuring various physical quantities.
- Evaluate the dynamic behavior and errors of measurement systems.
- Analyze the basic signal conditioning and data acquisition setups for industrial applications.
- Apply instrumentation concepts in real-world industrial scenarios including automation and smart manufacturing.

TEXT BOOK:

1.D. Patranabis, "Principles of Industrial Instrumentation", 3rd Edition, Tata McGraw-Hill, 2010.

REFERENCES:

1. A.K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai & Co., 2011.
2. B.C. Nakra and K.K. Chaudhry, "Instrumentation, Measurement and Analysis", McGraw-Hill Education, 3rd Edition, 2009.
3. R. K. Rajput, "Instrumentation and Control Systems", S. Chand Publishing, 2015.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC103PE	DISPLAY TECHNOLOGIES	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Understand the fundamental principles and classification of display technologies.
- Study the working and limitations of LCD and LED display systems.
- Explore modern flat-panel technologies like TFT and plasma.
- Gain insight into the latest trends in interactive and smart displays, including AR/VR and HUDs.
- Learn the principles and applications of projection and 3D display systems.

UNIT I FUNDAMENTALS OF DISPLAY SYSTEMS **9**

Human visual characteristics related to display systems-Brightness and contrast - Visual acuity, information content and resolution- Field of view and angle of viewing- Perception of colour-Colour gamut - Perception of motion, refresh rate and Critical Fusion Frequency. Display interfaces-VGA, DVI, HDMI, Display Port

UNIT II LCD AND LED TECHNOLOGIES **9**

Construction-principle-technology for LCD display, Construction-principle in LED-OLED-QLED. Construction and principle in Quantum dot display (QLED) display, Electroluminescent (ELD) Surface-conduction electron-emitter displays (SEDs).

UNIT III TFT AND PLASMA DISPLAY DISPLAYS **9**

TFT -structure, process, MOSFET basics, LTPS-TFT -driven OLEO display design, TFT technologies for OLEO displays- new OLEO applications-TFT Active-matrix LCD, Construction and principle in PDP.

UNIT IV ADVANCED DISPLAYS AND TRENDS **9**

Touch screen technologies-Resistive, Capacitive, Infrared, Surface Acoustic Wave (SAW)-Smart displays, Heads-Up Displays, Augmented Reality-Virtual Reality displays- Energy efficiency and display power management-Future trends- E-paper, wearable displays, 8K displays.

UNIT V PROJECTION AND 3D DISPLAY TECHNOLOGIES **9**

Projection systems-LCD projectors, DLP projectors, Laser projectors. Basic principle of operation and applications of Television set Computer monitors- Head mounted display-Broadcast reference monitor-Medica.1 monitors3-dimensional displays: Basic principle of operation and applications of Volumetric display Laser display-Holographic display-Light field displays.

TOTAL:45 PERIODS

CHAIRMAN
BoS (ECE) 24/10/25

OUTCOMES:

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

- Identify and explain key parameters and types of display technologies.
- Compare various display devices like LCD, LED and OLED based on performance metrics.
- Gain a sound understanding of the operation, analysis and design of TFT and plasma displays
- Apply knowledge of modern display systems in designing interactive or wearable devices.
- Evaluate projection and 3D display methods for immersive visualization.

TEXT BOOK:

1.Elias Kougianos, Sai Munaga, Mohammed Ismail, "Advanced Display Technologies: Fundamentals and Applications", Springer, 2020.

REFERENCES:

1.Rolf R. Hainich and Oliver Bimber, "Displays: Fundamentals and Applications", 2nd Edition, CRC Press, 2016.
2.Shin-Tson Wu and Deng-Ke Yang, "Fundamentals of Liquid Crystal Devices", 2nd Edition, Wiley, 2015.
3.Janglin Chen, Wayne Cranton, Mark Fihn, "Handbook of Visual Display Technology", Springer, 2012.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC104PE	NANO ELECTRONICS	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce the fundamental principles of quantum mechanics that govern nanoscale phenomena.
- Explain the various scaling approaches and limitations in CMOS and nanoscale device technologies.
- Familiarize students with the classification, properties, and characterization of nanostructured materials.
- Discuss the operation and applications of nano electronic devices and emerging 2D materials.
- Provide insight into thin film deposition and characterization techniques used in nanotechnology research and applications.

UNIT I INTRODUCTION TO NANOTECHNOLOGY 9

Basics of Quantum Mechanics: Wave nature of particles and wave-particle duality, Pauli Exclusion Principle, wave functions and Schrodinger's equations, Density of States, Band Theory of Solids, Particle in a box Concepts.

UNIT II SHRINK-DOWN APPROACHES 9

CMOS scaling: advantages and limitations. Nanos cale MOSFETs, FINFETs, Vertical MOSFETs, system integration limits (interconnect issues etc.).

UNIT III NANOSTRUCTURE MATERIALS 9

classifications of nanostructure materials, zero dimensional, one dimensional, two dimensional and three dimensional, properties and applications Characterization techniques for nanostructured materials: SEM, TEM and AFM

UNIT IV NANO ELECTRONICS DEVICES 9

Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation.

UNIT V THIN FILM CHARACTERIZATION TECHNIQUES 9

Cyclic Voltammetry and Linear Sweep Techniques, Thickness measurement Techniques, X-Ray Diffraction Technique, Raman Spectral Study, Scanning Electron Microscopy, Energy Dispersive Analysis by X-rays measurements, Atomic Force Microscopy.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE) 24/10/25

OUTCOMES:

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

- Explain the basic principles of quantum mechanics and their relevance to nanotechnology.
- Analyze the effects of CMOS scaling and compare various nanoscale transistor architectures.
- Classify different types of nanostructured materials and describe their properties and characterization techniques.
- Evaluate the working principles of nanoelectronic devices and their potential applications in modern electronics.
- Apply various thin film and nanoscale material characterization

TEXT BOOKS:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 1st Edition, Pearson, 2009.
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Material and Novel Devices), 3rd Editon, Wiley VCH,2012.

REFERENCES:

1. K.E. Drexler, Nano systems Nanosystems: Molecular Machinery, Manufacturing, and Computation, Wiley, 1992
2. J.H. Davies, The Physics of Low-Dimensional Semiconductors. Cambridge University Press,1998
3. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC105PE	MEMS DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Prepare students with fundamental knowledge/ overview in the field of Micro Electro Mechanical System.
- Equip students with a basic foundation in electronic engineering, mechanical engineering, electrical engineering, chemistry, physics and mathematics fundamentals required for comprehending the operation and application of MEMS circuits, design.
- Understand various design concepts of micro system
- Leverage advantages of miniaturization and appropriate use in solving practical problems.
- Understand various process of micromanufacturing and applications

UNIT I OVERVIEW OF MEMS AND MICROSYSTEMS 9

MEMS and Microsystem, Typical MEMS and Microsystems products, Evolution of micro fabrication, Microsystems and microelectronics, Multidisciplinary Nature of Microsystems, Miniaturization. Applications and Markets.

UNIT II WORKING PRINCIPLES OF MICROSYSTEMS 9

Introduction, Microsensors, Micro actuation, MEMS with Micro actuators, Micro accelerometers, Microfluidics. Engineering Science for Microsystems Design and Fabrication: Introduction, Atomic Structure of Matter, Ions and Ionization Molecular Theory of Matter and intra molecular forces, Plasma physics, Electrochemistry.

UNIT III MICROSYSTEMS DESIGN 9

Introduction, Static Bending of Thin Plates, Mechanical Vibration, Thermo mechanics, Fracture Mechanics, Thin film mechanics, Overview of finite element stress analysis.

UNIT IV SCALING LAWS IN MINIATURIZATION 9

Introduction, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic Forces, Scaling in electricity, Scaling fluid mechanics, Scaling in heat transfer.

UNIT V MICROMANUFACTURING 9

Introduction, Bulk Micromanufacturing, Surface Micromachining, The LIGA Process, Summary on Micromanufacturing, Microsystem Packaging: Introduction, Overview of Mechanical Packaging of Microelectronics, microsystem packaging.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE) 24/10/25

OUTCOMES:

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

- Introduce the fundamental concepts, applications, and multidisciplinary nature of MEMS and Microsystems.
- Understand the working principles of microsensors, microactuators, and microfluidics.
- Analyze mechanical and thermal aspects in microsystem design.
- Study scaling laws relevant to miniaturization and microsystem behavior.
- Learn various micromanufacturing and packaging techniques used in MEMS fabrication.

TEXT BOOK:

1. Tai-Ran Hsu, MEMS and Micro systems: Design and Manufacture, 1st Edition, Tata Mc Graw Hill.2004.

REFERENCES:

1. Hans H Gatzen, Volker Saile, JurgLeuthold, Micro and Nano Fabrication: Tools and Processes, Springer, 2015.
2. Dilip Kumar Bhattacharya, Brajesh Kumar Kaushik, Microelectromechanical Systems (MEMS), Cengage Learning.
3. Chang Liu, Foundations of MEMS, 2nd Edition, Pearson Ed,2012.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC106PE **PCB DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce the principles of layout design and planning in printed circuit boards (PCBs).
- Explain the technologies and fabrication processes involved in PCB manufacturing.
- Provide knowledge of photo-printing and pattern transfer techniques used in PCB production.
- Discuss plating, multilayering, and automation techniques in PCB fabrication.
- Familiarize students with emerging trends and computer-aided tools used in PCB design and manufacturing.

UNIT I DESIGN OF PRINTED CIRCUIT BOARDS **9**

Layout Planning: Introduction, General Consideration, PCB Sizes, Layout Approaches, Documentation, Layout, General Rules and Parameters: Introduction, Resistance, Capacitance, Inductance of PCB conductors, Conductor Spacing, Component Placing and Mounting, Cooling Requirements and Package Density, Layout Check, Art work.

UNIT II TECHNOLOGY OF PCB **9**

Basic Processes for Double Sided PCBs, Photoresists, Wet Film Resists, Coating Processes, Exposure and further Processing of Wet Film Resists, Dry Film Resists. Screen Printing: Screen Fabrics, Screen and Frame Preparation, Pattern Transfer onto the screen, Reclamation of the Screen Fabrics, Printing, Trouble shooting.

UNIT III PHOTOPRINTING **9**

Basic Processes for Double Sided PCBs, Photoresists, Wet Film Resists, Coating Processes, Exposure and further Processing of Wet Film Resists, Dry Film Resists. Screen Printing: Screen Fabrics, Screen and Frame Preparation, Pattern Transfer onto the screen, Reclamation of the Screen Fabrics, Printing, Trouble shooting.

UNIT IV PLATING **9**

Fine line conductors with Ultra-Thin Copper Foil, Multilayer and Multiwire Boards, Flexible Printed Circuit Boards. Automation and Computers in PCB Design: Automated Artwork Draughting, Computer Aided Design, Design Automation.

UNIT V PCB TECHNOLOGY TRENDS **9**

Fine line conductors with Ultra-Thin Copper Foil, Multilayer and Multiwire Boards, Flexible Printed Circuit Boards. Automation and Computers in PCB Design: Automated Artwork Droughting, Computer Aided Design, Design Automation.

TOTAL :30 PERIODS

CHAIRMAN
BoS (ECE) 24/10/25

PRACTICAL EXERCISES: **TOTAL :30 PERIODS**

1. Schematic Capture of a Given Electronic Circuit
2. Design and Preparation of PCB Layout for the Given Circuit
3. PCB Design under Constrained Board Dimensions
4. Design and Development of a Single-Sided PCB
5. Design of Custom Footprint for Electronic Components
6. Linking Custom Footprints to Schematic Symbols
7. Generation of Gerber Files for PCB Fabrication
8. Preparation of Silkscreen and Other Manufacturing Layers for PCB
9. Performing Design Rule Check (DRC) and Error Correction
10. Fabrication of PCB Board for the given circuit

Components Required:

- Copper gladded base board
- Hand Drilling machine
- Soldering guns
- Assorted electronic components for making circuits
- OrCAD/ allegro/Altium or equivalent software

TOTAL :60 PERIODS

OUTCOMES:

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

- Explain the fundamental concepts of PCB layout planning, conductor parameters, and design rules.
- Describe the various fabrication technologies used for single and double-sided PCBs.
- Apply photolithography and screen-printing techniques for PCB pattern transfer and processing.
- Analyze multilayer, flexible, and automated PCB design approaches using CAD tools.
- Evaluate the latest PCB technology trends and design automation techniques in modern electronics.

TEXT BOOKS:

1. Printed Circuit Boards-Design & Technology by Walter C Bosshart, Tata Mc Graw-Hill Pvt.Ltd, 2010.
2. Printed Circuit Boards-Design, Fabrication, Assembly and Testing by Dr.R.S. Khandapur, Mc Graw-Hill Education, 2017

REFERENCES:

1. Printed Circuit Boards: Design and Technology. Bossart ,TMH, New Delhi 2008

CHAIRMAN
BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE) 24/10/25

24EC107PE	MEASUREMENTS AND INSTRUMENTATION	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Understand the fundamental concepts, significance, and classification of measurement systems.
- Familiarize with various analog and digital instruments such as ammeters, voltmeters, multimeters, and frequency meters.
- Study the working principles and applications of oscilloscopes and their special types.
- Learn about different signal generators and bridge circuits used for measurement of electrical quantities.
- Acquire knowledge of data acquisition systems and virtual instrumentation using LabVIEW

UNIT I INTRODUCTION TO MEASURING INSTRUMENTS 9

introduction, Significance of measurements, methods of measurements, instruments and measurement systems, Functions of instruments and measurement systems, Applications of measurement systems. Measurement Errors: Introduction Gross errors and systematic errors, Absolute and relative errors, basic concepts of accuracy, Precision, Resolution and Significant figures, Measurement error combinations.

UNIT II AMMETERS, VOLTMETER AND MULTIMETERS 9

A). Ammeters, Voltmeter and Multimeters: Introduction, DC ammeter principle only, DC voltmeter, Multi-range voltmeter, Extending voltmeter ranges, Loading, Peak responding and True RMS voltmeters. (relevant problems) B). Digital Voltmeters: Introduction, Ramp type, Dual slope integrating type (V–T), integrating type (V–F) and Successive approximation type (relevant problems). Digital Instruments: Introduction, Block diagram of a Basic Digital Multi meter. Digital frequency meters: Basic circuit of a Digital frequency meter, Basic circuit for frequency measurement.

UNIT III OSCILLOSCOPES 9

Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch. B).Special Oscilloscopes: Delayed time-base oscilloscopes: Need for a time delay & delayed-time base system. Analog storage oscilloscopes: Need for trace storage, bistable storage CRT, Variable persistence storage CRT. Digital storage oscilloscopes: Basic DSO operation only.

UNIT IV SIGNAL GENERATORS 9

A). Signal Generators : Introduction. Fixed and variable AF oscillator, Standard signal generator, Modern laboratory signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator. B). Bridge Circuits for Measurement of R, L & C: DC bridges:

CHAIRMAN
BoS (ECE)
24/10/25

Introduction, Wheatstone's bridge, Kelvin Bridge AC bridges: Capacitance Comparison Bridge, inductance Comparison Bridge, Maxwell's bridge, Schering Bridge. (relevant problems).

UNIT V DATA ACQUISITION & LABVIEW **9**

A/D converters: Types, resolution, dynamic range, accuracy, sampling concepts and techniques. A/D boards - D/A converters: Types, D/A boards - Digital I/O boards - Counter/Timer I/O boards. Virtual Instrumentation: Components of LabView - Front panel - LOOP Behaviour and inter loop communication - Block diagram - SubVI- DAQ cards and accessories-Data Acquisition with LabVIEW.

TOTAL :45 PERIODS

OUTCOMES:

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

- Explain the significance, functions, and classification of instruments and measurement systems, including error analysis.
- Analyze the operation and characteristics of analog and digital measuring instruments such as ammeters, voltmeters, multimeters, and frequency meters.
- Illustrate the construction and working principles of cathode-ray oscilloscopes and distinguish between analog and digital storage oscilloscopes.
- Evaluate the performance of various signal generators and bridge circuits for measurement of R, L, and C parameters.
- Design and implement basic data acquisition systems using A/D and D/A converters and perform virtual measurements through LabVIEW.

TEXT BOOK:

1.David A. Bell, "Electronic Instrumentation and Measurements", 3rd Edition, Oxford university press, New Delhi, 2013.

2.Cooper W.D and Helfrick A.D, "Modern Electronic Instrumentation and Measurement Techniques", 4th Edition, Pearson India Education, 2015.

REFERENCES:

1.H.S. Kalsi, "Electronic Instrumentation", 3rd Edition, Mc-Graw Hill education, 2015.

2. A.K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai Publications, 2012.

CHAIRMAN
BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

CHAIRMAN
BoS (ECE)
24/10/25

24EC108PE	ENCLOSURE DESIGN OF ELECTRONICS EQUIPMENT (COMMON TO BME AND ECE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Introduce the fundamentals of industrial and product design, including creativity, product conceptualization, and visualization tools.
- Explain the role of packaging and enclosures in product functionality and aesthetics, including prototype mock-ups and simulation.
- amiliarize students with development and fabrication tools used for designing and prototyping products using CAD and 3D printing.
- Develop an understanding of I/O interface design, connector types, ergonomic considerations, and integration processes.
- Equip students with the skills to create manufacturing documentation, detailing, and specifications for production and scale-up.

UNIT I INTRODUCTION **9**

Introduction to Products, Industrial Design and Product design, Types of products ID as per ICSID and WIPO-Creativity in Product Design, Needs vs features, Product conceptualization -Sketching basics, sketching as a design tool, Using illustration software.

UNIT II PACKAGING AND ENCLOSURES **9**

Role of packaging and enclosures, Use of IP approved sets, Design of Purpose built enclosures-Physical simulation of a small system, Basics of building a prototype mock up. Skills and specification in alternate materials -Use of off the shelf electronics system, Gumstix, Beagle, Rasberry Pi, Arduino, Kit application. Adaption for I/O.

UNIT III DEVELOPMENT TOOLS **9**

Development of Enclosures with Laser tools, Use of Flat plastics, Product specific Enclosure design, Application of CAD tools (Dassault, siemens, Autodesk, McNeil), Design for FDM (3d printing), Specifics of Design for Production Scale-up.

UNIT IV I/O INTERFACES **9**

Design of I/O interfaces Front panel layout and graphics Heat sink enclosures, Detailing of Built in Heat sink boxes, Connector basics, Common connectors, MIL. C connectors- Basics of ergonomic. Connection and wiring. Integration and Validation

UNIT V MANUFACTURING DOCUMENTATION **9**

Detailing and manufacturing enclosures using CAD: Detailing with CAD, Integrating Products with CAD, Product Detailing, Components CAD Physical Models, Applicability for industrial specific dealing-Sheet Metal and Plastic common details, Sourcing and logistics of hardware, Area for specification-Sample of Simple Organic Shapes.

TOTAL: 45 PERIODS

CHAIRMAN
BOS/ECE 24/10/25

OUTCOMES:

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

- Explain the fundamentals of industrial and product design, and apply creativity in product conceptualization using sketching and design tools.
- Demonstrate knowledge of packaging and enclosure design, and build basic physical prototypes using standard platforms and materials.
- Use CAD and rapid prototyping tools (e.g., Dassault, Siemens, Autodesk) to design enclosures and prepare products for production scale-up.
- Design I/O interfaces, connectors, and heat-sink enclosures, ensuring ergonomic and functional integration in product layouts.
- Prepare detailed manufacturing documentation, component CAD models, and specifications for sheet-metal or plastic enclosure production

TEXT BOOK:

1. Prof. N. V. Chalapathi Rao, "Enclosure design of Electronics Equipment", IISC, Bangalore.
2. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development, 7th Edition, McGraw Hill Education, 2020.

REFERENCES:

1. Kevin Otto and Kristin Wood, Product Design: Techniques in Reverse Engineering and New Product Development, Pearson Education, 2001.
2. Geoffrey Boothroyd, Peter Dewhurst, and Winston A. Knight, Product Design for Manufacture and Assembly, 3rd Edition, CRC Press, 2011.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BOS/ECE

24EC201PE	DIGITAL IMAGE PROCESSING	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamentals of digital image formation, sampling, and quantization processes.
- Explain various image transforms and their significance in real-world applications such as image compression, medical imaging, and pattern recognition.
- Develop understanding of image enhancement and restoration techniques in both spatial and frequency domains.
- Analyze segmentation and morphological processing methods for object detection and recognition.
- Familiarize students with image compression methods and international standards used in storage and transmission of visual data.

UNIT I DIGITAL IMAGE FUNDAMENTALS **9**

Digital Image -Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sampling and Quantization – Basic relationship between pixels - Color image fundamentals - RGB and HSI models

UNIT II IMAGE TRANSFORMS **9**

Need for Transform- DFT- Properties of DFT- Separability, Translation, Periodicity, Rotation, Average Value - DCT - DST – Walsh Transform – Hadamard Transform - Fast image coding and real-time embedded image systems- Haar Transform, object detection - Slant Transform- Wavelet transform

UNIT III IMAGE ENHANCEMENT **9**

Spatial Domain: Gray level transformations – Histogram equalization – Basics of Spatial Filtering- Smoothing and Sharpening Spatial Filtering. Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters- Ideal, Butterworth and Gaussian filters- Homomorphic Filtering

UNIT IV IMAGE RESTORATION AND SEGMENTATION **9**

Restoration: Degradation Model -Noise models – Mean Filters – Order Statistics filters – Inverse Filtering – Wiener Filtering, Segmentation: Point, Line and Edge Detection– Region based segmentation: Region growing - Region splitting and merging- Thresholding- Morphological processing: Erosion and dilation.

UNIT V . IMAGE COMPRESSION **9**

Need for data compression- Image Compression model – Lossless Compression: Huffman Coding - Arithmetic Coding – Bit-Plane Coding – Run Length Encoding- Lossy Compression: Lossy Predictive Coding – Compression Standards: JPEG and MPEG.

