Electronics and Communication Engineering

Regulation2019

B.E – ELECTRONICS AND COMMUNICATION ENGINEERING

VISION OF THE DEPARTMENT

- To emerge as a centre of academic eminence in Electronics and Communication and related spheres through knowledge acquisition and propagation meeting global needs and standards.

MISSION OF THE DEPARTMENT

- To impart quality education by inculcating fundamental knowledge in Electronics and Communication Engineering with due focus on research and industry practices.
- To propagate lifelong learning.
- To impart the right proportion of knowledge, attitudes and ethics in students to enable them take up positions of responsibility in the society and make significant contributions.

PROGRAMME OUTCOMES (PO'S)

PO'S	PROGRAMME OUTCOMES
PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design / Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO'S)

PSO'S	PROGRAMME SPECIFIC OUTCOMES
PSO1	Demonstrate and analysis of Electronic systems through analog and digital circuits.
PSO2	Design and Develop models to progress on latest technological improvement in the fulfillment of electronics, communication and computing knowledge.
PSO3	Identify the environmental requirements and able to provide technological assistance to the society by acquired technical knowledge.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO'S)

PEOS	PROGRAMME EDUCATIONAL OBJECTIVES
PEO1	Graduates will acquire strong foundation in basic science, mathematics and computing knowledge and get benefits in their professional career or higher education and research or technological entrepreneur
PEO2	Graduates will have analyze the trends in need of electronics engineering, design appropriate system to provide solutions that are technically sound, economically feasible and socially acceptable.
PEO3	Graduates will have the ethical attitude, effective communication skills, and team work to adapt recent trends by engaging in lifelong learning

Semester-I

S.No	Course Code	Name of the Course	Category	No of Hours/Week			Credits
THEORY				Lecture	Tutorial	Practical	
1	191MA101	Engineering Mathematics - I	BS	2	2	0	3
2	191PH101	Engineering Physics	BS	3	0	0	3
3	191CH101	Engineering Chemistry	BS	3	0	0	3
4	191HS101	English for Engineering Students	HSS	3	0	0	3
5	191ME111	Basic of Civil and Mechanical Engineering	ES	3	0	0	3
6	191EE111	Basic of Electrical and Electronics Engineering	ES	3	0	0	3
7	191ME112	Engineering Graphics	ES	2	2	0	3
PRACTICAL							
8	191PH10A	Physics Laboratory	BS	0	0	2	1
9	191CH10A	Chemistry Laboratory	BS	0	0	2	1
Total				19	4	4	23

Semester-II

S.No	Course code	Name of the Course	Category	No of Hours/Week			Credits
THEORY				Lecture	Tutorial	Practical	
1	191MA201	Engineering Mathematics - II	BS	2	2	0	3
2	191EE211	Network Analysis and Synthesis	ES	2	2	0	3
3	191EC221	Semiconductor Devices	PC	3	0	0	3
4	191HS201	Environment Science and Engineering	HSS	3	0	0	3
5	191CS211	Problem Solving and Python Programming	ES	3	0	0	3
PRACTICAL							
6	191EC22A	Circuits and Devices Laboratory	PC	0	0	4	2
7	191CS21A	Problem Solving and Python Programming Laboratory	ES	0	0	2	1
8	191ME21A	Engineering Practices Laboratory	ES	0	0	4	2
Total				13	4	10	20

Semester-III

S.No	Course Code	Name of the Course	Category	No of Hours/Week			Credits
THEORY				Lecture	Tutorial	Practical	
1	191MA304	Linear Algebra and Partial Differential Equations	BS	2	2	0	3
2	191CS311	Data Structures in C	ES	3	0	0	3
3	191EC321	Digital Logic Circuit Design	PC	3	0	0	3
4	191EC322	Electronic Circuits-I	PC	3	0	0	3
5	191EC323	Signals and Systems	PC	2	2	0	3
6	191HS301	Management Science	HSS	3	0	0	3
PRACTICAL							
7	191CS31A	Data Structures in C Laboratory	ES	0	0	2	1
8	191EC32A	Analog and Digital Electronics Laboratory	PC	0	0	4	2
9	191HS30B	Inter Personal Skills Listening and Speaking	BS	0	0	2	1
Total				16	4	8	22