TOTAL: 45 PERIODS

CHAIRMAN
BoS/ECE
24/10/25

OUTCOMES:

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

- Explain the fundamentals of digital image formation, sampling, quantization, and color models.
- Apply various image transforms (DFT, DCT, Wavelet, Hadamard, Haar) to analyze and process images for real-world applications such as compression and feature extraction.
- Analyze image enhancement and restoration techniques in both spatial and frequency domains.
- Apply segmentation and morphological operations for object detection, feature recognition, and classification.
- Evaluate image compression techniques and standards (JPEG, MPEG) for efficient image storage and transmission.

TEXT BOOKS:

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Pearson, 4th Edition, 2018.
2. Anil K Jain, "Fundamentals of Digital Image Processing", Pearson, 2006.

REFERENCES:

1. Jayaraman S, Esakkirajan S & Veerakumar T, "Digital Image Processing", 2nd Edition, Tata McGraw Hill, New Delhi, 2019.
2. Kenneth R Castleman, "Digital Image Processing", Pearson, 2006.
3. William K Pratt, " Digital Image Processing", 4th edition John Wiley, New York, 2007
4. Sridhar.S, "Digital Image Processing", Oxford University Press, 2nd Edition – 2016.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS/ECE

24EC202PE	DSP PROCESSORS AND ARCHITECTURES	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the architecture, features, and functionalities of programmable digital signal processors.
- Provide knowledge on implementation issues such as fixed-point/floating-point arithmetic, quantization, overflow handling, and real-time constraints.
- Familiarize students with the architecture, instruction set, and pipelining of fixed-point DSP processors (TMS320C54x).
- Expose students to the architecture and programming of floating-point DSP processors (TMS320C67x).
- Demonstrate practical applications of DSPs in real-time systems including filtering, transforms, communication, control, and healthcare technologies.

UNIT I INTRODUCTION TO DIGITAL SIGNAL PROCESSORS **9**

Programmable DSP Processors (P-DSPs), Multiplier and Multiplier Accumulator (MAC), modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, VLIW architecture, Pipelining, Special addressing modes in P-DSPs, On-chip peripherals.

UNIT II IMPLEMENTATION CONSIDERATIONS **9**

Fixed-point & floating-point numbers and arithmetic, Quantization, Overflow and solutions, Rounding and truncation, Real-time Implementation Considerations: Signal converters, Stream processing, Block processing, Vector processing; Hardware Interfacing: External memory interfacing, Serial & parallel port interfacing, Host-port interfacing, Multiprocessing techniques.

UNIT III FIXED POINT DIGITAL SIGNAL PROCESSORS **9**

Introduction to TMS320C54x, Bus structure, Central Arithmetic Logic Unit (CALU), Auxiliary Register ALU (ARALU), Index register, Block Move Address register, Block Repeat registers, Assembler directives; Architecture overview, CPU, Addressing modes, Instruction set: Addition/Subtraction instructions, Load/Store instructions, Move instructions, Multiplication instructions, NORM and Program control instructions; pipelining in C54x processor.

UNIT IV FLOATING POINT DIGITAL SIGNAL PROCESSORS **9**

Introduction to TMS320C67x, Bus Structure, Central ALU, Auxiliary Register ALU, Index Register, Auxiliary Register ALU, Block Move Address Register, Block repeat registers, parallel logic unit, memory-mapped registers, program controller, flags in status register, on-chip memory, on-chip peripherals, Assembly Language Syntax, Addressing Modes and instructions, pipelining in C67x processor.

UNIT V APPLICATIONS OF DIGITAL SIGNAL PROCESSORS **9**

FIR and IIR filtering applications, Adaptive filtering, FFT, Discrete Cosine Transform (DCT) and Other transforms; Real-time applications in Automation and Process control, Communication and telecom, Health tech, Consumer and Portable electronics.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)

24/10/25

OUTCOMES:

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

- Explain the architecture, memory organization, and addressing modes of programmable DSP processors.
- Analyze implementation considerations such as quantization effects, overflow, and real-time processing requirements.
- Develop assembly-level programs for fixed-point DSP processors and utilize pipelining for performance optimization.
- Demonstrate the use of floating-point DSP processors and apply their instruction sets for efficient computations.
- Apply DSP processors to real-world applications such as filtering, FFT/DCT, adaptive filtering, communication, and automation systems.

TEXT BOOKS:

1. Sen M. Kuo and Woon-Seng S. Gan, Digital Signal Processors: Architectures, Implementations and Applications, Pearson Education, 2005.

REFERENCES:

1. Lapsley et al., DSP Processor Fundamentals, Architectures & Features, S. Chand & Co, 2000
2. B. Venkata Ramani and M. Bhaskar, Digital Signal Processors. Architecture, Programming and Applications, TMH, 2004

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

CSE

24CS104PE	IMAGE AND VIDEO ANALYTICS (Common to CSE & ECE)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Explain the basics of image processing techniques for computer vision.
- Apply image pre-processing techniques for enhancing visual data.
- Analyze different object detection techniques and compare their effectiveness.
- Evaluate object recognition mechanisms for accuracy and performance.
- Design and develop solutions using video analytics techniques.

UNIT I INTRODUCTION 9

Computer Vision - Image representation and image analysis tasks - Image representations - digitization - properties - colour images - Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.

UNIT II IMAGE PRE-PROCESSING 9

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multi - speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.

UNIT III OBJECT DETECTION USING MACHINE LEARNING 9

Object detection - Object detection methods - Deep Learning framework for Object detection– bounding box approach - Intersection over Union (IoU) - Deep Learning Architectures - R-CNN - Faster R-CNN - You Only Look Once (YOLO)-Salient features - Loss Functions - YOLO architectures.

UNITIV FACE RECOGNITION AND GESTURE RECOGNITION 9

Face Recognition – Introduction - Applications of Face Recognition-Process of Face Recognition DeepFace solution by Facebook - FaceNet for Face Recognition - Implementation using FaceNetGesture Recognition.

UNIT V VIDEO ANALYTICS 9

Video Processing - use cases of video analytics - Vanishing Gradient and exploding gradient problem - RestNet architecture - RestNet and skip connections-Inception Network - GoogleNet architecture - Improvement in Inception v2 - Video analytics - RestNet and Inception v3.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CSE) 23/10/25

OUTCOMES:

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

- Explain the basics of image processing techniques for computer vision and video analysis.
- Apply techniques for image pre-processing to enhance visual data quality.
- Develop and implement object detection techniques.
- Analyze face recognition mechanisms and their effectiveness.
- Design and evaluate deep learning-based video analytics solutions.

TEXT BOOKs:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4th Edition, Thomson Learning, 2013.
2. Vaibhav Verdhan, "Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras", Apress 2021. (UNIT-III, IV and V)

REFERENCES:

1. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited, 2011.
3. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.
4. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.

COs - POs Mapping

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

CHAIRMAN
BoS (CSE)

24EC204PE	SPEECH PROCESSING	L T P C 2 0 2 3

OBJECTIVES:

The Student should be made to:

- Study the fundamentals of speech production, speech signal characteristics, and the human auditory system.
- Analyze and extract key speech features such as pitch, formants, MFCCs, and LPCs for various speech processing applications.
- Understand and evaluate different speech coding and compression techniques including waveform and parametric coders.
- Design and implement speech enhancement techniques to improve the quality and intelligibility of noisy speech signals.
- Develop and explore systems for text-to-speech synthesis and automatic speech recognition.

UNIT I FUNDAMENTALS OF SPEECH **9**

The Human speech production mechanism, Discrete-Time model of speech production, Speech perception - human auditory system, Phonetics - articulatory phonetics, acoustic phonetics, and auditory phonetics, Categorization of speech sounds, Spectrographic analysis of speech sounds, Pitch frequency, Pitch period measurement using spectral and cepstral domain, Formants, Evaluation of Formants for voiced and unvoiced speech.

UNIT II SPEECH FEATURES AND DISTORTION MEASURES **9**

Significance of speech features in speech-based applications, Speech Features – Cepstral Coefficients, Mel Frequency Cepstral Coefficients (MFCCs), Perceptual Linear Prediction (PLP), Log Frequency Power Coefficients (LFPCs), Speech distortion measures–Simplified distance measure, LPC-based distance measure, Spectral distortion measure, Perceptual distortion measure.

UNIT III SPEECH CODING **9**

Need for speech coding, Waveform coding of speech – PCM, Adaptive PCM, DPCM, ADPCM, Delta Modulation, Adaptive Delta Modulation, G.726 Standard for ADPCM, Parametric Speech Coding – Channel Vocoders, Linear Prediction Based Vocoders, Code Excited Linear Prediction (CELP) based Vocoders, Sinusoidal speech coding techniques, Hybrid coder, Transform domain coding of speech.

UNIT IV SPEECH ENHANCEMENT **9**

Classes of Speech Enhancement Algorithms, Spectral-Subtractive Algorithms – Multiband Spectral Subtraction, MMSE Spectral Subtraction Algorithm, Spectral Subtraction Based on Perceptual Properties, Wiener Filtering - Wiener Filters in the Time Domain, Wiener Filters in the Frequency Domain, Wiener Filters for Noise Reduction, Maximum-Likelihood Estimators, Bayesian Estimators, MMSE and Log-MMSE Estimator, Subspace Algorithms.

CHAIRMAN
BoS (ECE) 24/10/25

UNIT V SPEECH SYNTHESIS AND APPLICATION 9

A Text-to-Speech systems (TTS), Synthesizers technologies – Concatenative synthesis, Use of Formants for concatenative synthesis, Use of LPC for concatenative synthesis, HMM-based synthesis, Sinewave synthesis, Speech transformations, Watermarking for authentication of a speech, Emotion recognition from speech.

TOTAL: 30 PERIODS

PRACTICAL EXERCISES: **TOTAL: 30 PERIODS**

1. Write a MATLAB Program to classify voiced and unvoiced segment of speech using various time domain measures
2. Write a MATLAB Program to calculate the MFCC for a speech signal
3. Implement Speech encoder in MATLAB
4. Write a MATLAB Program to implement Wiener Filters for Noise Reduction
5. Design a speech emotion recognition system using DCT and WPT in MATLAB

HARDWARE & SOFTWARE SUPPORT TOOLS:

- Personal Computer with MATLAB
- Microphone and Speakers

TOTAL: 60 PERIODS

OUTCOMES:

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

- Understand the fundamentals of human speech production and perception mechanisms
- Analyze time and frequency domain features of speech signals
- Extract and interpret speech features such as pitch, formants, LPC, and MFCC
- Evaluate various speech coding and compression techniques for efficient storage
- Design and implement basic speech processing applications like enhancement, TTS

TEXT BOOKS:

1. Shaila D. Apte, Speech and Audio Processing, Wiley India (P) Ltd, New Delhi, 2012
2. Philipos C. Loizou, Speech Enhancement Theory and Practice, Second Edition, CRC Press, Inc., United States, 2013

REFERENCES:

1. Rabiner L. R. and Juang B. H, Fundamentals of speech recognition, Pearson Education, 2003
2. Thomas F. Quatieri, Discrete-time speech signal processing - Principles and practice, Pearson, 2012

CHAIRMAN
BoS (ECE)

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)
24/10/25

24EC205PE	SOFTWARE DEFINED RADIO	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamentals of Software Defined Radio and its evolution from traditional radio systems.
- Explore various hardware and software architectures used in SDR systems.
- Understand signal processing techniques for SDR, including modulation/demodulation, filtering, and channel coding.
- Provide practical exposure to SDR platforms like GNU Radio, USRP, and MATLAB/Simulink.
- Examine applications of SDR in modern communication systems such as cognitive radio, 5G, and satellite communication.

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO **9**

Definition and evolution of SDR – Traditional vs. Software radios – SDR architecture – Benefits and challenges – Analog-to-digital and digital-to-analog conversion – Software and hardware components – Overview of DSP in SDR – Reconfigurability and flexibility in radio design.

UNIT II SDR ARCHITECTURE AND HARDWARE PLATFORMS **9**

Transceiver architecture – RF front-end and data converters – Intermediate frequency processing – Baseband processing – SDR hardware platforms: USRP, RTL-SDR, HackRF – Embedded platforms: Raspberry Pi, FPGA-based systems – Role of ADC/DAC, mixers, filters – Performance trade-offs in SDR hardware.

UNIT III SIGNAL PROCESSING IN SDR **9**

Modulation and demodulation schemes – Filtering techniques – Sampling, decimation, interpolation – Channel coding: convolutional codes, LDPC – Timing and carrier synchronization – Spectrum sensing – Digital up conversion/down conversion – Real-time signal processing.

UNIT IV SDR SOFTWARE TOOLS AND PROGRAMMING **9**

Introduction to GNU Radio – Software frameworks and flow graphs – SDR programming in Python and C++ – Signal source/sink blocks – Using USRP with GNU Radio – MATLAB/Simulink for SDR – Interface to hardware – Implementation of modulation/demodulation using software tools.

UNIT V ADVANCED SDR APPLICATIONS **9**

Cognitive Radio: concept, spectrum holes, dynamic spectrum access – SDR in 5G and LTE – Military and satellite communication systems – SDR in IoT and wireless sensor networks – Security in SDR – Case studies: Voice communication, spectrum analyzer, simple radio receiver using SDR platform.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Explain the fundamentals and architecture of software defined radios
- Identify and analyze SDR hardware platforms and their components
- Apply signal processing techniques in the context of SDR-based communication
- Develop and test SDR applications using tools like GNU Radio and MATLAB
- Evaluate the role of SDR in modern wireless systems like cognitive radio and 5G

TEXT BOOKS:

1. C. Richard Johnson, William A. Sethares, Andrew G. Klein, Software Defined Radio: A Signal Processing Perspective, Cambridge University Press, 2011.
2. Tranter, Jeffrey H. Reed, Software Radio: A Modern Approach to Radio Engineering, Pearson Education, 2002.

REFERENCES:

1. Alexander M. Wyglinski, Di Pu, Thomas W. Rondeau, Digital Signal Processing with Field Programmable Gate Arrays, Springer, 2017.
2. Bruce A. Fette, Cognitive Radio Technology, Academic Press, 2009.
3. GNU Radio Documentation and Tutorials: https://wiki.gnuradio.org
4. Ettus Research Application Notes: https://kb.ettus.com

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

CHAIRMAN
BoS (ECE)

24EC206PE	DIGITAL AUDIO PROCESSING	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the basic principles of audio signal acquisition and digital audio representation.
- Analyze various time-domain and frequency-domain characteristics of audio signals.
- Explore feature extraction techniques specific to speech and music signals.
- Understand and apply audio compression, enhancement, and coding techniques.
- Provide hands-on exposure in building real-time audio applications using suitable tools and platforms.

UNIT I FUNDAMENTALS OF AUDIO SIGNALS **9**

Introduction to audio signals – Characteristics and types of audio signals: speech, music, noise – Microphones and audio sensors – Sampling, quantization, and digitization of audio – Perception of sound: loudness, pitch, and timbre – Mono and stereo audio – Basic signal operations.

UNIT II TIME AND FREQUENCY DOMAIN ANALYSIS **9**

Time-domain analysis: energy, zero-crossing rate, auto-correlation – Short-time energy and pitch estimation – Frequency-domain analysis: Fourier Transform, STFT – Spectrogram – Mel and Bark scales – Cepstrum and MFCCs – Audio visualization techniques.

UNIT III AUDIO FEATURE EXTRACTION AND CLASSIFICATION **9**

Audio descriptors: temporal, spectral, perceptual features – Feature extraction for speech and music – Voice activity detection (VAD) – Onset detection – Audio fingerprinting – Classifiers: k-NN, SVM, GMM, HMM – Audio event detection – Music genre and instrument classification.

UNIT IV AUDIO ENHANCEMENT AND CODING **9**

Audio denoising – Noise reduction techniques: spectral subtraction, Wiener filtering – Echo cancellation – Audio compression standards: MP3, AAC, Opus – Psychoacoustic models – Audio watermarking and encryption – Evaluation metrics: SNR, PESQ, STOI.

UNIT V MACHINE LEARNING & DEEP LEARNING IN VISION **9**

Text-to-Speech (TTS) and Speech-to-Text (STT) systems – Audio synthesis – Assistive listening systems – Smart audio assistants (e.g., Alexa, Siri) – Real-time audio streaming – Tools and platforms: MATLAB, Python (Librosa, PyDub), Audacity – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the fundamental principles of audio signal processing and perception
- Analyze and visualize audio signals in both time and frequency domains
- Extract and interpret features for various audio classification tasks
- Evaluate and implement audio enhancement and compression techniques
- Develop basic audio-based applications using standard tools and frameworks

CHAIRMAN
BoS (ECE)
24/10/25

TEXT BOOKS:

1. Zölzer, Udo, Digital Audio Signal Processing, Wiley, 2nd Edition, 2022.
2. T. Painter and A. Spanias, Perceptual Coding of Digital Audio, Wiley-IEEE Press, 2007.

REFERENCES:

1. B. Gold, N. Morgan, D. Ellis, Speech and Audio Signal Processing, Wiley, 2011.
2. Julius O. Smith, Introduction to Digital Filters with Audio Applications, W3K Publishing, 2007.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC207PE **MACHINE LEARNING FOR IMAGE ANALYSIS** **L T P C**
3 0 0 3

OBJECTIVES:

The Students Should be made to

- Explain the basic concepts of digital image processing and image features.
- Apply supervised and unsupervised machine learning algorithms for image analysis tasks.
- Design and implement deep learning models for image classification and object detection.
- Evaluate the performance of ML models using appropriate metrics.
- Develop and deploy ML pipelines for real-world image analysis applications.

UNIT I INTRODUCTION TO IMAGE ANALYSIS AND MACHINE LEARNING **9**

Overview of digital image processing and computer vision- Image representation and color models -Features and descriptors: edges, corners, textures, and shapes-Overview of machine learning paradigms: supervised, unsupervised, reinforcement-Image datasets and preprocessing (normalization, augmentation)

UNIT II SUPERVISED LEARNING FOR IMAGE ANALYSIS **9**

Classification concepts: k-NN, SVM, Decision Trees, Random Forests-Feature selection and dimensionality reduction (PCA, LDA)-Image classification pipeline design-Evaluation metrics: accuracy, precision, recall, F1-score, ROC

UNIT III UNSUPERVISED AND STATISTICAL METHODS **9**

Clustering methods: k-Means, Mean-Shift, DBSCAN for image segmentation- Gaussian Mixture Models (GMMs) and Expectation Maximization-Image segmentation using clustering and thresholding- Anomaly and defect detection in images

UNIT IV DEEP LEARNING FOR IMAGE UNDERSTANDING **9**

Introduction to Neural Networks and Convolutional Neural Networks (CNNs)- CNN architectures: LeNet, AlexNet, VGG, ResNet, Inception-Transfer learning and fine-tuning pretrained models-Object detection: R-CNN, YOLO, SSD- Semantic segmentation: U-Net, SegNet

UNIT V APPLICATIONS AND EMERGING AREAS **9**

Medical image analysis-Remote sensing and satellite image analysis-Face recognition and biometrics-Scene understanding and autonomous vision systems-Explainable AI and ethical considerations in visual ML systems

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

TEXT BOOKS:

1. Bishop, C. M., *Pattern Recognition and Machine Learning*, Springer, 2006.
2. Goodfellow, I., Bengio, Y., and Courville, A., *Deep Learning*, MIT Press, 2016.
3. Gonzalez, R. C., and Woods, R. E., *Digital Image Processing*, Pearson Education, 4th Ed., 2018.

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2nd Ed., 2022.
2. Simon J.D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly Media, 3rd Ed., 2023.
4. Adrian Rosebrock, Deep Learning for Computer Vision, PyImageSearch, 2019.

OUTCOMES:

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

- Explain the basic concepts of digital image processing and image features.
- Apply supervised and unsupervised machine learning algorithms for image analysis tasks.
- Design and implement deep learning models for image classification and object detection.
- Evaluate the performance of ML models using appropriate metrics.
- Develop and deploy ML pipelines for real-world image analysis applications.

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

CHAIRMAN
BoS (ECE)

24EC208PE	SIGNAL PROCESSING FOR MM WAVE COMMUNICATION FOR 5G AND BEYOND	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the propagation characteristics of wireless channels using ray tracing and mmWave models.
- Analyze channel statistics, angle parameters, and channel gain.
- Introduce the fundamentals of antenna arrays and beamforming in mmWave communication.
- Explore hybrid beamforming in MIMO systems and parameter optimization.
- Discuss MIMO-OFDM integration with mmWave systems and analyze system impairments.

UNIT I WIRELESS CHANNEL MODELING 9

Overview of wireless communication system and modem structure – Ray tracing-based channel modeling – Large-scale and small-scale propagation – Narrowband and broadband channel characteristics – Delay spread, coherence bandwidth, and time-frequency duality – Introduction to mmWave frequency bands.

UNIT II ANGULAR PARAMETERS AND CHANNEL GAIN 9

Angle of Arrival (AoA) and Angle of Departure (AoD) – Physical interpretation of angular spreads – Channel gain modeling and path loss in mmWave – Spatial correlation and fading – Impact of angular statistics on signal processing.

UNIT III ANTENNA ARRAYS AND BEAMFORMING CONCEPTS 9

Single antenna beamforming – Array signal processing principles – Antenna manifold vectors – Beam pattern parameters: main lobe, side lobes, beamwidth, gain – Efficiency of beam patterns – Trade-offs in mmWave antenna design.

UNIT IV HYBRID BEAMFORMING IN MIMO SYSTEMS 9

Hybrid beamforming architecture – Analog and digital beamforming – Precoder and equalizer design – Use of phase shifters – Beam steering and tracking – MIMO system structure – Design optimization for hybrid beamforming – Impact on throughput and energy efficiency.

UNIT V SYSTEM INTEGRATION AND PERFORMANCE ANALYSIS 9

MIMO-OFDM with mmWave beamforming – Channel estimation: Linear Minimum Mean Square Error (LMMSE) – Impact of impairments in mmWave systems – Quantization, phase noise, hardware non-idealities – Case studies and performance evaluations of practical mmWave systems.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE) 24/10/25

OUTCOMES:

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

- Understand the principles of image formation, filtering, and edge detection
- Apply feature extraction and matching techniques for image analysis
- Analyze 3D scene geometry using multiple views and reconstruct spatial layouts
- Evaluate object detection and recognition algorithms using traditional and deep models
- Design machine learning-based computer vision systems using standard toolkits

TEXT BOOKS:

1. Rappaport, T. S., Wireless Communications: Principles and Practice, Pearson Education, 2nd Edition, 2010.
2. Rohde & Schwarz, mmWave Beamforming: Antenna Array Design and Applications, Technical Whitepapers, 2020.

REFERENCES:

1. T. S. Rappaport et al., "Millimeter Wave Wireless Communications", Pearson, 2014.
2. Heath, Robert W., Foundations of MIMO Communication, Cambridge University Press, 2018.
3. NPTEL lectures from course NOC25_EE161 (https://nptel.ac.in)

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

CHAIRMAN
BoS (ECE)

24BM406PE	ASSISTIVE TECHNOLOGY (Common to BME, ECE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Analyze the principles, operation, and clinical relevance of major biomedical assist devices
- Evaluate technological innovations in cardiac, renal, auditory, and prosthetic systems for improved patient outcomes
- Integrate clinical engineering practices, safety standards, and regulatory guidelines into medical device usage
- Design and propose advanced assistive solutions using emerging biomedical technologies
- Critically assess the role of assistive devices in multidisciplinary healthcare and rehabilitation

UNIT I CARDIAC ASSIST DEVICES 9

Cardiac functions and parameters, principle of External counter pulsation techniques, intra-aortic balloon pump, Auxiliary ventricle and schematic for temporary bypass of left ventricle, prosthetic heart valves, cardiac pacemaker, ventricular assist devices (VADs) and total artificial hearts (TAH), implantable cardioverter defibrillators (ICDs)

UNIT II HEMODIALYSERS 9

Physiology of kidney, Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyzer monitoring and functional parameters, hemodiafiltration, wearable artificial kidney (WAK), infection control protocols in dialysis units

UNIT III HEARING AIDS 9

Anatomy of ear, Common tests – audiograms, air conduction, bone conduction, masking techniques, SISI, Hearing aids – principles, drawbacks in the conventional unit. DSP based hearing aids, wireless and Bluetooth-enabled hearing aids, bone-anchored hearing systems (BAHS)

UNIT IV PROSTHETIC AND ORTHODIC DEVICES 9

Hand and arm replacement – different types of models, externally powered limb prosthesis, feedback in orthotic system, functional electrical stimulation, sensory assist devices, myoelectric control systems, powered exoskeletons.

UNIT V RECENT TRENDS 9

Transcutaneous electrical nerve stimulator, bio-feedback, assistive devices in drug delivery, neuroprosthetics and brain–computer interface (BCI) applications, robotic rehabilitation systems.

TOTAL: 45 PERIODS

Chairman
BoS/BME

OUTCOMES:

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

- Demonstrate in-depth understanding of the working principles and clinical applications of assistive biomedical devices
- Apply safety protocols, performance evaluation methods, and maintenance strategies for medical equipment
- Compare and contrast conventional and advanced assistive technologies in terms of efficiency and patient adaptability
- Integrate multidisciplinary knowledge to suggest appropriate device solutions for specific clinical scenarios
- Assess recent trends and innovations for potential adoption in healthcare and rehabilitation practice

TEXT BOOKS:

1. Joseph D. Bronzino, "The Biomedical Engineering Handbook", 3rd Edition, Three Volume Set, CRC Press, 2006.
2. Marion. A. Hersh, Michael A. Johnson, "Assistive Technology for visually impaired and blind", Springer Science & Business Media, 1st edition, 2010.
3. Yadin David, Wolf W. von Maltzahn, Michael R. Neuman, Joseph.D, Bronzino, "Clinical Engineering", CRC Press, 1st edition, 2010.

REFEENCES:

1. Kenneth J. Turner, "Advances in Home Care Technologies: Results of the match Project", Springer, 1st Edition, 2011.
2. Gerr M. Craddock, "Assistive Technology-Shaping the future", IOS Press, 1st Edition, 2003.
3. Matthew Dipaola, "3D Printing in Orthopaedic Surgery", Elsevier, 2019.
4. Daniel Goldstein, Mehmet Oz, "Cardiac Assist Devices", Wiley-Blackwell 2000.

Mapping of COs with POs and PSOs

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

Chairman
BoS/BME

24BM501	DIAGNOSTIC AND THERAPEUTIC EQUIPMENT (Common to BME and ECE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the principles and applications of cardiac diagnostic and therapeutic equipment
- Explain the functioning and clinical relevance of neurological instrumentation
- Describe muscular measurement systems and electrotherapy devices used in rehabilitation and diagnostics
- Analyze respiratory measurement systems and ventilator technologies
- Evaluate sensory measurement instruments and oximetry techniques for physiological monitoring

UNIT I CARDIAC EQUIPMENT 9

Electrocardiograph, Normal and Abnormal Waves, Cardiac monitor, Arrhythmia monitor, Holter Monitor, Phonocardiography, ECG machine maintenance, ECG faults and troubleshooting, Cardiac Pacemaker-Internal and External Pacemaker - Batteries, AC and DC Defibrillator - Internal and External, cardiac catheterization, Heart lung machine.

UNIT II NEUROLOGICAL EQUIPMENT 9

Clinical significance of EEG, Multi-channel EEG recording system, Epilepsy, Evoked Potential - Visual, Auditory and Somatosensory, MEG (Magneto Encephalograph), EEG Bio Feedback Instrumentation, EEG system maintenance and troubleshooting, EEG Telemetry.

UNIT III MUSCULAR MEASUREMENTS AND ELECTROTHERAPY EQUIPMENT 9

Recording and analysis of EMG, Muscle stimulators, Nerve stimulators, Nerve conduction velocity measurement, short wave and microwave diathermy, ultrasonic therapy unit, electro-diagnostic therapeutic stimulator. TENS, spinal cord stimulator and bladder stimulator.

UNIT IV RESPIRATORY MEASUREMENT SYSTEM 9

Lung Volume and Vital capacity, Instrumentation for measuring the mechanics of breathing – Spirometer, Measurements of residual volume, Whole body Plethysmograph, Intra-Alveolar and Thoracic pressure measurements, Airway resistance measurement, Pneumotachometer, Inhalators, Types of Ventilators - Pressure, Volume and Time controlled, Humidifiers, Nebulizers and Aspirators.

UNIT V SENSORY MEASUREMENT AND OXIMETERS 9

Psychophysiological Measurements -polygraph, Basal Skin Resistance (BSR), Galvanic Skin Resistance (GSR). Instrumentation for Sensory measurements – Audiometer - Pure tone, Speech, Eye Tonometer, Applanation Tonometer. Oximeters – in vitro oximetry and in vivo oximetry.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Describe the function and maintenance of cardiac equipment.
- Explain the clinical use of EEG and neurological instruments
- Apply electrotherapy techniques using muscular measurement devices
- Analyze respiratory systems and ventilator operations
- Evaluate sensory instruments and oximeters for diagnostic accuracy

Chairman
Bos/BME

TEXT BOOKS:

1. John G Webster, "Medical Instrumentation Application and Design", Fourth Edition, Wiley India Pvt Ltd, New Delhi, 2015.

2. Joseph J Carr and John M Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2012.

REFERENCES:

1. Myer Kutz, "Standard Handbook of Biomedical Engineering and Design", McGraw Hill, 2003.

2. Geddes LA and Baker LE, "Principles of Applied Biomedical Instrumentation", Fourth Edition, A Wiley-Interscience Publication, 2008.

3. Lelie Cromwell, "Biomedical Instrumentation and Measurement, Pearson Education, New Delhi, 2007

4. Antony YK Chan, "Biomedical Device Technology, Principles and design", Charles Thomas Publisher Ltd, Illionois, USA, 2008.

5. Brown B H, Smallwood RH, Barber DC, Lawford PV and Hose D R, "Medical Physics and Biomedical Engineering", Second Edition, IOP Publishers, 2001.

Mapping of COs with POs

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

Chairman
Bos/BME

24BM505PE	BRAIN COMPUTER INTERFACE AND ITS APPLICATIONS (Common to BME and ECE)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand types of BCI, principles and its applications which are present in the State of art in the Neurosciences domain
- Illustrate the various control signals used in BCI
- Demonstrate the signal processing methods used in BCI
- Assess the various machine learning methods of BCI
- Learn the various applications of BCI

UNIT I INTRODUCTION 9

Introduction - Brain structure and function, Brain Computer Interface Types - Synchronous and Asynchronous -Invasive BCI -Partially Invasive BCI - Non-Invasive BCI, Structure of BCI System, BCI Monitoring Hardware, EEG, ECG, MEG, fMRI..

UNIT II BRAIN ACTIVATION 9

Brain activation patterns - Spikes, Oscillatory potential and ERD, Slow cortical potentials, Movement related potentials-Mu rhythms, motor imagery, Stimulus related potentials – Visual Evoked Potentials P300 and Auditory Evoked Potentials, Potentials related to cognitive tasks.

UNIT III FEATURE EXTRACTION METHODS 9

Data Processing Spike sorting, Frequency domain analysis, Wavelet analysis, Time domain analysis, Spatial filtering -Principal Component Analysis (PCA), Independent Component Analysis (ICA), Artifacts reduction, Feature Extraction - Phase synchronization and coherence

UNIT IV MACHINE LEARNING METHODS 9

Classification techniques Binary classification, Ensemble classification, Multiclass Classification, Evaluation of classification performance, Regression -Multilayer neural networks, Support vector machine, Graph theoretical functional connectivity analysis.

UNIT V APPLICATIONS 9

BCIs for Assistive Technology – BCIs for Recreation - BCIs for Cognitive Diagnostics and Augmented Cognition, Brain-Computer Interfacing and Games – Introduction - Human-Computer Interaction for BCI - BCI for Controlling and Adapting Games Case Studies - Invasive BCIs: decoding and tracking arm (hand) position, controlling prosthetic devices such as orthotic hands, Cortical control of muscles via functional electrical stimulation. Non-invasive BCIs: P300 Mind Speller, Visual cognitive BCI, Emotion detection. Ethics of Brain Computer Interfacing

TOTAL: 45 PERIODS

Chairman
BoS/BME 28/10/25

OUTCOMES:

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

- Develop an understanding towards BCI types and compare various acquisition modalities
- Identify and apply signals for BCI control
- Explore and identify appropriate feature extraction methods
- Apply suitable machine learning algorithms for BCI decision making/control
- Propose different BCI's for a variety of applications

TEXT BOOKS:

1. Rajesh P.N. Rao, Brain-Computer Interfacing: An Introduction, Cambridge University Press, 1st edition, 2013.
2. Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction, Springer, 2010.
3. Jonathan Wolpaw and Elizabeth Winter Wolpaw, Brain Computer Interfaces: Principles and practice, Oxford University Press, USA, 1st edition, 2012.

REFERENCES:

1. Ella Hassianien A and Azar A.T (Editors), Brain-Computer Interfaces Current Trends and Applications, Springer, 2015.
2. Ali Bashashati, MehrdadFatourechi, Rabab K Ward and Gary E Birch, A survey of signal Processing algorithms in brain–computer interfaces based on electrical brain signals, Journal of Neural Engineering, Vol (4), 2007, PP: 32-57.
3. Wolpaw J.R, N. Birbaumer et al, Brain control interface for Communication and control, Clinical Neurophysiology, 113, 2002

Mapping of COs with POs

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

Chairman
BoS/BME

24BM602PE	WEARABLE SYSTEMS (Common to BME and ECE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the fundamentals and components of wearable systems
- Analyze sensor technologies and power requirements for wearable devices
- Evaluate wireless health systems and Body Area Networks (BANs)
- Explore smart textile technologies and fabrication methods
- Assess real-world applications of wearable systems across domains

UNIT I INTRODUCTION TO WEARABLE SYSTEMS AND SENSORS 9

Wearable Systems- Introduction, Need for Wearable Systems, Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Types of Wearable Systems, Components of wearable Systems. Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, ECG and Heart Rate Monitoring Sensors, Impedance plethysmography, pneumography, Wearable Blood Pressure Monitoring Sensor.

UNIT II SIGNAL PROCESSING AND ENERGY HARVESTING FOR WEARABLE DEVICES 9

Wearability issues -physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, sampling frequency for reduced energy consumption, Rejection of irrelevant information. Power Requirements- Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Wireless Charging Methods, Nanogenerator-Based Energy Harvesting

UNIT III WIRELESS HEALTH SYSTEMS 9

Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture – Introduction, Energy Efficiency in BAN Systems, Interoperability and Standards in BANs, Wireless communication Techniques.

UNIT IV SMART TEXTILE 9

Introduction to smart textile- Passive smart textile, active smart textile. Fabrication Techniques- Conductive Fibres, Treated Conductive Fibres, Conductive Fabrics, Nano-Coated Textiles, Conductive Inks. Case study- smart fabric for monitoring biological parameters - ECG, respiration, Body Temperature Monitoring.

UNIT V APPLICATIONS OF WEARABLE SYSTEMS 9

Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, Remote Patient Monitoring, Rehabilitation and Physiotherapy Monitoring, Gait analysis, Sports Medicine.

TOTAL:45 PERIODS

Chairman
BoS/BME 28/10/25

OUTCOMES:

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

- Identify key types, components, and applications of wearable systems in healthcare and monitoring
- Compare different biosensors and energy harvesting methods used in wearable systems
- Assess BAN architecture, security, and interoperability challenges in wireless health monitoring
- Describe fabrication techniques and apply smart textile concepts to biological parameter monitoring
- Illustrate use cases in diagnostics, rehabilitation, sports medicine, and remote patient care

TEXT BOOKS:

1. Annalisa Bonfiglo and Danilo De Rossi, Wearable Monitoring Systems, Springer, 2011
2. Zhang and Yuan-Ting, Wearable Medical Sensors and Systems, Springer, 2013
3. Edward Sazonov and Micheal Neuman, WearableSensors: Fundamentals, Implementation and Applications, Elsevier, 2014
4. Mehmet R.Yuce and JamilY. Khan, Wireless Body Area Networks Technology, Implementation applications, Pan Stanford Publishing Pte.Ltd, Singapore, 2012

REFERENCES:

1. Sandeep K.S, Gupta, Tridib Mukherjee and Krishna Kumar Venkatasubramanian, Body Area Networks Safety, Security, and Sustainability, Cambridge University Press, 2013.
2. Guang-Zhong Yang, Body Sensor Networks, Springer, 2006.

Mapping of COs with POs

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

Chairman
BoS/BME

24BM604PE	TELEHEALTH TECHNOLOGY (Common to BME and ECE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the evolution, ethical, and legal dimensions of telemedicine
- Analyze telemedical technologies and communication infrastructure
- Evaluate standards and protocols for secure telemedical data exchange
- Apply mobile telemedicine tools for clinical data management
- Explore applications and business models of telemedicine in healthcare

UNIT I TELEMEDICINE AND HEALTH 9

History and Evolution of telemedicine, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine – Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

UNIT II TELEMEDICAL TECHNOLOGY 9

Principles of Multimedia – Text, Audio, Video, data, Data communications and networks, PSTN, POTS, ANT, ISDN, Internet, Air/ wireless communications. Communication infrastructure for telemedicine – LAN and WAN technology, Satellite communication, Mobile communication.

UNIT III TELEMEDICAL STANDARDS 9

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to be followed: DICOM, HL7, H.320 series Video Conferencing. Security and confidentiality of medical records, Cyber laws related to telemedicine.

UNIT IV MOBILE TELEMEDICINE 9

Tele radiology: Image Acquisition system, Display system, Tele pathology. Medical information storage and management for telemedicine: patient information, medical history, test reports, medical images. Hospital information system.

UNIT V TELEMEDICAL APPLICATIONS 9

Telemedicine – health education and self-care. Introduction to robotic surgery, Telesurgery, Telecardiology, Tele oncology, Telemedicine in neurosciences. Business aspects – Project planning and costing, Usage of telemedicine.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Describe the history of telemedicine and explain ethical, legal, and regulatory issues in global and Indian contexts
- Identify multimedia principles and evaluate various communication networks used in telemedicine
- Compare encryption mechanisms and assess compliance with standards like DICOM, HL7, and ISO-OSI

Chairman
BoS/BME 28/10/25

- Demonstrate the use of tele-radiology and tele-pathology systems for patient data storage and retrieval
- Discuss telemedicine applications in various specialties and evaluate project planning and cost aspects

TEXT BOOK:

1.Norris, A.C. "Essentials of Telemedicine and Telecare", Wiley, 2002

REFERENCES:

1. Wootton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine. Royal Society of Medicine" Press Ltd, Taylor & Francis 2006

2. O'Carroll, P.W., Yasnoff, W.A., Ward, E., Ripp, L.H., Martin, E.L. (Eds), "Public Health Informatics and Information Systems", Springer, 2003.

3. Ferrer-Roca, O., Sosa – Iudicissa, M. (Eds.), Handbook of Telemedicine. IOS Press (Studies in Health Technology and Informatics, Volume 54, 2002.

4. Simpson, W. Video over IP. A practical guide to technology and applications. Focal Press Elsevier, 2006.

5. Bemmel, J.H. van, Musen, M.A. (Eds.) Handbook of Medical Informatics. Heidelberg, Germany: Springer, 1997

6. Mohan Bansal " Medical Informatics", Tata McGraw-Hill, 2004.

Mapping of COs with POs

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

Chairman
BoS/BME

24BM105PE	MEDICAL OPTICS (Common to BME and ECE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Illustrate about the optical properties of the tissues and the interactions of light with tissues
- Assess the suitability of different optical components for specific biomedical imaging applications
- Learn about the Medical Lasers and their applications
- Have an overview of the optical diagnostic application
- Appreciate the emerging optical diagnostic and therapeutic techniques

UNIT I OPTICAL PROPERTIES OF THE TISSUES 9

Fundamental Properties of light – Refraction, Reflection, Laws (Snell's law and Fresnel law) Scattering, Absorption, Light transport inside the tissue, Tissue properties, LASER characteristics as applied to medicine and biology, LASER tissue interactions – Photo chemical, Photo thermal and Photo mechanical interactions, Fluorescence, Speckles, Photo ablative processes.

UNIT II INSTRUMENTATION IN PHOTONICS 9

Instrumentation for absorption, Scattering and emission measurements, Excitation light sources – high pressure arc lamps, LEDs, LASERS, Optical filters – Prism and Monochromators, Polarizers, Optical detectors – Single Channel and Multichannel detectors, Time resolved and phase resolved detection methods, Optical fibers – Total Internal Reflection.

UNIT III SURGICAL THERAPEUTIC APPLICATIONS OF LASERS 9

LASERS in ophthalmology, Dermatology, Dentistry, Urology, Otolaryngology, Tissue welding and Soldering.

UNIT IV NON-THERMAL DIAGNOSTIC APPLICATIONS 9

Optical coherence tomography, Elastography, LASER induced Fluorescence (LIF)-Imaging, FLIM Raman Spectroscopy and imaging, FLIM – Holographic and Speckle applications of LASERS in biology and medicine.

UNIT V DIAGNOSTIC AND THERAPEUTIC TECHNIQUES 9

Near field imaging of biological structures, In vitro clinical diagnostics, Phototherapy, Photodynamic therapy (PDT) – Principles and mechanisms – Oncological and non-oncological applications of PDT – Biostimulation effect – applications – LASER safety procedures.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Demonstrate knowledge of the fundamentals of optical properties of tissues
- Analyze the components of instrumentation in Medical Photonics and Configurations
- Describe surgical applications of LASERS
- Describe photonics and its diagnostic applications
- Investigate emerging techniques in medical optics

Chairman
BoS/BME 28/10/25

TEXT BOOKS:

1. Tuan Vo Dirh, *"Biomedical Photonics – Handbook"*, CRC Press, Boca Raton, 2014.
2. Paras N Prasad, *"Introduction to Biophotonics"*, A John Wiley and Sons Inc. Publications, 2003.

REFERENCES:

1. Markolf H Niemz, *"LASER-Tissue Interaction Fundamentals and Applications"*, Springer, 2007.
2. David Baxter G, *"Therapeutic LASERS – Theory and Practice"*, Churchill Livingstone Publications, Edition-2001.
3. Leon Goldman, M D and James Rockwell R Jr, *"LASERS in Medicine"*, Gordon and Breach, Science Publishers Inc., 1975.

Mapping of COs with POs

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

Chairman
BoS/BME

24BM605PE	BODY AREA NETWORKS (Common to BME and ECE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the architecture and challenges of Body Area Networks (BAN)
- Analyze hardware components and power sources used in BAN systems
- Explore wireless communication protocols and network topologies
- Evaluate coexistence and security issues in BAN environments
- Investigate real-world applications of BAN in healthcare and rehabilitation

UNIT I INTRODUCTION 9

Definition, BAN and Healthcare, Technical Challenges- Sensor design, biocompatibility, Energy Supply, optimal node placement, number of nodes, System security and reliability, BAN Architecture – Standardization efforts – Emerging trends in digital healthcare and IoMT

UNIT II HARDWARE FOR BAN 9

Processor-Low Power MCUs, Mobile Computing MCUs, Integrated processor with radio transceiver, Memory, Antenna-PCB antenna, Wire antenna, Ceramic antenna, External antenna, Sensor Interface, Power sources- Batteries and fuel cells for sensor nodes.

UNIT III WIRELESS COMMUNICATION AND NETWORK 9

RF communication in Body, Antenna design and testing, Propagation, Base Station- Network Topology-Stand –Alone BAN, Wireless personal Area Network Technologies-IEEE 802.15.1, IEEE P802.15.13, IEEE 802.15.14, Zigbee. Bluetooth Low Energy (BLE), Ultra-Wideband (UWB).

UNIT IV COEXISTENCE ISSUES WITH BAN 9

Interferences – Intrinsic - Extrinsic, Effect on transmission, Counter measures- on physical layer and data link layer, Regulatory Issues-Medical Device regulation in USA and Asia, Security and Self-Protection-Bacterial attacks, Virus infection, Secured protocols, Authentication, encryption-Self-protection and resilience.