Semester-IV

S.No	Course Code	Name of the Course	Category	No of Hours/Week			Credits
THEORY				Lecture	Tutorial	Practical	
1	191MA401	Probability and Random Process	BS	2	2	0	3
2	191EC421	Analog Communication	PC	3	0	0	3
3	191EC422	Electronic Circuits-II	PC	3	0	0	3
4	191EC423	Electromagnetic Field	PC	2	2	0	3
5	191EC424	Linear Integrated Circuits	PC	3	0	0	3
6	191EC425	Microprocessors and Microcontrollers	PC	3	0	0	3
PRACTICAL							
7	191EC42A	Integrated Circuits and Simulation Laboratory	PC	0	0	2	1
8	191EC42B	Microprocessor and Microcontrollers Laboratory	PC	0	0	2	1
9	191MC46A	Internship / Training-I	MC	0	0	0	**
Total				16	4	4	20

Semester-V

S.No	Course Code	Name of the Course	Category	No of Hours/Week			Credits
THEORY				Lecture	Tutorial	Practical	
1	191EC521	Digital Communication	PC	3	0	0	3
2	191EC522	Digital Signal Processing	PC	2	2	0	3
3	191EC523	Transmission Lines and RF Systems	PC	3	0	0	3
4	191EE511	Control System Engineering	ES	3	0	0	3
5		Professional Elective I	PE	3	0	0	3
6		Open Elective I	OE	3	0	0	3
PRACTICAL							
7	191EC52A	Communication System Laboratory	PC	0	0	2	1
8	191EC52B	Digital Signal Processing Laboratory	PC	0	0	2	1
9	191MC56A	Technical Seminar	PW	0	0	2	1
Total				17	2	6	21

Semester-VI

S.No	Course Code	Name of the Course	Category	No of Hours/Week			Credits
	THEORY			Lecture	Tutorial	Practical	
1	191EC621	Antennas and Microwave Engineering	PC	3	0	0	3
2	191EC622	Digital VLSI Design	PC	3	0	0	3
3		Professional Elective II	PE	3	0	0	3
4		Professional Elective III	PE	3	0	0	3
5		Open Elective II	OE	3	0	0	3
6		Open Elective III	OE	3	0	0	3
PRACTICAL							
7	191EC62A	Digital VLSI Design Laboratory	PC	0	0	2	1
8	191EC62B	Microwave Engineering Laboratory	PC	0	0	2	1
9	191MC66A	Internship - II	MC	0	0	0	**
Total				18	0	4	20

Semester-VII

S.No	Course Code	Name of the Course	Category	No of Hours/Week			Credits
	THEORY			Lecture	Tutorial	Practical	
1	191EC721	Embedded and Real Time Systems	PC	3	0	0	3
2	191EC722	Optical Communication and Networks	PC	3	0	0	3
3		Professional Elective IV	PE	3	0	0	3
4		Professional Elective V	PE	3	0	0	3
5		Open Elective IV	OE	3	0	0	3
PRACTICAL							
6	191EC72A	Embedded System Laboratory	PC	0	0	2	1
7	191EC72B	Optical Communication Laboratory	PC	0	0	2	1
8	191EC77A	Project Phase -I	PW	0	0	4	2
Total				15	0	8	19

Semester-VIII

S.No	Course Code	Name of the Course	Category	No of Hours/Week			Credits
	THEORY			Lecture	Tutorial	Practical	
1		Professional Elective VI	PE	3	0	0	3
2		Open Elective V	OE	3	0	0	3
3	191EC87A	Project Work	PW	0	0	20	10
Total				6	0	20	16

TOTAL NO. OF CREDITS: 161

Humanities and Social Sciences (HSS)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191HS101	English for Engineering Students	HSS	3	0	0	3
2	191HS201	Environment Science and Engineering	HSS	3	0	0	3
3	191HS301	Management Science	HSS	3	0	0	3

Basic Sciences (BS)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191MA101	Engineering Mathematics - I	BS	2	2	0	3
2	191PH101	Engineering Physics	BS	3	0	0	3
3	191CH101	Engineering Chemistry	BS	3	0	0	3
4	191PH10A	Physics Laboratory	BS	0	0	2	1
5	191CH10A	Chemistry Laboratory	BS	0	0	2	1
6	191MA201	Engineering Mathematics - II	BS	2	2	0	3
7	191MA304	Linear Algebra and Partial Differential Equations	BS	2	2	0	3
8	191HS30B	Inter Personal Skills Listening and Speaking	BS	0	0	2	1
9	191MA401	Probability and Random Process	BS	2	2	0	3