UNIT V APPLICATIONS OF BAN 9

Monitoring patients with chronic disease, Hospital patients, Elderly patients, Cardiac arrythmias monitoring, Multi patient monitoring systems, Multichannel Neural recording, Gait analysis, Sports Medicine, Electronic pill, Smart Prosthetics – Remote rehabilitation- Integration with AI, Cloud computing and Big data for healthcare analytics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Define BAN and explain its role in healthcare, including technical and security challenges
- Compare low-power MCUs, antenna types, and energy sources for sensor nodes in BAN applications
- Describe RF propagation and apply IEEE standards (e.g., BLE, Zigbee, UWB) in BAN design
- Assess interference types, regulatory frameworks, and secured protocols for resilient BAN systems
- Illustrate BAN use cases in chronic disease monitoring, smart prosthetics, and AI-integrated analytics

Chairman
BoS/BME 28/10/25

TEXT BOOKS:

1. Sandeep K.S. Gupta,Tridib Mukherjee, Krishna Kumar Venkata Subramanian, "Body Area Networks Safety, Security, and Sustainability'', Cambridge University Press, 2013
2. Mehmet R. Yuce, Jamil Y.Khan, "Wireless Body Area Networks Technology, Implementation, and Applications", Pan Stanford Publishing Pte. Ltd., Singapore, 2012

REFERENCES:

1. Zhang, Yuan-Ting, "Wearable Medical Sensors and Systems'', Springer, 2013.
2. Guang-Zhong Yang(Ed.), "Body Sensor Networks'', Springer, 2006.
3. Annalisa Bonfiglio, Danilo De Rossi, "Wearable Monitoring Systems", Springer, 2011

Mapping of COs with POs

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

Chairman
BoS/BME

24EC401PE	RADAR ENGINEERING	L T P C 3 0 0 3

OBJECTIVES

The student should be made to:

- Introduce the fundamental principles of radar systems and their practical applications.
- Familiarize students with the operation and analysis of CW, FM-CW, MTI, and pulse Doppler radars.
- Provide knowledge of tracking radar techniques, including tracking loops and filtering concepts.
- Explain radar receiver design, antenna types, and modern imaging radars such as SAR and ISAR.
- Develop analytical skills for predicting radar performance under various operational conditions.

UNIT I BASICS OF RADAR **9**

Introduction to Radar - Radar Block Diagram - Radar Equation - Prediction of Range Performance - Minimum Detectable Signal - Receiver Noise - Radar Cross Section of Targets - Transmitter Power - Pulse Repetition Frequency - Antenna Parameters - System Losses - Propagation Effects - Introduction to Radar Clutter.

UNIT II CW AND FREQUENCY MODULATED RADAR **9**

Continuous Wave Radar - Doppler Effect - Applications of CW Radar - FM-CW Radar- Range and Doppler Measurement - Multiple Frequency CW Radar - Ambiguity Diagram- FMCW Radar Altimeter.

UNIT III MTI AND PULSE DOPPLER RADAR **9**

Introduction to MTI Radar - Delay Line Cancellers - Blind Speeds - Staggered PRF - Doppler Filter Banks - Digital MTI Processing - Pulse Doppler Radar - Non-Coherent MTI - Moving Target Detector.

UNIT IV TRACKING RADAR **9**

Tracking with Radar- Sequential Lobing - Conical Scan - Monopulse Tracking Radar - Tracking in Range - Comparison of Trackers- Tracking Radar Applications - Tracking Loops - Kalman Filter Basics (conceptual overview).

UNIT V RADAR RECEIVERS AND ANTENNAS **9**

Radar Receivers - Noise Figure - Duplexers - Display - Signal Processing - Radar Antennas - Parabolic Reflectors - Slot and Horn Antennas - Phased Array Antennas - Introduction to Synthetic Aperture Radar (SAR) and Inverse SAR (ISAR).

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES

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

- Explain the basic principles of radar operation, derive and apply the radar equation, and analyze range performance considering system parameters and propagation effects.
- Analyze the working of CW and FM-CW radars for range and Doppler measurements, and interpret ambiguity functions.
- Evaluate MTI and pulse Doppler radar systems, identify blind speeds, and understand digital MTI signal processing methods.
- Compare different tracking radar techniques (sequential lobing, conical scan, monopulse) and apply basic concepts of Kalman filtering for radar tracking.
- Assess radar receiver characteristics, antenna configurations, and advanced radar techniques including phased arrays, SAR, and ISAR.

TEXT BOOKS:

1. M.I. Skolnik, Introduction to Radar Systems, 3rd Edition, McGraw-Hill, 2001.
2. N.S. Nagaraja, Elements of Electronic Navigation,2nd Edition, Tata McGraw Hill, 2009.

REFERENCES:

1. M.I. Skolnik, Radar Handbook, 3rd Edition, McGraw-Hill, 2008.
2. Nadav Levanon, Radar Principles, Wiley-Interscience, 1988.
3. Merrill I. Skolnik, Radar Systems, Pearson Education, 2005.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC402PE	WIRELESS COMMUNICATION	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamentals of cellular concepts, frequency reuse, and network architectures (GSM, GPRS, UMTS).
- Provide knowledge on traffic engineering, mobile radio propagation mechanisms, and fading models.
- Familiarize students with modulation techniques for mobile radio channels and OFDM principles.
- Develop understanding of diversity techniques and receivers to combat fading.
- Impart knowledge of multiple access techniques and protocols used in mobile communication systems.

UNITI CELLULAR CONCEPT **9**

Cellular Concept- Frequency reuse- channel assignment strategies – Handoff strategies- Interference and system capacity- Improving coverage and capacity in cellular system- GSM architecture- GPRS architecture- UMTS architecture.

UNIT II TRAFFIC ENGINEERING AND MOBILE RADIO PROPAGATION **9**

Trunking and Grade of Service – Propagation Mechanisms – Fading –Large Scale Fading Small Scale Fading-Types of Small Scale Fading - Link budget calculations

UNIT III MODULATION TECHNIQUES FOR MOBILE RADIO CHANNEL **9**

Overview of linear modulation techniques: QPSK, MSK, QAM – GMSK- OFDM and its principle, transceiver implementation, cyclic prefix, inter carrier interference, windowing, PAPR and its reduction techniques.

UNIT IV DIVERSITY TECHNIQUES **9**

Diversity – Types of diversity – Diversity combining techniques: Selection, Feedback, Maximal - Ratio Combining and Equal Gain Combining – Rake receiver

UNIT V MULTIPLE ACCESS TECHNIQUES **9**

Introduction, Comparisons of multiple Access Strategies, TDMA, CDMA, FDMA, OFDMA, CSMA Protocols.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the principles of cellular concepts, frequency reuse, handoff, and mobile network architectures.
- Apply traffic engineering concepts and propagation models to analyze link budgets and radio channel characteristics.

CHAIRMAN
BoS (ECE)
24/10/25

- Analyze various digital modulation schemes (QPSK, QAM, GMSK, OFDM) and evaluate their performance in mobile channels.
- Compare and assess different diversity techniques and receiver architectures for improving system reliability
- Differentiate among multiple access techniques (FDMA, TDMA, CDMA, OFDMA) and select suitable protocols for specific applications.

TEXT BOOKS:

1. Rapport T.S., Wireless Communications, 2012 (Reprint) 2nd edition, Pearson R education, Noida, India.
2. A.F,Molish, Wireless communications, Wiley, 2005
3. A.Goldsmith, Wireless communications, Cambridge university Press, 2005

REFERENCES:

1. T.L Signal, Wireless Communications, 2014 (Reprint) Tata McGraw Hill Education 1st edition ,Newdelhi,India
2. Keith Q T Zhang,Wireless communications: Principles, Theory and Mehodology, 2016, 1st edition John Wiley & Sons, west Sussex,UK
3. S.G Glisic," Advanced Wireless communications," 4G Technologies, Wiley 2004.
4. Ke-Lin Du,M.N.Swamy," Wireless communication systems," Wiley, 2004

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC403PE ADHOC AND WIRELESS SENSOR NETWORKS L T P C
3 0 0 3

OBJECTIVES:

The Students Should be made to

- Understand the fundamentals of wireless communication technology, various modulation and multiple access techniques.
- Comprehend the principles, structure, and design factors of ad hoc and sensor networks along with their unique constraints, challenges, and applications.
- Understand the functioning of MAC protocols with an emphasis on optimizing efficiency, ensuring reliability, and QoS.
- Examine and assess different routing protocols and comprehending their underlying design principles, benefits, and drawbacks.
- Understand the principles of QoS and energy management including strategies for power conservation and efficient resource utilization.

UNIT I INTRODUCTION **9**

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.

UNIT II INTRODUCTION TO ADHOC/SENSOR NETWORKS **9**

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

UNIT III MAC PROTOCOLS **9**

MAC Protocols : Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4.

UNIT IV ROUTING PROTOCOLS **9**

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on- demand, hybrid, flooding, hierarchical, and power aware routing protocols.

UNIT V QUALITY OF SERVICE AND ENERGY MANAGEMENT **9**

QoS and Energy Management: Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)

TEXT BOOKS:

1. Dr. Manish Gupta, Mr Deepak Sharma, Ms Neha Gupta, Dr. Naresh Kumar, "A Complete guide to Wireless sensor networks", Notion Press 2021.
2. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education – 2008.

REFERENCES:

1. Shashikant V. Athawale, Ad-Hoc and Wireless Sensor network, Pearson, 2022.
2. Feng Zhao and Leonides Guibas, "Wireless sensor networks ", Elsevier publication – 2005
3. William Stallings, "Wireless Communications and Networks ",**2nd Edition**, published by Pearson Education – 2014

OUTCOMES:

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

- Comprehend the fundamental principles governing wireless communication systems and their diverse applications.
- Describe the architecture, constraints, and applications of ad hoc and sensor networks.
- Acquire knowledge on designing MAC protocols, emphasizing energy efficiency and data transmission reliability
- Compare and evaluate routing protocols for ad hoc/sensor networks (table-driven, on-demand, hybrid, hierarchical, and power-aware protocols).
- Assess QoS issues and energy management strategies in wireless networks and sensor systems.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC404PE	SATELLITE COMMUNICATION	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Introduce the history, evolution, and basic concepts of satellite communication, including frequency allocation, satellite orbits, and orbital parameters.
- Familiarize students with satellite subsystems, including attitude control, telemetry, power systems, communication payloads, and propulsion.
- Explain earth station design, antenna types, uplink/downlink considerations, and multiple access techniques.
- Develop skills in satellite link design and analysis, including system noise, C/N and G/T ratios, rain attenuation, and link budget calculations.
- Provide knowledge of satellite applications in communication, navigation, remote sensing, and emerging areas like Internet and IoT.

UNIT I INTRODUCTION TO SATELLITE COMMUNICATION **9**

History and evolution of satellite communication – Basic concepts: frequency allocation, satellite orbits, Kepler's laws – Orbital parameters – Satellite classifications – Launch vehicles – Geostationary and non-geostationary orbits – Orbital effects.

UNIT II SATELLITE SUBSYSTEMS **9**

Satellite architecture – Attitude and orbit control system (AOCS), Telemetry, Tracking and Command (TT&C), Power subsystem – Communication payload: transponders, antennas – Thermal control – Propulsion systems.

UNIT III EARTH STATIONS AND MULTIPLE ACCESS **9**

Earth station design – Types of antennas – Low Noise Amplifier (LNA), High Power Amplifier (HPA) – Uplink and downlink – Tracking systems – Multiple access techniques: FDMA, TDMA, CDMA, DAMA – Comparison and applications.

UNIT IV SATELLITE LINK DESIGN AND ANALYSIS **9**

Link design equation – System noise temperature – C/N and G/T ratio – Uplink and downlink design – Rain attenuation – Link budget analysis with practical examples – Interference and frequency reuse.

UNIT V SATELLITE APPLICATIONS **9**

Direct Broadcast Satellite (DBS) – DTH – VSAT – GPS & Navigation systems – Remote sensing satellites – Mobile satellite services – Satellite communication in Internet and IoT.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Explain the fundamentals of satellite communication, satellite orbits, and the effects of orbital parameters.
- Describe the architecture and functioning of satellite subsystems, including communication payloads and control systems.
- Design and analyze earth station components, antennas, amplifiers, and multiple access techniques.
- Perform satellite link design and analysis, calculate link budgets, and evaluate interference and frequency reuse.
- Assess various satellite communication applications, including DBS, DTH, VSAT, GPS, remote sensing, and IoT integration.

TEXT BOOKS:

1. Dennis Roddy, "Satellite Communications", 4th Edition, McGraw Hill Education, 2017.

REFERENCES:

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt, "Satellite Communications", 3rd Edition, Wiley India, 2021.
2. Tri T. Ha, "Digital Satellite Communications", 2nd Edition, McGraw-Hill, 2009.
3. M. Richharia, "Satellite Communication Systems: Design Principles", Macmillan, 2003.
4. Bruce R. Elbert, "Introduction to Satellite Communication", Artech House, 2008.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC405PE	HIGH SPEED SYSTEMS	L T P C 3 0 0 3

OBJECTIVES

The student should be made to:

- Introduce the fundamentals and need for high-speed digital system design, including frequency vs. time domain perspectives.
- Familiarize students with signal integrity issues, interconnect effects, and modeling techniques.
- Provide knowledge of timing, clock distribution, and verification in high-speed design.
- Explain power delivery networks, noise issues, and power integrity analysis.
- Teach high-speed design techniques, PCB rules, differential signaling, serial standards, and testing methods.

UNIT I INTRODUCTION TO HIGH SPEED SYSTEMS 9

Need for High-Speed Design-Types of High-Speed Systems-Basics of High-Speed Digital Design -Frequency vs Time Domain Perspective -Signal Spectra -Effects of Interconnects at High Speeds -Design Goals and Trade-offs.

UNIT II SIGNAL INTEGRITY AND INTERCONNECTS 9

Signal Integrity Issues - Reflection -Transmission Line Effects -Termination Techniques - Impedance Matching -Interconnect Modeling-Crosstalk - Noise Margins - Ground Bounce - Jitter and Skew.

UNIT III TIMING AND CLOCKING IN HIGH SPEED DESIGN 9

Clock Distribution Techniques - Clock Skew - Delay Modeling- Timing Budget - Setup and Hold Time - Synchronous and Asynchronous Design - PLL and DLL based Clocking -Timing Verification.

UNIT IV POWER DELIVERY AND NOISE ISSUES 9

Power Distribution Network (PDN) Design - Decoupling Capacitors - Power Supply Noise - Simultaneous Switching Noise (SSN) - Electromagnetic Interference (EMI)- Grounding Concepts - Power Integrity Analysis.

UNIT V DESIGN TECHNIQUES AND TESTING 9

High-Speed PCB Design Rules - Differential Signaling-Serial Communication Standards (PCIe, SATA, USB, HDMI) - Eye Diagram Analysis - Design for Testability - Built-In Self-Test (BIST) - High-Speed Measurement Techniques.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES

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

- Explain the fundamentals of high-speed digital systems and the impact of interconnects on system performance.
- Analyze signal integrity issues, including reflections, crosstalk, jitter, skew, and noise margins.
- Apply timing analysis, clock distribution techniques, and setup/hold time considerations in high-speed designs.
- Assess power delivery networks, power supply noise, simultaneous switching noise, and EMI in high-speed systems.
- Design high-speed PCBs, implement differential signaling, apply serial communication standards, and use test/measurement techniques including BIST.

TEXTBOOKS:

1. Howard Johnson, Martin Graham, "High-Speed Digital Design: A Handbook of Black Magic", Prentice Hall, 1993.

REFERENCES:

1. Stephen H. Hall, Garrett W. Hall, James A. McCall, "High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices", Wiley-IEEE Press, 2000.
2. Eric Bogatin, "Signal and Power Integrity - Simplified, Pearson Education", 3rd Edition, 2017.
3. Michael H. Rashid, "Introduction to PSpice Using OrCAD for Circuits and Electronics", Prentice Hall, 2003.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC406PE	5G COMMUNICATION NETWORKS	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Explain the evolution of cellular and wireless network technologies from 2G to 5G.
- Illustrate the architecture and functionalities of 5G core networks and radio access technologies.
- Familiarize students with 5G network slicing, edge computing, and service continuity concepts.
- Examine dynamic spectrum management, mobility management, and millimeter wave technologies.
- Discuss the various security challenges and mitigation techniques in 5G networks.

UNIT I EVOLUTION OF WIRELESS NETWORKS **9**

Networks evolution: 2G,3G,4G, evolution of radio access networks, need for 5G. 4G versus 5G, Next Generation core(NG-core), visualized Evolved Packet core(vEPC).

UNIT II 5G CONCEPTS AND CHALLENGES **9**

Fundamentals of 5G technologies, overview of 5G core network architecture,5G new radio and cloud technologies, Radio Access Technologies (RATs), EPC for 5G.

UNIT III NETWORK ARCHITECTURE AND THE PROCESSES **9**

5G architecture and core, network slicing, multi access edge computing(MEC)visualization of 5G components, end-to-end system architecture, service continuity, relation to EPC, and edge computing. 5G protocols: 5G NAS,NGAP, GTP-U, IPSec and GRE.

UNIT IV DYNAMIC SPECTRUM MANAGEMENT AND MM-WAVES **9**

Mobility management, Command and control, spectrum sharing and spectrum trading, cognitive radio based on 5G, millimeter waves.

UNIT V SECURITY IN 5G NETWORKS **9**

Security features in 5G networks, network domain security, user domain security, flow based QoS framework, mitigating the threats in 5G.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Describe the evolution of wireless communication networks from 2G to 5G and explain the need for next-generation network architectures.
- Explain the concepts, architecture, and challenges of 5G networks, including the 5G core and radio access technologies.
- Analyze 5G network architecture components such as network slicing, MEC, and end-to-end service continuity.
- Evaluate dynamic spectrum management techniques and the role of millimeter wave communication in 5G.
- Assess security mechanisms and threat mitigation strategies in 5G networks.

TEXT BOOKS:

1. 5G Core networks: Powering Digitalization , Stephen Rommer, 1st Edition,Academic Press,2019
2. An Introduction to 5G Wireless Networks : Technology, Concepts and Use cases, Saro Velrajan,1st Edition, 2020.

REFERENCES:

1. 5G Simplified: ABCs of Advanced Mobile Communications Jyrki.,T.J.Penttinen, Copyrighted Material,2019
2. 5G system Design: An end to end Perspective , Wan Lee Anthony, Springer Publications,2019.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC407PE	AVIONICS SYSTEMS	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce students to the basics of avionics, cockpit systems, and the importance of avionics in civil and military aircraft.
- Familiarize students with digital avionics bus architectures and data communication standards (MIL-STD, ARINC, AFDX).
- Explain cockpit display technologies and man-machine interaction concepts, including modern glass cockpit systems.
- Provide knowledge of flight control systems, autopilot, and flight management systems for civil and military aircraft.
- Introduce navigation systems, including radio navigation, inertial sensors, GNSS, and approach/landing aids.

UNIT I INTRODUCTION TO MEASURING INSTRUMENTS **9**

Basics of Avionics-Basics of Cockpits – Need for Avionics in civil and military aircraft and space systems – Integrated Avionics Architecture –Military and Civil system – Typical avionics System and Sub systems – Design and Technologies – Requirements and Importance of facilities of Avionic Systems.

UNIT II DIGITAL AVIONICS BUS ARCHITECTURE **9**

Evolution of Avionics architecture– Avionics Data buses MIL-STD-1553, MIL-STD-1773, ARINC 429, ARINC-629, AFDX/ARINC-664, ARINC-818 – Aircraft system Interface

UNIT III COCKPIT DISPLAYS AND MAN-MACHINE INTERACTION **9**

Trends in display technology- CRT, LED, LCD, EL and plasma panel - Touch screen - Direct voice input (DVI) –-Civil cockpit and military cockpit: MFD, MFK, HUD, HDD, HMD, HOTAS – Glass cockpit.

UNIT IV FLIGHT CONTROL SYSTEMS **9**

Introduction to Flight control systems and FMS– Longitudinal control – Lateral Control – Autopilot – Flight planning – Radar Electronic Warfare - Certification-Military and civil aircrafts.

UNIT V NAVIGATION SYSTEMS **9**

Overview of navigation systems - Communication Systems – Radio navigation – Types & Principles – Fundamentals of Inertial Sensors – INS – GNSS -- GPS – Approach and Landing Aids – ILS & MLS – Hybrid Navigation.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Explain the fundamentals of avionics systems, integrated architecture, and the role of avionics in civil and military aircraft.
- Analyze digital avionics bus architectures and interface standards used in modern aircraft.
- Evaluate cockpit display technologies and man-machine interaction systems for effective human-centered design.
- Describe flight control systems, autopilot functions, and flight management systems for aircraft operations.
- Assess navigation systems, including INS, GNSS, radio navigation, and landing aids, for aircraft guidance.

TEXT BOOK:

1. R.P.G. Collinson, "Introduction to Avionics", Springer Publications, 4th Edition, 2023.

REFERENCES:

1. Cary R .Spitzer, "The Avionics Handbook", CRC Press, 2000.
2. Middleton, D.H. "Avionics Systems", Longman Scientific and Technical, Longman Group UK Ltd., England, 1989. 164
3. Spitzer, C.R. "Digital Avionics Systems", Prentice Hall, Englewood Cliffs, N.J., U.S.A., 1987.
4. Myron Kayton , Walter R. Fried "Avionics Navigation Systems" 2nd Edition,Wiley Publication, 2008.
5. Jim Curren, "Trend in Advanced Avionics", IOWA State University, 1992.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC408PE	INTRODUCTION TO WIRELESS AND CELLULAR COMMUNICATIONS	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamental concepts of cellular systems and wireless technologies including 5G.
- Explain the propagation models, fading mechanisms, and channel characteristics in
- wireless systems.
- Analyze the statistical behavior of different fading models such as Rayleigh, Rician, and Nakagami.
- Provide an understanding of diversity techniques and their impact on communication performance.
- Describe spread spectrum communication principles and evaluate CDMA system performance in multipath environments.

UNIT I INTRODUCTION **9**

Overview of Cellular Systems- 5G and other Wireless Technologies- Basic Cellular Terminology- Introduction to Antennas and Propagation Models- Link budget, Fading margin, Outage- Cellular Concept- Cellular system design and analysis- Cellular Geometry & System Design- Cellular System Capacity, Trunking Handoff & Mobility.

UNIT II CLASSIFICATION OF SIGNAL **9**

Classification of Signal Variation-- Shadowing, Outage, Multipath-- Rayleigh Fading and Statistical Characterization- Properties of Rayleigh Distribution- BER in Fading, Narrowband vs Wideband Channels- Characterization of Multipath Fading Channels- Choice of Modulation- Coherent versus Differential Detection- BER in Fading - Part II, Ricean Fading- Ricean and Nakagami Fading, Moment Generating Function (MGF)- MGF Part II, WSSUS.

UNIT III CHARACTERISTICS OF CHANNELS **9**

WSSUS Part II, Coherence Time, Doppler Spectrum- Doppler, Temporal Characteristics of Fading Channels- Characterization of Time Dispersive Fading Channels- Classification of Fading Channels- Practical Channel Models (ITU, COST), Computer generation of Rayleigh fading- Rayleigh Fading simulation - Clark and Gans Method- Jakes Method.

UNIT IV DIVERSITY **9**

Introduction to Diversity, Antenna selection diversity-- Statistical Characterization of Antenna Diversity, Optimal Diversity Combining- BER in fading, Equal Gain Combining- Array Gain, Diversity Gain, Alamouti Scheme- Alamouti Scheme Part II, Channel Capacity- Capacity of fading Channels, Capacity with Outage- Channel State Information, Optimum Power Allocation- Optimum Power Allocation - Water filling.

CHAIRMAN
BoS (ECE) 24/10/25

UNIT V SPREAD SPECTRUM COMMUNICATIONS 9

Intro to Direct Sequence Spread Spectrum Communications- Properties of Spreading Sequences- Introduction to CDMA- Features of cdma2000 and WCDMA- Rake Receiver for multipath channels- Multiuser environment- CDMA system Capacity- CDMA Multiuser

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the basic concepts of cellular systems, 5G technologies, and wireless system design principles.
- Analyze the statistical properties of wireless fading channels and their effect on system performance.
- Characterize different types of wireless channels using practical models and simulation techniques.
- Evaluate the performance of diversity schemes and optimal power allocation methods in fading environments.
- Explain and analyze spread spectrum and CDMA techniques in multiuser wireless communication systems.

TEXT BOOK:

1. Rappaport.T.S, "Wireless Communications – Principles and Practice", 2nd edition Pearson, 2010..

REFERENCES:

1. Molisch.A, "Wireless Communications," Wiley, 2005
2. Haykin & Moher, "Modern Wireless Communications" Pearson 2011 Indian Edition.
3. Proakis.J.G, "Digital Communications", 5th edition McGraw Hill.
4. Goldsmith.A, "Wireless Communications," Cambridge Univ Press, 2005.
5. Tse.D and Viswanath.P, "Fundamentals of Wireless Communications," Cambridge Univ Press, 2005

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

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.

CHAIRMAN
BoS (CSE) 16/10/25

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)

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)

24ME605PE	DRONE TECHNOLOGIES (COMMON TO ECE AND MECH)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Define the fundamental concepts and components of drone technologies.
- Describe the fundamentals of design, fabrication, and programming of drones.
- Demonstrate the methods of flying and operating different types of drones.
- Analyze various real-world applications of drones across multiple sectors.
- Recognize the safety regulations, operational risks, and guidelines for safe drone flying.

UNIT I INTRODUCTION TO DRONE TECHNOLOGY **9**

Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability.

UNIT II DRONE DESIGN, FABRICATION AND PROGRAMMING **9**

Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts - Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection

UNIT III DRONE FLYING AND OPERATION **9**

Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity Removable storage devices- Linked mobile devices and applications.

UNIT IV DRONE COMMERCIAL APPLICATIONS **9**

Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing.

UNIT V FUTURE DRONES AND SAFETY **9**

The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms

TOTAL: 45 PERIODS

CHAIRMAN
(BoS / MECH) 28/10/25

OUTCOMES:

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

- Compare the various types of drone technologies, fabrication methods, and programming elements.
- Demonstrate appropriate operational procedures for effective drone functioning.
- Choose relevant sensors and actuators based on the functional requirements of drones.
- Construct drone mechanisms suited for specific real-world applications.
- Develop control programs for operating various types of drones.

TEXT BOOKS:

1. Daniel Tal and John Altschuld, "Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation", 2021 John Wiley & Sons, Inc.
2. Terry Kilby and Belinda Kilby, "Make:Getting Started with Drones ",Maker Media, Inc, 2016

REFERENCES:

1. John Baichtal, "Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs", Que Publishing, 2016
2. Zavrsnik, "Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance", Springer, 2018.

Mapping of COs with POs

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

CHAIRMAN
(BoS / MECH)

24ME705PE	TOTAL QUALITY MANAGEMENT	L	T	P	C
	(COMMON TO AGE, BME, ECE, EEE, CIVIL AND MECH)	3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn the fundamental approaches and philosophy of Total Quality Management (TQM)
- Know the core concepts and principles of TQM
- Equip with knowledge of both traditional and modern quality improvement tools
- Understand the different types of TQM techniques across different industries
- Study the various quality systems, international standards, and procedural frameworks

UNIT I INTRODUCTION **9**

Definition of quality and TQM – basic needs of TQM – contributions of Deming, Juran, Crosby – TQM framework – history review of quality management – dimensions of quality – barriers to TQM – benefits of TQM – quality council – quality statements.

UNIT II TQM PRINCIPLES **9**

Customer satisfaction – customer perception of quality, customer complaints, service quality, Kano Model and customer retention – employee involvement – motivation, empowerment, team and teamwork, recognition and reward, performance appraisal – continuous process improvement – PDSA cycle, 5s and Kaizen – supplier partnership– supplier selection and supplier rating and relationship development.

UNIT III TQM TOOLS **9**

Basic seven tools of quality – new seven management tools – six-sigma – concepts and process – quality costs – BPR - reengineering process – improvement strategies – Taguchi principles – quality loss function – role of IT in TQM.

UNIT IV TQM TECHNIQUES **9**

Benchmarking – reasons, types and process – Failure Mode of Effect Analysis (FMEA) – procedures and types – Quality Function Deployment (QFD) – benefits and process – Total Productive Maintenance (TPM) – process.

UNIT V QUALITY SYSTEMS **9**

Benefits of ISO registration – ISO 9000 series of standards – ISO 9000 requirements and implementation – other sectors specific standards – documentation – audit – ISO 14000 series of standards – concepts, requirements and benefits – quality awards.

TOTAL: 45 PERIODS

CHAIRMAN
(BoS MECH) 28/10/25

OUTCOMES:

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

- Explain the basic approaches and philosophy of TQM in organizational contexts.
- Interpret the key principles and concepts of Total Quality Management.
- Apply basic and advanced quality tools for process improvement and problem-solving.
- Identify the use of TQM techniques in real-world industrial scenarios.
- Build standardized quality systems and procedures to ensure improved quality assurance

TEXT BOOKS:

1. Dale H Besterfiled, "Total Quality Management", Pearson Education Asia, 5th Edition, 2018.
2. Poonia M P and Sharma S C, "Total Quality Management", Khanna Publication, 1st Edition 2019

REFERENCES:

1. James R Evans and William M Lindsay, "The Management and Control of Quality", South-Western Cengage Learning, 11th Edition, 2020.
2. Vijayan V and Ramakrishnan H "Total Quality Management", S Chand Publication, Pune, 1st Edition, 2014.
3. Suganthi L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 7th Edition, 2011.
4. Poornima M Charantimath, "Total Quality Management", Pearson Education, 4th Edition, 2022.

Mapping of COs with POs

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

CHAIRMAN
(BoS / MECH)

24EE704PE	INTELLECTUAL PROPERTY RIGHTS (Common to ECE and EEE)	L T P C 3 0 0 3

COURSE OBJECTIVES:

The students should be made to:

- Explain the basic concepts, types and importance of Intellectual Property Rights (IPR)
- Describe the procedures and practical aspects of registering various intellectual property rights in India and abroad
- Summarize major international treaties, conventions and national legislations related to intellectual property rights
- Discuss the impact of digital innovations on intellectual property laws and the challenges of protecting digital content
- Examine the enforcement mechanisms, remedies and emerging challenges in protecting intellectual property rights

UNIT I INTRODUCTION **9**

Introduction to Intellectual Property Rights (IPR) – Basic concepts and importance of Intellectual Property – Patents, Copyrights, Trademarks, Geographical Indications and Industrial Designs – Intellectual Property Rights in India and abroad – Genesis and development – World Trade Organization (WTO), World Intellectual Property Organization (WIPO) and Trade-related aspects of Intellectual Property Rights (TRIPS) framework – Nature of Intellectual Property – Industrial property – Research, Inventions and Innovations – Illustrative examples of IPR.

UNIT II REGISTRATION OF IPR **9**

Practical aspects and procedures of registration – Copyrights – Trademarks – Patents – Geographical Indications – Trade secrets – Industrial Design registration in India and abroad.

UNIT III AGREEMENTS AND LEGISLATIONS **9**

International treaties and conventions on IPRs – TRIPS agreement – Patent Cooperation Treaty (PCT) – The Patent Act of India and Amendment acts – Design act – Trademark act – Geographical Indications of Goods (Registration and Protection) act.

UNIT IV DIGITAL PRODUCTS AND LAW **9**

Digital innovations and knowledge assets – Intellectual property laws in the digital era – Cyber Law and digital content protection – Unfair competition – Concept, scope and relationship with IPR laws – Case studies.

UNIT V ENFORCEMENT OF IPRs **9**

Infringement of IPR – Enforcement measures and remedies – Emerging issues and challenges in IPR enforcement – Case studies.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (EEE)

16/10/25

COURSE OUTCOMES:

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

- Identify different forms of intellectual property and describe their significance in research, innovation and industry
- Demonstrate the steps involved in registering copyrights, trademarks, patents, geographical indications, trade secrets and industrial designs
- Interpret the relevance of TRIPS, WIPO, PCT and Indian IPR laws in protecting and managing intellectual property
- Analyse case studies to evaluate the effectiveness of IPR and cyber laws in the digital era
- Assess infringement cases and propose suitable enforcement measures for effective IPR protection

TEXT BOOKS:

1. Deborah E Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets", Fourth Edition, Cengage Learning, 2016.
2. Scople Vinod V, "Managing Intellectual Property", Prentice Hall of India Private Limited, 2012.

REFERENCES:

1. Narayanan P, "Intellectual Property Law", Eastern Law House, 2017.
2. Deborah E Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Third Edition, Cengage Learning, 2012.
3. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
4. Edited by Derek Bosworth and Elizabeth Webster, "The Management of Intellectual Property", Edward Elgar Publishing Limited, 2013.
5. WIPO Intellectual Property Handbook, World Intellectual Property Organization, 2017.
6. Satakar S V, "Intellectual Property Rights and Copy Rights", ESS ESS Publications, New Delhi, 2003.

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
CO3	3	3	2	–	–	3	–	–	2	–	2
CO4	3	3	2	–	–	–	–	–	2	–	2
CO5	3	3	2	–	–	–	–	–	2	–	2

CHAIRMAN
BoS (EEE)

24EE401PE	ELECTRIC VEHICLE ARCHITECTURE (Common to ECE and EEE)	L T P C 3 0 0 3

COURSE OBJECTIVES:

The students should be made to:

- Understand the history, types, and specifications of electric vehicle architectures such as series, parallel, and hybrid configurations
- Learn the fundamentals of vehicle motion including kinetics, dynamics, propulsion power, and tire-road mechanics
- Know the sizing and functioning of powertrain components like gears, clutches, differentials, transmissions, and braking systems for EVs and HEVs
- Explore control strategies for hybrid vehicles focusing on supervisory control and mode selection
- Describe the history, construction, working principles, and charging mechanisms of plug-in hybrid electric vehicles (PHEVs)

UNIT I VEHICLE ARCHITECTURE AND SIZING (7+2 Skill)

Electric vehicle: History and evolution of Electric Vehicles – Series, parallel and series parallel architecture, Micro and mild architectures – Mountain bike – Motorcycle – Electric cars and heavy duty EVs – Details and specifications.

UNIT II VEHICLE MECHANICS (7+2 Skill)

Introduction – Roadway fundamentals, Laws of motion, Vehicle kinetics, Dynamics of vehicle motion, Propulsion power, Velocity and acceleration, Tire–road mechanics, Propulsion system design.

UNIT III POWER COMPONENTS AND BRAKES (7+2 Skill)

Power train component sizing – Gears, Clutches, Differential, Transmission and vehicle brakes – EV power train sizing – HEV power train sizing – Case study.

UNIT IV HYBRID VEHICLE CONTROL STRATEGY (7+2 Skill)

Vehicle supervisory control – Mode selection strategy – Model control strategies.

UNIT V PLUG-IN HYBRID ELECTRIC VEHICLE (7+2 Skill)

Introduction – History – Comparison with electrical and hybrid electrical vehicle – Construction and working of PHEV – Block diagram and components – Charging mechanisms – Advantages of PHEVs.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (EEE) 16/10/25

SKILL DEVELOPMENT ACTIVITIES: (Group Seminar/Mini Project/ Assignment/ Content Preparation / Quiz/ Surprise Test / etc.,)

Basics of MATLAB Simulation

1. Variables and expressions formats, Vectors and matrices
2. Arrays, vectors
3. Matrices, Built-in functions, Trigonometric functions
4. Data types and plotting
5. Simulation of drive cycles

COURSE OUTCOMES:

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

- Describe different electric vehicle (EV) architectures and specify components for various vehicle types
- Construct propulsion systems based on laws of motion for effective vehicle acceleration and velocity regulation
- Design powertrain components and systems for electric and hybrid vehicles
- Create mode selection algorithms to enhance hybrid vehicle operation
- Explain plug-in hybrid electric vehicle (PHEV) components, operation, charging methods and advantages over other EV types

TEXT BOOKS:

1. Ali Emadi, "Advanced Electric Drive Vehicles", First Edition, CRC Press, 2017.
2. Mark Warner, "The Electric Vehicle Conversion Handbook: How to Convert Cars, Trucks, Motorcycles, and Bicycles - Includes EV Components, Kits and Project Vehicles", HP Books, 2011.

REFERENCES:

1. Mehrdad Ehsani, YiminGao, Sebastian E Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.
2. Seth Leitman and Bob Brant, "Build Your Own Electric Vehicle", Third Edition, McGraw Hill, 2013.
3. Shashank Arora, Alireza Tashakori Abkenar, Shantha Gamini Jayasinghe and Kari Tammi, "Heavy-duty Electric Vehicles from Concept to Reality", Elsevier Science, 2021.
4. Nil Patel, Akash Kumar Bhoi, Sanjeevikumar Padmanaban and Jens Bo Holm-Nielsen, "Electric Vehicles Modern Technologies and Trends", Springer, 2020.

CHAIRMAN
BoS (EEE)

Mapping of COs with POs:

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

CHAIRMAN
BoS (EEE) 16/10/25

24CS202PE	THE JOY OF COMPUTING USING PYTHON	L	T	P	C
	(Common to CSE & ECE)	3	0	0	3

OBJECTIVES:

The student should be made to:

- Equip with programming skills through Python.
- Understand expressions, variables, loops, lists, tuples, and conditionals.
- Focus logical thinking and problem-solving.
- Gain insights into practical applications like sentiment analysis, image processing, and the page ranking system.
- Explore image processing, problem-solving with games and recursion, and page ranking basics.

UNIT I INTRODUCTION TO PYTHON PROGRAMMING 9

Motivation for Computing - Welcome to Programming - Variables and Expressions: Design your own calculator - Loops and Conditionals: Hopscotch once again

UNIT II LISTS, TUPLES AND ITS APPLICATIONS 9

Lists, Tuples and Conditionals: Lets go on a trip Abstraction Everywhere: Apps in your phone Counting Candies: Crowd to the rescue Birthday Paradox: Find your twin Google Translate: Speak in any Language Currency Converter: Count your foreign trip expenses Monte Hall: 3 doors and a twist.

UNIT III DICTIONARIES, SORTING, SEARCHING WITH APPLICATIONS 9

Dictionaries: operations and methods, advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation, Sorting: Arrange the books Searching: Find in seconds Substitution Cipher: What's the secret.

UNIT IV SENTIMENT ANALYSIS 9

Sentiment Analysis: Analyze your Facebook data 20 questions game: I can read your mind Permutations: Jumbled Words Spot the similarities: Dobble game Count the words: Hundreds, Thousands or Millions. Rock, Paper and Scissor: Cheating not allowed Lie detector: No lies, only TRUTH Calculation of the Area: Don't measure. Six degrees of separation: Meet your favorites.

CHAIRMAN
BoS (CSE) 15/10/25

UNIT V WORKING WITH IMAGE PROCESSING AND PAGE RANKING 9

Image Processing: Fun with images Tic tac toe: Let's play Snakes and Ladders: Down the memory lane. Recursion: Tower of Hanoi Page Rank: How Google Works.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the fundamental programming concepts.
- Apply Python data structures such as lists and tuples to organize and manipulate data.
- Analyze problems logically and develop programmatic solutions using Python.
- Explore and implement real-world applications of Python programming, including sentiment analysis, image processing, and page ranking.
- Develop skills in image processing, problem-solving with games and recursion, and understanding page ranking algorithms.

TEXT BOOKs:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

COs - POs Mapping

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

CHAIRMAN
BoS (CSE)

24EC601PE	ADVANCED MICROCONTROLLERS	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce the architecture, memory organization, and functional units of 16-bit and 32-bit microcontrollers.
- Enable students to understand the operation of timers, interrupt systems, and on-chip peripherals in MSP430 and ARM-based controllers.
- Familiarize students with the configuration and programming of serial communication protocols such as UART, I²C, and SPI.
- Develop the ability to analyze and design embedded applications using microcontroller peripherals.
- Provide practical exposure to real-time applications through programming examples and interfacing concepts.

UNIT 1 ARCHITECTURE OF 16-BIT MICROCONTROLLER **9**

Introduction - Functional Block Diagram of MSP430 - Memory Structure - Usage of Interrupts-Clock Sources and Controls - Timer A & B - Timer Operating Modes Capture/Compare Channels-RTC.

UNIT II OVERVIEW OF 32-BIT MICROCONTROLLER **9**

Introduction - Architecture - Functional Overview - Overview of all Peripherals -Overview of CC32xx - Block Diagram - Functional Description - Overview of GPIO - Function Description - Data Control - Interrupt Control - Initialization and Configuration - GPIO Registers Map.

UNIT III TIMERS AND ADC **9**

Timers: Introduction - Functional Description - Initialization and Configuration Timer Registers - Introduction to Watchdog Timer - Initialization - Register Map.-Introduction to ADC - ADC Module Register - Initialization and Configuration Peripheral Library APIs for ADC.

UNIT IV INTRODUCTION TO UART, I2C AND SPI PROTOCOLS **9**

UART: Overview and Block Diagram - Functional Description - Initialization and Configuration - Register Description Introduction to I2C: Block Diagram Functional Description - Initialization and Configuration - Register Map - SPI: Introduction-Functional Description - Initialization and Configuration - Access to Data Register - Module Initialization - SPI Registers.

UNIT V ON-CHIP PERIPHERALS OF MSP430 **9**

Digital I/O - ADC-DAC - Serial Peripheral interface – Communication with ADC and I2C Bus - Asynchronous Serial Communication- UART.

TOTAL:45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Explain the architecture, memory organization, and interrupt structure of MSP430 microcontrollers.
- Analyze the functional blocks and peripheral overview of 32-bit CC32xx microcontrollers.
- Demonstrate timer operations, ADC configurations, and watchdog timer functionalities.
- Implement communication between devices using UART, I²C, and SPI protocols.
- Develop embedded applications utilizing on-chip peripherals of MSP430 microcontrollers.

TEXT BOOKS:

1. John H Davies, "MSP430 Microcontroller Basics", Elsevier, ISBN-10: 9789380501857.
2. MSP 430 Technical Reference Manual and Datasheet

REFERENCES:

1. Adrian Femandez, Dung Dang, "Getting Started with MSP 430 Launchpad", Newnes, 2013.
2. Chris Nagy, "Embedded Systems Design using the TI MSP430 Series", Elsevier, 2003.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

29/10/25

24EC602PE	EMBEDDED PROCESSORS (COMMON TO EEE AND ECE)	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce the fundamental processor architectures used in embedded systems.
- Differentiate between Von Neumann and Harvard architectures and understand their relevance to embedded processors.
- Explore RISC and CISC architectures and their implications for embedded system performance.
- Familiarize students with System-on-Chip (SoC) concepts, architecture, and design approaches.
- Understand memory organization and system buses within an SoC environment.

UNIT I INTRODUCTION TO EMBEDDED PROCESSORS 9

Introduction to processors - Von Neumann architecture and Harvard architecture, RISC VS CISC System on Chip (SoC)-Introduction to SoC Architecture, An approach for SOC Design, System Architecture and Complexity. Processor Selection for SOC, Basic concepts in Processor Architecture, Overview of SOC external memory, Internal Memory, Scratchpads and Cache memory, SOC Memory System, Models of Simple Processor - memory interaction, SOC Standard Buses.

UNIT II EMBEDDED PROCESSORS ON CHIP PERIPHERALS 9

Memory Interrupts - I/O Ports-Timers & Real Time Clock (RTC), Watch dog timer -CCP modules - Capture Mode - Compare Mode-PWM Mode - Serial communication module USART SPI interface I2C interface, Analog Comparator, Analog interfacing and data acquisition.

UNIT III ARM PROCESSOR 9

Architecture of ARM Controller – Registers, Pipeline organization 3 stage & 5 stage, Thumb mode of operation - D/A and A/D converter, sensors, actuators and their interfacing – Case study- Digital clock, Temperature sensing, Light sensing, Introduction to Internet of Things, smart home concepts.