Engineering Sciences (ES)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191ME111	Basic of Civil and Mechanical Engineering	ES	3	0	0	3
2	191EE111	Basic of Electrical and Electronics Engineering	ES	3	0	0	3
3	191ME112	Engineering Graphics	ES	2	2	0	3
4	191EE211	Network Analysis and Synthesis	ES	2	2	0	3
5	191CS211	Problem Solving and Python Programming	ES	3	0	0	3
6	191CS21A	Problem Solving and Python Programming Laboratory	ES	0	0	2	1
7	191ME21A	Engineering Practices Laboratory	ES	0	0	4	2
8	191CS311	Data Structures in C	ES	3	0	0	3
9	191CS31A	Data Structures in C Laboratory	ES	0	0	2	1
10	191EE511	Control System Engineering	ES	3	0	0	3

Professional Core (PC)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC221	Semiconductor Devices	PC	3	0	0	3
2	191EC22A	Circuits and Devices Laboratory	PC	0	0	4	2
3	191EC321	Digital Logic Circuit Design	PC	3	0	0	3
4	191EC322	Electronic Circuits-I	PC	3	0	0	3
5	191EC323	Signals and Systems	PC	2	2	0	3
6	191EC32A	Analog and Digital Electronics Laboratory	PC	0	0	4	2
7	191EC421	Analog Communication	PC	3	0	0	3
8	191EC422	Electronic Circuits-II	PC	3	0	0	3
9	191EC423	Electromagnetic Field	PC	2	2	0	3
10	191EC424	Linear Integrated Circuits	PC	3	0	0	3
11	191EC425	Microprocessors and Microcontrollers	PC	3	0	0	3
12	191EC42A	Integrated Circuits and Simulation Laboratory	PC	0	0	2	1
13	191EC42B	Microprocessor and Microcontrollers Laboratory	PC	0	0	2	1
14	191EC521	Digital Communication	PC	3	0	0	3
15	191EC522	Digital Signal Processing	PC	2	2	0	3
16	191EC523	Transmission Lines and RF Systems	PC	3	0	0	3
17	191EC52A	Communication System Laboratory	PC	0	0	2	1
18	191EC52B	Digital Signal Processing Laboratory	PC	0	0	2	1
19	191EC621	Antennas and Microwave Engineering	PC	3	0	0	3
20	191EC622	Digital VLSI Design	PC	3	0	0	3
21	191EC62A	Digital VLSI Design Laboratory	PC	0	0	2	1
22	191EC62B	Microwave Engineering Laboratory	PC	0	0	2	1
23	191EC721	Embedded and Real Time Systems	PC	3	0	0	3
24	191EC722	Optical Communication and Networks	PC	3	0	0	3
25	191EC72A	Embedded System Laboratory	PC	0	0	2	1
26	191EC72B	Optical Communication Laboratory	PC	0	0	2	1

Mandatory Course (MC)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191MC46A	Internship / Training-I	MC	0	0	0	**
2	191MC66A	Internship – II	MC	0	0	0	**

Project Work (PW)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC56A	Technical Seminar	PW	0	0	2	1
2	191EC77A	Project Work-I	PW	0	0	4	2
3	191EC87A	Project Work	PW	0	0	20	10

Professional Elective - I (Semester - V)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC531	Computer Architecture and Organization	PE	3	0	0	3
2	191EC532	Human Rights	PE	3	0	0	3
3	191EC533	Medical Electronics	PE	3	0	0	3
4	191EC534	Operating Systems	PE	3	0	0	3
5	191EC535	Robotics and Automation	PE	3	0	0	3
6	191HS531	Principle of Management	PE	3	0	0	3

Professional Elective - II (Semester - VI)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC631	CMOS Analog IC Design	PE	3	0	0	3

2	191EC632	Computer Networks	PE	3	0	0	3
3	191EC633	Cryptography and Network Security	PE	3	0	0	3
4	191EC634	Disaster Management	PE	3	0	0	3
5	191EC635	MEMS and NEMS	PE	3	0	0	3
6	191EC636	Speech Signal Processing	PE	3	0	0	3

Professional Elective - III (Semester - VI)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC637	Cognitive Radio	PE	3	0	0	3
2	191EC638	Intellectual Property Rights	PE	3	0	0	3
3	191EC639	Mixed Signal IC Design	PE	3	0	0	3
4	191EC6310	Sensors and Transducers	PE	3	0	0	3
5	191EC6311	Telecommunication Network Management	PE	3	0	0	3
6	191EC6312	Wireless Communication	PE	3	0	0	3

Professional Elective - IV (Semester - VII)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC731	Data Converters	PE	3	0	0	3
2	191EC732	Design Compressive Sensing	PE	3	0	0	3
3	191EC733	Electro Magnetic Interference and Compatibility	PE	3	0	0	3
4	191EC734	Satellite Communication	PE	3	0	0	3
5	191EC735	Video Analytics	PE	3	0	0	3
6	191EC736	Wireless Networks	PE	3	0	0	3