UNIT IV REAL WORLD INTERFACING USING ARM PROCESSOR 9

Interfacing the peripherals to LPC2148: GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SD card interface using SPI, on-chip DAC for waveform generation.

UNIT V ARM CORTEX PROCESSORS 9

Introduction to ARM CORTEX series, improvement over classical series and advantages for embedded system design. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications, need of operating system in developing complex applications in embedded system, Firmware development for ARM Cortex, Survey of CORTEX M3 based controllers, its features and comparison.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Explain the architectural differences between Von Neumann and Harvard architectures and their impact on embedded processor performance.
- Compare RISC and CISC architectures and justify suitable choices for embedded applications.
- Illustrate the structure and operation of a System-on-Chip (SoC), including internal and external memory organization.
- Describe the functioning of cache, scratchpad, and main memory systems in embedded processor design.
- Demonstrate knowledge of SoC standard buses and simple processor–memory interaction models used in embedded systems.

TEXT BOOKS:

1. F. Vahid and T. Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", Wiley India Pvt. Ltd., 2002.
2. Michael J. Flynn and Wayne Luk, "Computer System Design System-on-Chip", Wiley India Pvt. Ltd.

REFERENCES:

1. Steve Furber, "ARM System on Chip Architecture ", 2nd Edition, 2000, Addison Wesley Professional.
2. S. Pascricha and N. Dutt, Morgan Kaufmann, On-Chip Communication Architectures, System on Chip Interconnect, -Elsevier Publishers 2008.

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	1	-	-	-	-	1	-
CO2	3	2	2	2	2	-	-	-	-	1	-
CO3	3	3	3	2	2	-	-	-	1	2	1
CO4	3	2	3	3	3	-	-	-	1	2	1
CO5	3	3	3	3	3	1	1	-	-	2	1

CHAIRMAN
BoS (ECE)

29/10/25

24EC603PE	PROGRAMMING FOR EMBEDDED SYSTEMS (COMMON TO ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce the fundamentals of C programming and develop structured and modular programming skills.
- Familiarize students with Embedded C concepts and techniques for real-time programming.
- Provide knowledge on the C programming toolchain in Linux, including compilation, debugging, and performance analysis tools.
- Introduce the Python programming language and its essential constructs for problem-solving.
- Enable students to utilize Python modules, packages, and libraries effectively for scientific, graphical, and networking applications.

UNIT I BASIC C PROGRAMMING 9

Typical C Program Development Environment - Introduction to C Programming - Structured Program Development in C - Data Types and Operators - C Program Control - C Functions - Introduction to Arrays.

UNIT II EMBEDDED C 9

Adding Structure to 'C' Code: Object oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts.

UNIT III C PROGRAMMING TOOL-CHAIN IN LINUX 9

C preprocessor - Stages of Compilation - Introduction to GCC - Debugging with GDB - The Make utility - GNU Configure and Build System - GNU Binary utilities - Profiling - using gprof - Introduction to GNU C Library.

UNIT IV PYTHON PROGRAMMING 9

Introduction - Parts of Python Programming Language - Control Flow Statements - Functions - Strings - Lists - Dictionaries - Tuples and Sets.

UNIT V MODULES, PACKAGES AND LIBRARIES IN PYTHON 9

Python Modules and Packages - Creating Modules and Packages - Practical Example - Libraries for Python - Library for Mathematical functionalities and Tools - Numerical Plotting Library - GUI Libraries for Python - Imaging Libraries for Python - Networking Libraries.

TOTAL :45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Explain the fundamentals of embedded programming and its role in embedded system development.
- Develop programs that meet real-time constraints using hardware delays and timeout mechanisms.
- Use GCC and GDB tools for compiling and debugging C programs.
- Develop simple Python programs for computational and logical problem-solving.
- Create and manage Python modules and packages for program modularity and reuse.

TEXT BOOK:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Prentice Hall, 1988.
2. Christopher Hills, Embedded Software Development with C, McGraw Hill, 2018.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program", 8th Edition, Pearson Education Limited, 2016.
2. Michael J Pont, "Embedded C", Addison-Wesley, An imprint of Pearson Education, 2002
3. William von Hagen, "The Definitive Guide to GCC", 2nd Edition, Apress Inc., 2006.
4. Gowrishankar S and Veena A, "Introduction to Python Programming", CRC Press, Taylor & Francis Group, 2019.
5. Noel Kalicharan, "Learn to Program with C", Apress Inc., 2015.

MAPPING OF COs WITH POs

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

CHAIRMAN
BoS (ECE)

24EC604PE	ARM BASED SYSTEM DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Study the architecture of PIC Microcontroller
- Compare the architecture and programming of 8,16,32-bit RISC processor.
- Learn the implementation of DSP in ARM processor.
- Discuss on memory management, application development in RISC processor.
- Practice/Exercise onto revising & familiarizing the concepts Embedded Programming

UNIT I PIC MICROCONTROLLER 9

Architecture - memory organization - addressing modes - instruction set - PIC programming in Assembly & C - I/O port, Data Conversion, RAM & ROM Allocation, Timer programming, practice in MP-LAB.

UNIT II ARM ARCHITECTURE 9

Architecture – memory organization – addressing modes –The ARM Programmer's model Registers – Pipeline - Interrupts – Coprocessors – Interrupt Structure.

UNIT III PERIPHERALS OF PIC AND ARM MICROCONTROLLER 9

PIC: ADC, DAC and Sensor Interfacing –Flash and EEPROM memories. ARM: I/O Memory – EEPROM – I/O Ports – SRAM –Timer –UART - Serial Communication with PC – ADC/DAC Interfacing.

UNIT IV ARM MICROCONTROLLER PROGRAMMING 9

ARM general Instruction set – Thumb instruction set –Introduction to DSP on ARM – Implementation example of Filters.

UNIT V DESIGN WITH PIC AND ARM MICROCONTROLLERS 9

PIC implementation - Generation of Gate signals for converters and Inverters - Motor Control – Controlling DC/ AC appliances – Measurement of frequency - Stand alone Data Acquisition System –ARM Implementation- Simple ASM/C programs- Loops –Look up table Block copy- subroutines- Hamming Code.

TOTAL :45 PERIODS

OUTCOMES:

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

- Describe the internal architecture and features of the PIC microcontroller
- Compare and contrast the architecture and instruction sets of 8-bit, 16-bit, and 32-bit RISC processors for performance evaluation.

CHAIRMAN
BoS (ECE)
24/10/25

- Demonstrate the implementation of Digital Signal Processing (DSP) algorithms using ARM processor architecture.
- Analyze memory management techniques and application development strategies in RISC-based embedded systems.
- Apply embedded programming techniques to solve practical problems through structured practice and revision activities.

TEXT BOOKS:

1. Steve Furber, 'ARM system on chip architecture', Addison Wesley,2010.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield 'ARM System Developer's Guide Designing and Optimizing System Software', Elsevier 2007.
3. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ' PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008.

REFERNCES:

1.Muhammad Ali Mazidi, Rolin D. McKinlay, and Danny Causey, PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18, Pearson Education, 2008.

2.Andrew N. Sloss, Dominic Symes, and Chris Wright,ARM System Developer's Guide: Designing and Optimizing System Software, Morgan Kaufmann Publishers, 2004.

3.Steve Furber, ARM System-on-Chip Architecture, 2nd Edition, Addison Wesley, 2000.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC605PE **IoT ARCHITECTURES AND PROTOCOLS** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamentals, characteristics, and challenges of the Internet of Things.
- Explain the IoT architectural reference models, their domains, and communication frameworks.
- Illustrate IoT reference architectures and their implementation approaches using SOA and API-based frameworks.
- Familiarize students with IoT application and communication protocols used for device connectivity and data exchange.
- Explore real-world IoT applications and case studies in domains like healthcare, agriculture, smart infrastructure, and logistics.

UNIT I IoT FUNDAMENTALS **9**

Definition & Characteristics of IoT - Challenges and Issues - Physical Design of IoT, Logical Design of IoT - IoT Functional Blocks, Security.

UNIT II IoT ARCHITECTURAL REFERENCE MODEL AS ENABLER **9**

The IoT Architectural Reference Model as Enabler, IoT in Practice: Examples: IoT in Logistics and Health, IoT Reference Model: Domain, information, functional and communication models;

UNIT III IoT REFERENCE ARCHITECTURE **9**

Architecture, Functional, information, deployment and operation views, SOA based Architecture, API-based Architecture, OPENIoT Architecture for IoT/Cloud Convergence.

UNIT IV APPLICATION PROTOCOLS FOR IoT **9**

UPnP, CoAP, MQTT, XMPP. SCADA, Web Socket, IP-based Protocols: 6LoWPAN, RPL; Authentication Protocols; IEEE 802.15.4.

UNIT IV PROGRAMMING THE MICROCONTROLLER FOR IoT **9**

Working principles of sensors – IOT deployment for Raspberry Pi /Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, wifi and USB - Contiki OS- Cooja Simulator.

UNIT V APPLICATION AND CASE STUDY **9**

Business models for IoT, Green energy buildings and infrastructure, Smart farming, Smart retailing and Smart fleet management **Case study:** Cloud-Based Smart-Facilities Management, Healthcare, Environment Monitoring System.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)
21/10/25

OUTCOMES:

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

- Explain the definition, characteristics, and challenges of IoT systems and their functional blocks
- Describe and interpret the IoT Architectural Reference Model and its domain, information, functional, and communication view
- Compare and evaluate IoT reference architectures, including SOA-based, API-based, and OPENIoT frameworks.
- Demonstrate the use of IoT application and communication protocols such as CoAP, MQTT, XMPP, and IEEE 802.15.4
- Analyze IoT-based case studies and develop appropriate business models for smart and sustainable systems.

TEXT BOOKS:

1. Bassi, Alessandro, et al, "Enabling things to talk", Springer-Verlag Berlin An, 2016.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017
3. Vijay Madisetti and Arshdeep Bagha, "Internet of Things (A Hands-on- Approach)", 1st Edition, VPT, 2014.

REFERENCE BOOKS

1. Hersent, Olivier, David Boswarthick, and Omar Elloumi. "The internet of things: Key applications and protocols", John Wiley & Sons, 2011.
2. Bunya, Rajkumar, and Amir Vahid Dastjerdi, eds "Internet of Things:Principles and paradigms", Elsevier, 2016. Kenneth J. Ayala, "The 8051 Microcontroller: Architecture, Programming and Applications", 3rd Edition, Cengage Learning, 2004.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC606PE	SENSORS FOR IOT APPLICATIONS (COMMON TO ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the fundamental concepts, characteristics, and components of IoT systems, including sensors, actuators, and domain-specific applications.
- Recognize communication models, IoT protocols, and system management tools such as M2M, SDN, NFV, SNMP, NETCONF, and YANG.
- Demonstrate the use of programming platforms such as Python, Arduino, and Raspberry Pi for IoT device interfacing and data acquisition.
- Develop basic IoT hardware projects by integrating sensors, actuators, and other IoT modules.
- Identify cloud platforms and IoT web services (RESTful APIs, AWS IoT) for data collection, monitoring, and visualization.

UNIT I INTRODUCTION TO INTERNET OF THINGS 9

Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, Logical design of IoT – IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home Automation, City, Environment, Energy, Agriculture, Industry and Health & Life style.

UNIT II INTERNET OF THINGS AND M2M 9

Introduction, M2M, Software defined networks, network function virtualization, difference between SDN and NFV for IoT, IoT System Management with NETCONF - YANG –Need for IoT System Management, SNMP, NETCONF, YANG, NETOPEER.

UNIT III IOT SYSTEMS AND IOT PHYSICAL DEVICES & END POINTS 9

Introduction to python, Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, and reading input from pins.

UNIT IV PREPARING OUR IoT PROJECTS AND HARDWARE DESIGN 9

Creating the sensor project, Creating the actuator project, Connecting LED, Buzzer, Switching High Power devices with transistors, Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor.

UNIT V IOT PHYSICAL SERVERS AND CLOUD OFFERINGS 9

Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API, Amazon Web service for IoT

TOTAL: 45 PERIODS

CHAIRMAN
BoS /ECE

OUTCOMES:

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

- Describe the fundamental concepts, characteristics, physical and logical design, sensors, actuators, and domain-specific IoT applications.
- Explain the role of M2M communication, software-defined networks, network function virtualization, and IoT system management protocols like SNMP, NETCONF, and YANG.
- Demonstrate programming skills using Python, Arduino, and Raspberry Pi for interfacing sensors, actuators, and external gadgets.
- Design and implement IoT projects using hardware modules including LEDs, buzzers, sensors (temperature, motion, level, ultrasound), and high-power device switching.
- Utilize cloud platforms and web servers for IoT, including RESTful APIs and AWS IoT services, for data collection, storage, and visualization.

TEXT BOOKS:

1. Peter Waher, "Learning Internet of Things", Packt Publishing, 2015.
2. Arshdeep Bahga and Vijay Madisetti, "Internet of Things - A Hands-on Approach", Universities Press, 2015.

REFERENCES:

1.Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

2.Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016.

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
CO2	3	2	2	-	3	-	-	-	2	-	2
CO3	3	2	2	-	3	-	-	2	2	-	3
CO4	3	3	3	3	3	2	-	2	3	2	3
CO5	3	3	3	2	3	2	-	2	3	3	3

CHAIRMAN
BoS /ECE

24EC607PE	TRANSDUCER ENGINEERING	L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:

- Introduce the fundamentals of measurement systems, standards, and calibration techniques.
- Familiarize students with various types and classifications of transducers.
- Analyze the static and dynamic characteristics of transducers.
- Explain the working principles, construction, and applications of variable resistance, inductance, and capacitance transducers.
- Introduce other types of advanced transducers such as piezoelectric, Hall-effect, magnetoelastic, and smart sensors.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS **9**

Units and standards – Calibration methods – Static calibration – Classification of errors - Limiting error and probable error – Error analysis: – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS **9**

Static characteristics: – Accuracy, precision, resolution, sensitivity, linearity, span and range Dynamic characteristics: – Mathematical model of transducer – Zero, I and II order transducers - Response to impulse, step, ramp and sinusoidal inputs..

UNIT III VARIABLE RESISTANCE TRANSDUCERS **9**

Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS **9**

Induction potentiometer – Variable reluctance transducers – EI pick up – Principle of operation, construction details, characteristics and applications of LVDT –Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V OTHER TRANSDUCERS **9**

Piezoelectric transducer - Hall Effect transducer – Magneto elastic sensor- Digital transducers – Smart sensors - Fibre optic sensor.

TOTAL: 45 PERIODS

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

- Understand units, standards, and calibration methods used in measurement systems.
- Explain and evaluate static characteristics such as accuracy, precision, sensitivity, linearity, and range.

CHAIRMAN
BoS /ECE
24/10/25

- Describe the principles, construction, and characteristics of resistive transducers like potentiometers, strain gauges, and RTDs.
- Describe the operation and applications of capacitive transducers and analyze their frequency response.
- Design and evaluate capacitive and active transducer systems with suitable signal conditioning.
- Integrate the various transducers and their applications.

TEXT BOOKS:

1. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge, 2003.
2. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
3. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.

REFERENCES:

1. John P. Bentley, Principles of Measurement Systems, III Edition, Pearson Education, 2000.
2. Murthy, D.V.S., Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. Ramón Pallás-Areny, John G. Webster, Sensors and Signal Conditioning, Wiley Interscience 2nd Edition, 1991
4. Ian Sinclair, Sensors and Transducers, 3rd Edition, Elsevier, 2012.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS /ECE

24EE304PE	INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS (Common to ECE and EEE)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The students should be made to:

- State the key concepts of Industry 4.0 and sensing systems using appropriate terminology
- Identify the layers of an IIoT architecture and the main functions of each layer.
- Classify IIoT analytics concepts to data lifecycle stages in industrial contexts
- Compare cloud and fog computing concepts within IIoT
- Design IIoT applications and case-study solutions for diverse industries

UNIT I INTRODUCTION TO INDUSTRY 4.0 AND SENSING SYSTEMS 9

Industry 4.0 – Globalization and emerging issues – The fourth industrial revolution – LEAN production systems – Smart and connected business perspective – Smart factories – Cyber physical systems – Next generation sensors – Collaborative platforms – Product lifecycle management – Augmented Reality (AR) and Virtual Reality (VR) – Artificial Intelligence (AI) – Big Data and advanced analytics – Sensing and actuation – Communication– Networking.

UNIT II INDUSTRIAL IoT ARCHITECTURE AND LAYERS 9

Basics of Industrial IoT – Industrial processes – Industrial sensing and actuation – Industrial internet systems – IIoT business models – IIoT reference architecture – IIoT layered architecture – Sensing layer – Processing layer – Communication layer – Networking layer.

UNIT III BIG DATA ANALYTICS AND SOFTWARE PLATFORMS 9

IIoT analytics – Introduction to machine learning and data science – R and Julia programming – Data management with Hadoop – Software Defined Networks (SDN) in IIoT – Data center networks.

UNIT IV CLOUD, FOG COMPUTING AND SECURITY 9

Cloud computing in IIoT – Fog computing in IIoT – Security in IIoT – Cyber security in Industry 4.0 – Security threats, counter measures and industrial best practices.

UNIT V APPLICATIONS AND CASE STUDIES 9

Application domains – Factories and assembly lines – Food Industry – Healthcare – Power plants – Inventory management and quality control – Plant safety and security (including AR/VR safety applications) – Facility management – Oil, chemical and pharmaceutical industries – Applications of UAVs in industries – Case Study: Milk processing and packaging – Manufacturing industries.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (EEE) 16/10/25

COURSE OUTCOMES:

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

- Explain Industry 4.0 components' interaction in smart factories and modern sensing technologies
- Analyze the role of sensing, processing, communication, and networking layers in IIoT
- Illustrate the data flows from data collection to analytics in an IIoT platform and name common tools used in each stage
- Summarize security threats in IIoT and outline at least two countermeasures or best practices
- Evaluate a given industrial scenario to identify potential IIoT applications and benefits

TEXT BOOKS:

1. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress, 2016.
2. Sabina Jeschke, Christian Brecher, Tobias Meisen and Dennis Ozdemir, "Industrial Internet of Things: Cyber manufacturing Systems", Springer, 2017.

REFERENCES:

1. Jay Lee, Behrad Bagheri and Hung-An Kao, "A Cyber-Physical Systems architecture for Industry 4.0-based manufacturing systems", Manufacturing Letters, Elsevier, 2015.
2. Dieter Uckelmann, Mark Harrison and Florian Michahelles, "Architecting the Internet of Things", Springer, 2011.
3. Rajkumar Buyya and Amir Vahid Dastjerdi, "Internet of Things: Principles and Paradigms", Elsevier, 2016.

Mapping of COs with POs:

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

CHAIRMAN
BoS (EEE)

24EC701PE	SYSTEM ON CHIP ARCHITECTURE	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Understand the fundamentals of processor design and trade-offs involved in hardware architecture.
- Explore the principles, models, and techniques of hardware–software partitioning for efficient embedded system design.
- Develop models, topologies, switching techniques, and protocols used in on-chip communication for SoC/MPSoC design.
- Study memory hierarchy, management techniques, and the ARM memory interface.
- Learn about the architectural support ARM provides for operating systems including protection, MMU, and synchronization.

UNIT I INTRODUCTION TO PROCESSOR DESIGN 9

Introduction to SoCs-Technology trends-Design challenges-Abstraction in hardware design-MUO a simple processor-Processor design trade off-Design for low power consumption.

UNIT II HARDWARE AND SOFTWARE PARTIONING 9

Fundamentals of Hardware–Software Partitioning- Partitioning Models, Partitioning Techniques-Static-dynamic partitioning,Heuristic based approaches. Partitioning for Specific Architectures – Application specific instruction processors.

UNIT III ON-CHIP COMMUNICATION ARCHITECTURE DESIGN 9

Need for on-chip communication in SoC/MPSoC- Communication Models, Topologies- mesh, torus, tree, ring, star, fat-tree,butterfly-Switching techniques- circuit switching, packet switching, wormhole switching. Communication Protocols- AMBA, AXI, AHB, OCP, Wishbone

UNIT IV MEMORY HIERARCHY 9

Memory size and speed –on chip memory –caches-cache design an example-Memory managemen. Advanced Microcontroller bus architecture-ARM Memory Interface-ARM Reference Peripheral specification –Hardware System Prototyping tools – Emulator –Debug architecture.

UNIT V ARCHITECTURAL SUPPORT FOR OPERATING SYSTEM 9

An introduction to Operating Systems-ARM System Control coprocessor-CP15 Protection unit registers-ARM protection unit CP15 MMU registers-ARM Architecture-Synchronization-Context Switching input and output.

TOTAL:45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Explain the basic concepts of processor design and evaluate hardware design trade-offs.
- Apply partitioning techniques to select appropriate hardware and software components for optimized system performance.
- Identify and apply suitable on-chip communication architectures to improve system performance.
- Analyze memory organization and apply cache and memory management concepts.
- Describe the operating system support features in ARM including context switching and memory protection mechanisms.

TEXT BOOK:

1.Steve Furber, "ARM system on chip Architecture", 2nd Edition., Addison Wesley Professional.2000.

REFERENCES:

1. Michael J Flynn, Wayne Luck, "Computer System Design: System on Chip", 1st Edition Wiley India,2011.
2. Prakash Rashinkar, Peter Paterson and Leena Singh L., "System on Chip Verification – Methodologies and Techniques", 1st Edition,Kluwer Academic Publisher, 2002.
3. Ricardo Reis, "Design of System on a Chip: Devices and Components" 1st Edition., Springer, 2004.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC702PE	LOW POWER VLSI DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamental concepts of power dissipation mechanisms in CMOS circuits.
- Familiarize students with techniques for power optimization at logic, circuit, gate, and architectural levels.
- Provide knowledge of low-power design strategies for combinational, sequential, and memory circuits.
- Develop skills in power estimation methods at various abstraction levels of VLSI design.
- Equip students with the ability to apply synthesis techniques, algorithms, and software approaches for low-power CMOS design.

UNIT I POWER DISSIPATION IN CMOS **9**

Hierarchy of Limits of Power – Sources of Power Consumption – Physics of Power Dissipation in CMOS FET Devices – Basic Principle of Low Power Design.

UNIT II POWER OPTIMIZATION **9**

Logic Level Power Optimization – Circuit Level Low Power Design – Gate Level Low Power Design –Architecture Level Low Power Design – VLSI Subsystem Design of Adders, Multipliers, PLL, Low Power Design

UNIT III DESIGN OF LOW POWER CMOS CIRCUITS **9**

Computer Arithmetic Techniques for Low Power System – Reducing Power Consumption in Combinational Logic, Sequential Logic, Memories – Low Power Clock – Advanced Techniques – Special Techniques, Adiabatic Techniques – Physical Design, Floor Planning, Placement and Routing.

UNIT IV POWER ESTIMATION **9**

Power Estimation Techniques, Circuit Level, Gate Level, Architecture Level, Behavioral Level, – Logic Power Estimation – Simulation Power Analysis –Probabilistic Power Analysis

UNIT V SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER CMOS CIRCUITS **9**

Synthesis for Low Power – Behavioral Level Transform –Algorithms for Low Power – Software Design for Low Power.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Understand the hierarchy of power dissipation limits and the physics of power consumption in CMOS devices.
- Analyze different power optimization methods across logic, circuit, gate, and architectural levels.
- Apply low-power circuit design strategies to arithmetic units, clocking systems, and subsystems such as adders, multipliers, and PLLs.
- Evaluate power consumption using estimation and analysis techniques like simulation and probabilistic methods at various design levels.
- Design and implement energy-efficient CMOS circuits through synthesis techniques, algorithmic approaches, and software tools for low-power applications.

TEXT BOOKS:

1. Ajit Pal "Low-Power VLSI Circuits and Systems". , Springer Nature ,1st Edition.2015
2. Kaushik Roy and S.C.Prasad, "Low Power CMOS VLSI Circuit Design",1st Edition, Wiley, 2000

REFERENCES:

1. J.B.Kulo and J.H Lou, "Low Voltage CMOS VLSI Circuits", 1st Edition.Wiley-Interscince, 1999.
2. James B.Kulo, Shih-Chia Lin, "Low Voltage SOI CMOS VLSI Devices and Circuits", 1st Edition . Wiley-Interscience, 2001
3. J.Rabaey, "Low Power Design Essentials (Integrated Circuits and Systems)", Springer, 1st Edition ,2009

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

CHAIRMAN
BoS (ECE)

24EC703PE	TESTING OF VLSI CIRCUITS	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce test requirements, metrics, and economics for SOC-based VLSI systems.
- Familiarize students with scan design, Built-In Self-Test (BIST), and advanced DFT techniques.
- Provide knowledge of memory testing methodologies and standard test interfaces (JTAG, IEEE 1500, boundary scan, etc.).
- Develop skills in designing for testability under physical design constraints and power management during test.
- Equip students with techniques for testing analog and mixed-signal circuits in SOCs, including PLLs, ADCs, DACs, and RF blocks.

UNIT I TEST REQUIREMENTS AND METRICS 9

Validation platforms- SOC design methodology, IP components, Integration, Clocking, I/Os and interfaces, Device modes, Logic, memories, analog, I/Os, power management; Test requirements Test handoffs, Testers Where DUT and DFT fit into design / framework; Test- ATPG, DFT, BIST, COF, TTR; Test cost metrics and test economics: Logic fault models- SAF, TDF, PDF, Iddq, StBDG, Dy-BDG, SDD; Basics of test generation and fault simulation- Combinational circuits, Sequential; Specific algorithmic approaches, CAD framework, Optimizations.

UNIT II SCAN DESIGN AND BIST 9

Scan Design- Scan design requirements, Types of scan and control mechanisms, Test pattern construction for scan, Managing scan in IPs and SOCs, Scan design optimizations, Partitioning, Clocking requirements for scan and delay fault testing, Speed of operation; BIST – Framework, Controller configurations, FSMs, LFSRs, STUMPS architecture, Scan compression and bounds, Test per cycle, Test per scan, Self-testing and self-checking circuits, Online test.

UNIT III MEMORY TEST AND TEST INTERFACES 9

Memory Test -Memory fault models, Functional architecture as applicable to test, Test of memories, Test of logic around memories, BIST controller configuration, Test of logic around memories, DFT and architecture enhancements, Algorithmic optimizations; Test Interfaces-Test control requirements, Test interfaces - 1500, JTAG, Hierarchical, serial control, Module / IP test, SOC test, Board test, System test, Boundary scan.

UNIT IV DESIGN CONSIDERATIONS AND POWER MANAGEMENT DURING TEST 9

Design Considerations- Design considerations, Physical design congestion, Partitioning, Clocks, Test modes, Pins, Test scheduling, Embedded test, Architecture improvements, Test in the presence of security; Power management during test- Methods for low power test, ATPG methods, DFT methods, Scan methods, Low power compression, Test of power management, Implications of power excursions, Optimizations.

CHAIRMAN
BoS (ECE)
24/10/25

UNIT V ANALOG TEST 9

Test requirements. DFT methods. BIST methods. Test versus measurement. Defect tests versus performance tests. Tests for specific modules - PLL. I/Os. ADC. DAC. SerDes. etc. RF test requirements.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand SOC-level test requirements. metrics. economics. and logic fault models for digital systems.
- Analyze and apply scan design principles. scan optimizations. and BIST architectures for digital testability.
- Apply memory test fault models. BIST controllers. and test interfaces (1500. JTAG. boundary scan) for SOC-level testing.
- Evaluate design considerations. congestion. clocking. and implement low-power testing methods during DFT.
- Demonstrate knowledge of analog and mixed-signal test requirements and methods for PLLs. I/Os. ADCs. DACs. SerDes. and RF blocks.

TEXT BOOKS:

1. Vishwani Agrawal and Michael Bushnell."Essentials of Electronic Testing for Digital. Memory and Mixed-Signal VLSI Circuits." Springer. 2002.

REFERENCES:

1. M. Abramovici. M.A. Breuer. and A.D. Friedman. Digital Systems Testing and Testable Design. 1st Edition.Wiley. 1994.
2. Laung-Terng Wang. Cheng-Wen Wu. and Xiaoqing Wen. VLSI Test Principles and Architectures: Design for Testability. 1st Edition .Morgan Kaufmann. .2006.
3. M.L. Bushnell and V.D. Agrawal. Essentials of Electronic Testing for Digital. Memory and Mixed-Signal VLSI Circuits. Springer. 2002.
4. P.K. Lala. Digital Circuit Testing and Testability. 1st Edition.Academic Press. 1996.
5. Samiha Mourad and Yervant Zorian. Principles of Testing Electronic Systems. 1st Edition.Wiley. 2000.

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

CHAIRMAN
BoS (ECE)

ECE

31-10-25

24EC704PE	ASIC AND FPGA SYSTEM DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce ASIC types, design flows, CAD tools, and PLD programming technologies.
- Understand the steps involved in ASIC physical design including partitioning, placement, and routing.
- Familiarize students with logic synthesis, HDL-based simulation, and testing methods used in ASIC design.
- Explain FPGA architecture, design methodology, and logic optimization processes.
- Introduce SoC design flow and explore high-performance algorithm implementation for ASICs.

UNIT I OVERVIEW OF ASIC AND PLD **9**

Types of ASICs - Design flow – CAD tools used in ASIC Design – Programming Technologies: Antifuse – static RAM – EPROM and EEPROM technology, Programmable Logic Devices: ROMs and EPROMs – PLA –PAL. Gate Arrays – CPLDs and FPGAs

UNIT II ASIC PHYSICAL DESIGN **9**

System partition -partitioning - partitioning methods – interconnect delay models and measurement of delay - floor planning - placement – Routing: global routing - detailed routing - special routing - circuit extraction - DRC

UNIT III LOGIC SYNTHESIS, SIMULATION AND TESTING **9**

Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language - PLA tools -EDIF- CFI design representation. Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation.

UNIT IV FIELD PROGRAMMABLE ARRAY **9**

Field Programmable gate arrays- Logic blocks, routing architecture, Design flow technology - mapping for FPGAs, Xilinx XC4000 - ALTERA's FLEX 8000/10000, ACTEL's ACT-1,2,3 and their speed performance Case studies: Altera MAX 5000 and 7000 - Altera MAX 9000 – Spartan II and Virtex II FPGAs - Apex and Cyclone FPGAs

UNIT V SOC DESIGN **9**

Design Methodologies – Processes and Flows - Embedded software development for SOC – Techniques for SOC Testing – Configurable SOC – Hardware / Software Co design, Case studies: Digital camera, Bluetooth radio / modem, SDRAM and USB

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Understand ASIC and PLD technologies, types, programming methods, and design flows.
- Apply physical design techniques for ASICs, including partitioning, floor planning, placement, routing, and timing analysis.
- Perform logic synthesis, simulation, and testing using Verilog/VHDL and CAD tools, including boundary scan and fault simulation.
- Analyze FPGA architectures, design flows, and implement FPGA-based designs using industry-standard tools and case studies.
- Apply SoC design methodologies, embedded software development, and hardware/software co-design techniques in practical applications.

TEXT BOOKS:

1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997.
2. 2. S. Trimberger, Field Programmable Gate Array Technology, Edr, Kluwer Academic Publications, 1994

REFERENCES:

1. John V.Oldfield, Richard C Dore, Field Programmable Gate Arrays, Wiley Publications 1995.
2. Farzad Nekoogar and Faranak Nekoogar, From ASICs to SOCs: A Practical Approach, Prentice Hall PTR, 2003.
3. K.Chan & S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall, 1994.
4. Parag.K.Lala, Digital System Design using Programmable Logic Devices , BSP, 2003.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC705PE	VALIDATION AND TESTING TECHNOLOGY	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the fundamentals of IC technologies including MOS, CMOS, NMOS, PMOS, and BiCMOS, along with VLSI fabrication processes.
- Provide a detailed understanding of MOS transistor theory, including electrical characteristics, threshold voltage, transconductance, and short-channel effects.
- Familiarize students with CMOS and BiCMOS circuit design, including inverters, pass transistors, transmission gates, and latch-up considerations.
- Equip students with methods for CMOS circuit characterization, performance estimation, and power dissipation analysis, including delay estimation, logical effort, and transistor sizing.
- Introduce the basics of silicon validation and testing, covering fault modeling, test coverage, observability, controllability, and test economics.

UNIT I TECHNOLOGY INTRODUCTION **9**

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS Technologies. VLSI Fabrication, Oxidation, Lithography, Diffusion, Ion Implantation, Metallization, Integrated Resistors and Capacitors.

UNIT II MOS THEORY ANALYSIS-I **9**

Basic Electrical Properties of MOS Circuits: Ids-Vds Relationships, MOS Transistor Threshold Voltage Vth, gm, gds, Figure of Merit ωo, Short Channel and Narrow Channel Width Effects.

UNIT III MOS THEORY ANALYSIS- II **9**

Pass Transistor, Transmission Gate, NMOS Inverter, Various Pull-ups, CMOS Inverter Analysis and Design, Bi-CMOS Inverters, Latch up in CMOS Circuits.

UNIT IV CMOS CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION **9**

Sheet Resistance RS, conductivity and its Concept to MOS, Area Capacitance Units, Calculations - Delays, Driving Large Capacitive Loads, Delay Estimation, Logical Effort and Transistor Sizing, Power Dissipation, Reliability.

UNIT V BASIC OF SILICON VALIDATION **9**

Need for Testing, Testing at Various Levels, Objectives of Testing - VLSI Test process and Test Equipment - Types of Testing: Functionality Tests, Silicon Debug, Manufacturing Tests, Defect during manufacturing - Fault Modelling, Observability and Controllability, Fault Coverage, Fault Sampling - ATE, Test economics.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Understand different IC technologies, VLSI fabrication steps, and the use of integrated passive components.
- Analyze MOS transistor characteristics, including Ids–Vds relationships, threshold voltage, transconductance, and short/narrow channel effects.
- Design and analyze CMOS and BiCMOS circuits including inverters, pass transistors, transmission gates, and understand latch-up issues.
- Characterize CMOS circuits for performance estimation, including delay, logical effort, transistor sizing, power dissipation, and reliability.
- Understand silicon validation concepts, test processes, fault modeling, and test economics for VLSI circuits.

TEXT BOOKS:

1. Kamran Ehraghian, Dauglas A. Pucknell and Sholeh Eshraghiam, "Essentials of VLSI Circuits and Systems"1st Edition,PHI, EEE, 2005.
2. Neil H. E. Weste and David. Harris Ayan Banerjee, "CMOS VLSI Design" – 4th Edition,Pearson Education, 2010

REFERENCES:

1. M.L. Bushnell and V.D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers, 2004
2. N.K. Jha and S.G. Gupta, "Testing of Digital Systems", Cambridge University Press, 2003
3. Etienne Sicard, Sonia Delmas Bendhia, "Basics of CMOS Cell Design", TMH, EEE, 2007.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC706PE	HARDWARE-SOFTWARE CO-DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Introduce the concepts of embedded systems and the principles of hardware/software co-design.
- Explore hardware/software partitioning methods and cost estimation strategies for efficient system design.
- Apply the principles of processor architecture and system-on-chip design
- Explain the co-synthesis process and its application in generating optimized controller architectures.
- Familiarize students with prototyping, emulation environments, and system-level design specification and verification tools.

UNIT I SYSTEM SPECIFICATION AND MODELLING 9

Hardware, Software, Definition of Hardware/Software Co-Design – Driving factors Platform design space – Application mapping – Dualism of Hardware design and software design – Concurrency and parallelism. Data flow modeling and Transformation – Data Flow Graph – Architectures with one ASIC -Single Processor Architectures with many ASIC-Multi-Processor Architectures -Comparison of Co-Design Approaches.

UNIT II HARDWARE/SOFTWARE PARTITIONING 9

The Hardware/Software Partitioning Problem-Hardware-Software Cost Estimation- Generation of the Partitioning Graph-Formulation of the HW/SW Partitioning Problem-Optimization-HW/SW Partitioning based on Heuristic Scheduling-HW/SW Partitioning based on Genetic Algorithms.

UNIT III DESIGN SPACE OF CUSTOM ARCHITECTURES 9

Finite state machines with datapath – FSMD design example. Limitations – Microprogrammed Architecture – Microprogrammed control, microinstruction encoding, Microprogrammed data path, microprogrammed machine – General purpose Embedded Core – RISC pipeline, Program organization – SoC interfaces for custom hardware – Design Principles in SoC Architecture

UNIT IV PROTOTYPING AND EMULATION 9

Introduction, Prototyping and Emulation Techniques- Prototyping and Emulation Environments, Future Developments in Emulation and Prototyping-Target Architecture- Architecture Specialization Techniques-System Communication Infrastructure-Target Architectures and Application System- Architectures for Control and Dominated Systems, Architectures for Data Dominated Systems-Mixed Systems and Less Specialized Systems

CHAIRMAN
BoS (ECE)

UNIT V DESIGN SPECIFICATION AND VERIFICATION 9

Concurrency- Coordinating Concurrent Computations. Interfacing Components. Verification- Languages for System-Level Specification and Design System-Level Specification-Design Representation for System Level Synthesis- System Level Specification Languages- Heterogeneous Specification and Multi-Language Co-simulation

TOTAL:45 PERIODS

OUTCOMES:

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

- Describe the co-design methodology for embedded systems and evaluate system specifications.
- Formulate and solve hardware/software partitioning problems using estimation and optimization techniques.
- Analyze processor subsystems and integrate custom hardware using SoC interfaces,
- Utilize prototyping and emulation tools and identify architectures suitable for various system types.
- Analyze system-level specification languages and verification methods for concurrent and heterogeneous systems.

TEXT BOOK:

1. Ralf Niemann , "Hardware/Software Co-Design for Data Flow Dominated Embedded Systems", Kluwer Academic Pub, 1998.

REFERENCES:

1. Jorgen Staunstrup , Wayne Wolf ,"Hardware/Software Co-Design: Principles and Practice" , Kluwer Academic Pub, 1997.
2. Giovanni De Micheli , Rolf Ernst Morgon." Reading in Hardware/Software Co-Design " Kaufmann Publishers.2001.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC707PE	RFIC DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Students Should be made to

- Understand the concept of impedance matching techniques for effective amplifier design.
- Provide knowledge on noise behavior of MOS devices and design techniques for low-noise and RF power amplifiers.
- Study the operation and design techniques of different types of mixer circuits.
- Explore oscillator topologies and understand their frequency stability and phase noise characteristics.
- Learn about PLL and frequency synthesizer architectures and their design considerations in RF systems.

UNIT I IMPEDANCE MATCHING IN AMPLIFIERS **9**

Definition of 'Q', Series Parallel Transformations of Lossy Circuits, Impedance Matching Using 'L', 'Pi' and T Networks, Integrated Inductors, Resistors, Capacitors, Tunable Inductors, Transformers.

UNIT II HIGH FREQUENCY AMPLIFIER DESIGN **9**

Noise Characteristics of MOS Devices, Design of CG LNA and Inductor Degenerated LNAs. Principles of RF Power Amplifiers Design-Power constrained noise optimization, linearity and large signal performance.

UNIT III ACTIVE AND PASSIVE MIXERS **9**

Qualitative Description of the Gilbert Mixer - Conversion Gain, and Distortion and Noise , Analysis of Gilbert Mixer – Switching Mixer - Distortion in Unbalanced Switching Mixer - Conversion Gain in Unbalanced Switching Mixer - Noise in Unbalanced Switching Mixer - a Practical Unbalanced Switching Mixer. Sampling Mixer - Conversion Gain in Single Ended Sampling Mixer - Distortion in Single Ended Sampling Mixer - Intrinsic Noise in Single Ended Sampling Mixer - Extrinsic Noise in Single Ended Sampling Mixer.

UNIT IV OSCILLATORS **9**

LC Oscillators, Voltage Controlled Oscillators, Ring Oscillators, Delay Cells, Tuning Range in Ring Oscillators, Tuning in LC Oscillators, Negative resistance oscillators, Tuning Sensitivity, Phase Noise in Oscillators, Sources of Phase Noise

UNIT V PLL AND FREQUECNCY SYNTHEZIERS **9**

Phase Detector/Charge Pump, Analog Phase Detectors, Digital Phase Detectors, Frequency Dividers, Loop Filter Design, Phase Locked Loops, Phase Noise in PLL, Loop Bandwidth,Basic Integer-N Frequency Synthesizer, Basic Fractional-N Frequency Synthesizer-Combination synthesizers, phases noise considerations.

TOTAL:45 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

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

- Understand impedance matching techniques using L, Pi, and T networks, and integrated passive components.
- Analyze and design high-frequency MOS amplifiers, including common-gate LNAs and RF power amplifiers with noise and linearity considerations.
- Apply principles of active and passive mixer design, evaluating conversion gain, noise, and distortion in Gilbert and sampling mixers.
- Design and evaluate oscillators (LC, ring, VCO) with consideration of phase noise, tuning range, and negative resistance characteristics.
- Design and analyze phase-locked loops and frequency synthesizers, considering loop filter design, phase noise, and bandwidth in integer-N and fractional-N architectures.

TEXT BOOK:

1. Thomas H. Lee, Cambridge, "The Design of CMOS Radio-Frequency Integrated Circuits", 2nd Edition,UK: Cambridge University Press, 2004.

REFERENCES:

1. Phillip E. Allen and Douglas R. Holberg,"CMOS Analog Circuit Design," 3rd Edition,Oxford, University Press,2011
2. Behzad Razavi, "RF Microelectronics", 2nd Edition,Prentice Hall, 2012.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

24EC708PE	ANALOG IC DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce negative feedback systems, loop gain concepts, and stability analysis for amplifiers.
- Explain frequency compensation techniques in op-amp design, including multi-stage op-amps and compensation methods.
- Familiarize students with IC components, device models, mismatch, layout considerations, and noise analysis in amplifier circuits.
- Provide hands-on knowledge of designing single-stage, multi-stage, and cascode op-amps with analysis of AC response, CMRR, mismatch, and noise.
- Introduce phase-locked loops (PLLs), frequency multipliers, and their transfer functions, including jitter, phase noise, and LC oscillator behavior.

UNIT I NEGATIVE FEEDBACK SYSTEMS AND STABILITY **9**

Negative feedback amplifier using an integrator; Frequency and time domain behavior; Loop gain and its implications; Negative feedback amplifier realization; Finite DC gain; Increasing DC gain; Effect of multiple poles; Negative feedback systems with multiple poles and zeros in the forward path; Stability analysis using Nyquist criterion; Nyquist criterion; Loop gain-Bode plot and time domain interpretation; Significance of 60 degree phase margin.

UNIT II OPAMP FREQUENCY COMPENSATION **9**

Concept of the op amp for realizing negative feedback circuits; Realizing a multi stage op amp-frequency compensation-miller op amp; Realizing a multi stage op amp; feedforward compensated op amp; Op amp as a general block; unity gain compensation; non idealities swing limits, slew rate, offset; dc negative feedback around op amps.

UNIT III COMPONENTS AND NOISES **9**

IC components and their models; Mismatch; Layout considerations . Noise models; Noise calculations; Noise scaling. Body effect in basic amplifier stages; Frequency response of a common source amplifier

UNIT IV OPAMP DESIGN **9**

Realizing a single stage op amp-diff pair; small signal ac analysis; Single stage op amp-mismatch and noise; Single stage op amp-telescopic cascode; Replica biasing a cascode; Single stage op amp-folded cascode; Two stage miller compensated op amp; Three stage o pamp; CMRR of an op amp and op amp circuits.

UNIT V PHASE LOCKED LOOP **9**

Frequency multiplier-Phase locked loop; Lock range limitations; type II loop; Jitter & Phase noise; Continuous time approximation; PLL transfer functions; Reference feedthrough spurs; LC oscillators.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (ECE)
24/10/25

OUTCOMES:

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

- Analyze negative feedback systems, determine stability using Nyquist and Bode methods, and understand phase margin significance.
- Design and implement frequency-compensated op-amps, including multi-stage and feedforward compensated structures, considering non-idealities.
- Model IC components, evaluate mismatch effects, and calculate noise performance in amplifier circuits.
- Design single-stage and multi-stage op-amps (telescopic, folded cascode, Miller-compensated), considering AC performance, CMRR, and biasing techniques.
- Analyze and design phase-locked loops and frequency multipliers, evaluating jitter, phase noise, and reference feedthrough effects in LC oscillators.

TEXT BOOKS:

1. Behzad Razavi, "Design of Analog CMOS Integrated Circuits",2nd edition, Mcgraw Hill, 2017.
2. Paul. R.Gray, Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley, 5th edition,2009.

REFERENCES:

1. Willey M.C. Sansen, "Analog Design Essentials", Springer, 2006.
2. D. A. Johns and K. Martin, "Analog Integrated Circuit Design", John Wiley & Sons, 1997
3. P.E.Allen, D.R. Holberg, "CMOS Analog Circuit Design",3rd Edition, Oxford University Press, 2012.

MAPPING OF COs WITH POs AND PSOs

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

CHAIRMAN
BoS (ECE)

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

CHAIRMAN
BoS (IT)

OUTCOMES:

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

- Explain about the decision areas in finance.
- Discuss about the various sources of Finance.
- Work on capital budgeting and cost of capital.
- Construct a robust capital structure and dividend policy.
- Handle the tools on Working Capital Management.

TEXT BOOKs:

1. M.Y. Khan and P.K.Jain, Financial management, Text, Tata McGraw Hill, Ltd.
2. M. Pandey, Financial Management, Vikas Publishing House Pvt. Ltd.

REFERENCES:

1. James C. Vanhorne, Fundamentals of Financial Management, PHI Learning.
2. Srivatsava, Mishra, Financial Management, Oxford University Press, 2011.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	2	1	-	-	-	1	-	-	3	3	2
2	2	1	-	-	-	1	2	-	3	3	2
3	2	1	-	-	-	1	-	--	3	3	2
4	2	1	-	-	-	1	2	-	3	3	2
5	2	1	-	-	-	1	-	-	3	3	2

CHAIRMAN
BoS (IT)

28/10/24

24M102	FUNDAMENTALS OF INVESTMENT	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	-	-	-	-	-

CHAIRMAN
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.

CHAIRMAN
BoS (IT)

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.

CHAIRMAN
BoS (IT)

UNIT V REGULATORY ISSUES **9**

FinTech Regulations: Global Regulations - Domestic Regulations - Evolution of RegTech - RegTech Ecosystem: Financial Institutions - RegTech Ecosystem: Startups RegTech - Startups: Challenges - RegTech Ecosystem: Regulators - Use of AI in Regulation - Fraud Detection.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain about the currency exchange and payment.
- Discuss on the concept of digital finance and alternative finance.
- Elaborate about the concept of insurtech.
- Discuss about the process of peer to peer lending.
- Explain about the various regulatory issues related to finance.

TEXT BOOKs:

- Swanson Seth, Fintech for Beginners: Understanding and utilizing the power of technology, Createspace Independent Publishing Platform, 2016.

REFERENCES:

- Models AuTanda, Fintech Bigtech And Banks Digitalization and Its Impact On Banking Business, Springer, 2019.
- Henning Diedrich, Ethereum: Blockchains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations, Wildfire Publishing, 2016.
- Jacob William, FinTech:TheBeginner's Guide to Financial Technology, Createspace Independent Publishing Platform, 2016.
- IIBF, Digital Banking, Taxmann Publication, 2016.
- Jacob William, Financial Technology, Create space Independent Pub, 2016.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	2	2	3	2	1	2	1	2	1
2	3	3	3	2	2	2	2	2	1	2	1
3	3	3	3	3	3	2	2	2	2	2	1
4	3	3	3	3	3	3	2	2	2	2	1
5	3	3	2	3	2	3	3	3	2	2	2

CHAIRMAN
BoS (IT)

28/10/25

24M106	INTRODUCTION TO FINTECH (Common to all Branches)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Learn about history, importance and evolution of Fintech.
- Acquire the knowledge of Fintech in payment industry.
- Acquire the knowledge of Fintech in insurance industry.
- Learn the Fintech developments around the world.
- Study about the future of Fintech.

UNIT I INTRODUCTION TO FINTECH **9**

Fintech - Definition - History - Concept - Meaning - Architecture - Significance - Goals - Key Areas in Fintech - Importance of Fintech - Role of Fintech in Economic Development - Opportunities and Challenges in Fintech - Evolution of Fintech in Different Sectors of the Industry - Infrastructure - Banking Industry - Startups and Emerging Markets.

UNIT II PAYMENT INDUSTRY **9**

Fintech in Payment Industry - Multichannel Digital Wallets - Applications Supporting Wallets - Onboarding and KYC Application - Fintech in Lending Industry - Formal Lending - Informal Lending - P2P Lending - POS Lending - Online Lending.

UNIT III INSURANCE INDUSTRY **9**

Fintech in Wealth Management Industry - Financial Advice - Automated Investing - Socially Responsible Investing - Fractional Investing - Social Investing - Fintech in Insurance Industry - P2P Insurance - On-Demand Insurance - Consultation - Customer Engagement through Quote to Sell - Policy Servicing - Claims Management - Investment Linked Health Insurance.

UNIT IV FINTECH AROUND THE GLOBE **9**

Fintech Developments - US - Europe - UK - Germany - Sweden - France - China - India - Regulatory and Policy Assessment for Growth of Fintech - Fintech as Disruptors - Financial Institutions Collaborating with Fintech Companies - New Financial World.

UNIT V FUTURE OF FINTECH **9**

How Emerging Technologies Will Change Financial Services - Future of Financial Services - Banking on Innovation through Data - Why Fintech Banks will Rule the World - Fintech Supermarket - Banks Partnering with Fintech Start-Ups - Rise of Banktech - Fintech Impact on Retail Banking - Future without Money - Ethics in Fintech.

CHAIRMAN
BoS (IT)

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain about history, importance and evolution of Fintech.
- Discuss about the process of Fintech in payment industry.
- Discuss about the process of Fintech in insurance industry.
- Handle the process of the various Fintech around the world.
- Discuss about the future of Fintech.

TEXT BOOKs:

- Arner D., Barbers J., Buckley R, The evolution of FinTech: a new post crisis paradigm, University of New South Wales Research Series, 2015

REFERENCES:

- Susanne Chishti, Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, Wiley Publications, 2016.
- Richard Hayen, FinTech: The Impact and Influence of Financial Technology on Banking and the Finance Industry, 2016.
- Parag Y Arjunwadkar, FinTech: The Technology Driving Disruption in the financial service industry CRC Press, 2018.
- Sanjay Phadke, Fintech Future : The Digital DNA of Finance Paperback .Sage Publications, 2020.

COs – POs Mapping

COURSE OUTCOMES	POs										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	2	2	2	2	1	2	1	2	1
2	3	3	3	3	3	2	2	2	1	2	1
3	3	3	3	3	3	3	2	2	2	2	1
4	3	3	3	3	3	3	3	3	2	3	2
5	3	3	2	3	3	3	3	3	2	3	2

CHAIRMAN
BoS (IT)

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.

CHAIRMAN
(BoS / MECH) 29/10/25

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

CHAIRMAN
(BoS / MECH) 28/10/25

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.

CHAIRMAN
(BoS / MECH) 28/10/25

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.

CHAIRMAN
(BoS / MECH) 28/10/25

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

CHAIRMAN
(BoS / MECH) 28/10/25

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

CHAIRMAN
(BoS / MECH) 28/10/25

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

CHAIRMAN
BOS/ECE 28/10/25

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

CHAIRMAN
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.

CHAIRMAN
BOS/ECE 28/10/25

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

CHAIRMAN
BOS/ECE

24M303	PUBLIC PERSONNEL ADMINISTRATION (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the concept, scope, and significance of personnel administration in public administration.
- Learn the structure and functioning of civil services and bureaucracy.
- Study recruitment, training, promotion, and disciplinary mechanisms in public service.
- Understand the role of ethics, code of conduct, and accountability in personnel administration.
- Examine contemporary issues, challenges, and reforms in personnel management in government.

UNIT-I INTRODUCTION TO PUBLIC PERSONNEL ADMINISTRATION **9**

1. Meaning, Nature, and Scope of Personnel Administration
2. Importance and Functions of Personnel Administration
3. Relationship between Personnel Administration and Public Administration
4. Principles of Effective Personnel Management

UNIT-II BUREAUCRACY AND CIVIL SERVICES **9**

1. Bureaucracy: Meaning, Nature, and Features
2. Role of Civil Services in Governance and Development
3. Classification of Civil Services: Central and State Services
4. Functions and Responsibilities of Civil Servants

UNIT-III RECRUITMENT AND TRAINING **9**

1. Recruitment: Methods and Procedures in Public Services
2. Selection Process and Entry-Level Requirements
3. 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

CHAIRMAN
BOS/ECE 28/10/25

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

CHAIRMAN
BOS/ECE

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

CHAIRMAN
BOS/ECE

- 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

CHAIRMAN
BOS/ECE

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

CHAIRMAN
BOS/ECE
28/10/25

OUTCOMES:

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

- Explain the evolution and constitutional basis of Indian administration
- Describe the structure, roles, and responsibilities of Union Government institutions
- Analyze state government structures and local self-governance mechanisms
- Explain the role, recruitment, and accountability of civil services in India
- Evaluate administrative reforms, e-governance, and contemporary challenges

TEXT BOOKS

1. M.P. Sharma and B.L. Sadana, "Public Administration in Theory and Practice," Kitab Mahal, 2021.
2. Avasthi, A. and Maheshwari, S.R., "Public Administration," Lakshmi Narain Agarwal, 18th Edition, 2022.
3. Laxmikanth, M., "Public Administration," McGraw-Hill, 2022.

REFERENCES:

1. Subhash Kashyap, "Indian Administration," National Book Trust, 2020.
2. Peter Self, "Administrative Theories and Politics," Routledge, 2nd Edition, 2019.
3. F.W. Riggs, "Ecology of Public Administration," Asia Publishing House, 2021.
4. Vig, N., "Indian Civil Services and Governance," Sage Publications, 2021.

MAPPING OF COs WITH POs

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

CHAIRMAN
BOS/ECE

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

CHAIRMAN
BOS/ECE
28/10/25

OUTCOMES:

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

- Explain the nature, scope, and significance of public policy
- Analyze the stages and actors in policy formulation
- Describe policy implementation mechanisms and challenges
- Evaluate policy outcomes using methods and feedback mechanisms
- Assess contemporary policy issues, reforms, and best practices

TEXT BOOKS:

1. Thomas R. Dye, "Understanding Public Policy," Pearson, 15th Edition, 2020.
2. DeLeon, Public Policy: Theory and Practice, Routledge, 2nd Edition, 2019.
3. M.P. Sharma and B.L. Sadana, "Public Administration in Theory and Practice," Kitab Mahal, 2021.

REFERENCES:

1. James E. Anderson, "Public Policy: An Introduction to the Theory and Practice," Cengage, 9th Edition, 2021.
2. Subhash Kashyap, "Public Policy and Governance in India," National Book Trust, 2020.
3. Peter Hupe and Michael Hill, "Implementing Public Policy," Sage Publications, 2019.
4. F.W. Riggs, "Ecology of Public Administration," Asia Publishing House, 2021.

MAPPING OF COs WITH POs

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

CHAIRMAN
BOS/ECE

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

CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

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

- Facilitate objective solutions in distribution techniques
- Estimate population values from samples
- Test hypotheses using parametric methods
- Develop skill-set that is in demand in both the research and business environments
- Measure correlation and build regression lines

TEXT BOOKS:

1. Richard I Levin, David S Rubin, Masood H Siddiqui, Sanjay Rastogi, "Statistics for Management", Pearson Education, 8th Edition, 2017.
2. Ken Black, "Applied Business Statistics", 7th Edition, Wiley India Edition, 2012.

REFERENCES:

1. Prem S Mann, "Introductory Statistics", Wiley Publications, 9th Edition, 2015.
2. Srivastava T N and Shailaja Rego, "Statistics for Management", Tata McGraw Hill, 3rd Edition 2017.
3. David R Anderson, Dennis J Sweeney, Thomas A Williams, Jeffrey D Camm, James J Cochran, "Statistics for business and economics", 13th Edition, Thomson (South – Western) Asia, Singapore, 2016.
4. Vohra N D, "Business Statistics", Tata McGraw Hill, 2017.

CO - PO Mapping:

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

CHAIRMAN
BoS (AD)

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

CHAIRMAN
BoS (AD) 23/10/25

TEXT BOOKS:

1. Ralph Kimball and Richard Merz, "The data warehouse toolkit", John Wiley, 3rd Edition, 2013.
2. Galit Shmueli, Nitin R Patel and Peter C Bruce, "Data Mining for Business Intelligence-Concepts, Techniques and Applications", Wiley, India, 2010.

REFERENCES:

1. Jaiwei Ham and Micheline Kamber, "Data Mining concepts and techniques", Kauffmann 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

CHAIRMAN
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

CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

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

- Explain stages of HR analytics maturity and identify key HR KPIs
- Calculate and interpret metrics like time to hire, cost per hire, and quality of hire
- Apply training metrics such as training hours, cost per employee, and ROI
- Use metrics like retention index, promotion index, and career path index
- Analyze diversity using gender mix, churn rate, and age/service 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

CHAIRMAN
BoS (AD)

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

CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

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

- Use techniques like market basket analysis and geo-mapping to interpret marketing data
- Identify social media goals, audiences, influencers, and promotional strategies
- Apply social media policies and measure platform performance responsibly
- Collect, interpret, and report web data to support digital strategy decisions
- Apply SEO, traffic analysis, and data visualization to improve online performance

TEXT BOOKS:

1. Takeshi Moriguchi, "Web Analytics Consultant Official Textbook", 7th Edition, 2016.
2. Christian Fuchs, "Social Media a critical introduction", SAGE Publications Ltd, 2014.

REFERENCES:

1. Shrivastava K M, "Social Media in Business and Governance", Sterling Publishers Private Limited, 2013.
2. Bittu Kumar, "Social Networking", V & S Publishers, 2013.
3. Avinash Kaushik, "Web Analytics An Hour a Day", Wiley Publishing, 2007.
4. Ric T Peterson, "Web Analytics Demystified", Celilo Group Media and Café Press 2004.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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

CHAIRMAN
BoS (AD)

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

CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

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

- Explain descriptive. predictive. and prescriptive analytics and their application in supply chain transformation
- Apply P-Median. LP. and heuristic approaches for warehouse space and layout decisions
- Implement lot sizing. multi-echelon inventory. and risk pooling strategies
- Solve problems using shortest path. maximal flow. traveling salesman. and scheduling algorithms
- Apply AHP. DEA. Fuzzy Logic. ANP. and TOPSIS in supply chain decisions

TEXT BOOKS:

1. Gerhard J Plenert. "Supply Chain Optimization through Segmentation and Analytics", CRC Press. Taylor & Francis Group. 2014.
2. Muthu Mathirajan. Chandrasekharan Rajendran. Sowmyanarayanan Sadagopan. Arunachalam Ravindran. Parasuram Balasubramanian. "Analytics in Operations/Supply Chain Management". I.K. International Publishing House Pvt. Ltd.. 2016.

REFERENCES:

1. Nada R Sanders. "Big data driven supply chain management: A framework for implementing analytics and turning information into intelligence". Pearson Education. 2014.
2. Michael Watson. Sara Lewis. Peter Cacioppi. Jay Jayaraman. "Supply Chain Network Design: Applying Optimization and Analytics to the Global Supply Chain". Pearson Education. 2013.
3. Anna Nagurney. Min Yu. Amir H Masoumi. Ladimer S Nagurney. "Networks Against Time: Supply Chain Analytics for Perishable Products". Springer. 2013.

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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

CHAIRMAN
BoS (AD)

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

CHAIRMAN
BoS (AD) 16/10/25

OUTCOMES:

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

- Perform cash flow analysis and apply payback, NPV, and IRR methods
- Analyze bond and stock investments using ARMA, ARCH, GARCH models and Value at Risk
- Apply CAPM, Sharpe ratio, binomial and Black-Scholes models in portfolio analysis
- Analyze share prices using RSI, MACD, moving averages, and simulate trading strategies
- Build and evaluate credit risk models using decision trees and logistic regression

TEXT BOOKS:

1. Yuxing Yan, "Python for Finance", Paperback - Import, 30 Jun 2017.
2. James Ma Weiming "Mastering Python for Finance Paperback", Import, 29 Apr 2015.

REFERENCES:

1. Mark J Bennett, Dirk L Hugen, "Financial analytics with R", Cambridge University Press.
2. Pavel Ryzhov, "Haskell Financial Data Modeling and Predictive Analytics", Paperback – Import, 25 Oct 2013.
3. Edward E Williams, John A Dobelman "Quantitative Financial Analytics: The Path to Investment Profits Paperback", Import, 11 Sep 2017.

CO - PO Mapping:

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

CHAIRMAN
BoS (AD)

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 –

CHAIRMAN
BoS (CIVIL)

Sustainability in geotechnical practice – Design considerations, Design Parameters and Procedures – Quality control and Assurance - Use of sustainable construction techniques: Precast concrete technology, Pre-engineered buildings

UNIT IV SUSTAINABLE CONSTRUCTION MATERIALS **9**

Construction materials: Concrete, steel, glass, aluminium, timber and FRP - No/Low cement concrete - Recycled and manufactured aggregate - Role of QC and durability - Sustainable consumption – Eco-efficiency - green consumerism - product stewardship and green engineering - Extended producer responsibility – Design for Environment Strategies, Practices, Guidelines, Methods, And Tools. Eco-design strategies –Design for Disassembly - Dematerialization, rematerialization, transmaterialization – Green procurement and green distribution - Analysis framework for reuse and recycling – Typical constraints on reuse and recycling - Communication of Life Cycle Information - Indian Eco mark scheme - Environmental product declarations – Environmental marketing- Life cycle Analysis (LCA), Advances in LCA: Hybrid LCA, Thermodynamic LCA - Extending LCA - economic dimension, social dimension - Life cycle costing (LCC) - Combining LCA and LCC – Case studies

UNIT V SUSTAINABLE MAINTENANCE OF INFRASTRUCTURE PROJECTS **9**

Case Studies - Sustainable projects in developed countries and developing nations - An Integrated Framework for Successful Infrastructure Planning and Management - Information Technology and Systems for Successful Infrastructure Management, - Structural Health Monitoring for Infrastructure projects - Innovative Design and Maintenance of Infrastructure Facilities - Capacity Building and Improving the Governments Role in Infrastructure Implementation, Infrastructure Management Systems and Future Directions. – Use of Emerging Technologies – IoT, Big Data Analytics and Cloud Computing, Artificial Intelligences, Machine and Deep Learning, Fifth Generation (5G) Network services for maintenance

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the environment sustainability goals at global and Indian scenario.
- Recognize risks in development of projects and suggest mitigation measures.
- Apply lean techniques, LBMS and new construction techniques to achieve sustainability in infrastructure construction projects.
- Explain Life cycle analysis and life cycle cost of sustainable construction materials.
- Explore the new technologies adopted for maintenance of infrastructure projects.

CHAIRMAN
BoS (CIVIL)

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	-

CHAIRMAN
BoS (CIVIL)

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

CHAIRMAN
BoS (CIVIL)

UNIT IV ENERGY AND WASTE MANAGEMENT 9

Types and sources of agricultural wastes - Composition of agricultural wastes - Sustainable technologies for the management of agricultural wastes - Useful and high value materials produced using different processes from agricultural wastes - Renewable energy for sustainable agriculture

UNIT V EVALUATING SUSTAINABILITY IN AGROECOSYSTEMS 9

Indicators of sustainability in agriculture - On-farm evaluation of agroecosystem sustainability - Alternative agriculture approaches/ farming techniques for sustainable food production - Goals and components of a community food system - Case studies

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explore the knowledge about the concepts, principles and advantages of sustainable agriculture.
- Discuss the sustainable ways in managing soil health, nutrients, pests and diseases.
- Suggest the ways to optimize the use of water in agriculture to promote an ecological use of resources.
- Develop energy and waste management plans for promoting sustainable agriculture in non-sustainable farming areas.
- Assess an ecosystem for its level of sustainability and prescribe ways of converting to a sustainable system through the redesign of a conventional agroecosystem.

REFERENCES:

1. Approaches to Sustainable Agriculture – Exploring the Pathways Towards the Future of Farming, Oberc, B.P. & Arroyo Schnell, A., IUCN, Belgium, 2020
2. Natural bioactive products in sustainable agriculture, Singh, J. & Yadav, A.N., Springer,2020
3. Organic Farming for Sustainable Agriculture, Nandwani, D., Springer, 2016
4. Principles of Agronomy for Sustainable Agriculture, Villalobos, F.J. &Fereres, E., Springer, 2016
5. Sustainable Agriculture for Food Security: A Global Perspective, Balkrishna, A., CRC Press, 2021
6. Sustainable Energy Solutions in Agriculture, Bundschuh, J. & Chen, G., CRC Press, 2014

Mapping of COs with POs

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

CHAIRMAN
BoS (CIVIL)

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

CHAIRMAN
BoS (CIVIL)

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	-	-	-	-	-

CHAIRMAN
BoS (CIVIL)

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).

CHAIRMAN
BoS (CIVIL)

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.

CHAIRMAN
BoS (CIVIL)

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	-	-	-	-	-

CHAIRMAN
BoS (CIVIL)

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.

CHAIRMAN
BoS (CIVIL)

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	-	-	-	-	-

CHAIRMAN
BoS (CIVIL)

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

CHAIRMAN
BoS (CIVIL)

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	-	-	-	-	-

CHAIRMAN
BoS (CIVIL)

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.

CHAIRMAN
BoS (CIVIL)

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	-	-	-	-

CHAIRMAN
BoS (CIVIL)

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

CHAIRMAN
BoS (CIVIL)

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	-	-	-	-	-

CHAIRMAN
BoS (CIVIL)