Professional Elective - V (Semester - VII)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC737	Digital Image Processing	PE	3	0	0	3
2	191EC738	DSP Architecture and Programming	PE	3	0	0	3
3	191EC739	Electronics Packaging and Testing	PE	3	0	0	3
4	191EC7310	Fundamentals of Nano Science	PE	3	0	0	3
5	191EC7311	Photonic Networks	PE	3	0	0	3
6	191EC7312	Total Quality Managements	PE	3	0	0	3

Professional Elective - VI (Semester - VIII)

S.No	Course Code	Name of the Course	Category	Lecture	Tutorial	Practical	Credits
1	191EC831	Ad hoc and Wireless Sensor Networks	PE	3	0	0	3
2	191EC832	Foundation Skills in Integrated Product Development	PE	3	0	0	3
3	191EC833	Low power SoC	PE	3	0	0	3
4	191EC834	Multimedia Compression and Communication	PE	3	0	0	3
5	191EC835	Principles of RADAR	PE	3	0	0	3
6	191EC836	Professional Ethics in Engineering	PE	3	0	0	3

Summary

S.NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1	**HSS**	3	3	3						9	**5.59**
2	**BS**	11	3	4	3					21	**13.04**
3	**ES**	9	9	4		3				25	**15.53**
4	**PC**		5	11	17	11	8	8		60	**37.27**
5	**PE**					3	6	6	3	18	**11.18**
6	**OE**					3	6	3	3	15	**9.32**
7	**PW**					1		2	10	13	**8.07**
	TOTAL	**23**	**20**	**22**	**20**	**21**	**20**	**19**	**16**	**161**	

Credit Distribution

S.No.	Code	Category	AICTE	Credits (Regular)	Credits (Lateral)
1	**HSS**	**Humanities and Social Science**	**12**	**9**	**3**
2	**BS**	**Basic Science**	**25**	**21**	**7**
3	**ES**	**Engineering Science**	**24**	**25**	**7**
4	**PC**	**Program Core**	**48**	**60**	**55**
5	**PE**	**Professional Electives**	**18**	**18**	**18**
6	**OE**	**Open Electives**	**18**	**15**	**15**
7	**PW**	**Project Work**	**15**	**13**	**13**
8	**MC**	**Mandatory Course**		**0**	**0**
Total Credits			**160**	**161**	**118**

SEMESTER I

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191MA101 / ENGINEERING MATHEMATICS - I			2	2	0	3

COURSE OBJECTIVES

- ✓ To develop greater knowledge and understanding of mathematics and to attain the skills necessary for success in the study of higher mathematics.

SYLLABUS

UNIT-I	MATRICES	12

Characteristic equation, Eigen values and Eigen vectors of a real matrix, Properties of Eigen values, Cayley Hamilton theorem, Orthogonal reduction of a symmetric matrix to diagonal form, Reduction of quadratic form by orthogonal transformation, Applications.

UNIT-II	GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	11

Curvature, Cartesian and Polar coordinates, Centre of curvature, Circle of curvature, Evolutes and Envelopes, Applications.

UNIT-III	FUNCTIONS OF SEVERAL VARIABLES	11

Function of two variables, Partial derivatives, Total derivative, Change of Variables, Jacobians, Taylor's expansion, Maxima and Minima, Constrained Maxima and Minima by Lagrangian Multiplier method, Applications.

UNIT-IV	ORDINARY DIFFERENTIAL EQUATIONS	11

Linear differential equations of second and higher order with constant coefficients, Method of variation of parameters, Equations reducible to linear equations with constant coefficients : Cauchy's homogeneous linear equation and Legendre's linear equation, Simultaneous linear equations with constant coefficients, Applications.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Analyze the characteristics equation of a linear system with Eigen values and vectors for practical application.
CO2	Determine the bending of family of curves using differential calculus which deals in various disciplines.
CO3	Apply partial derivatives in various engineering problems.
CO4	Identify and solve the real time problems using higher order differential equations.

TEXT BOOKS

1. Kreyszig. E, "Advanced Engineering Mathematics", John Wiley & Sons. Singapore, 10th edition, 2012.
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publications, 42nd Edition, 2012.

REFERENCES

1. Veerarajan. T, "Engineering Mathematics I", Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
2. Kandasamy.Pet.al. "EngineeringMathematics", Vol. I (4th revised edition), S. Chand & Co, New Delhi, 2000.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	1	-	-	1
CO2	3	3	2	2	1	-	-	-	-	-	-	1	-	-	1
CO3	3	3	2	2	1	-	-	-	-	-	-	1	-	-	1
CO4	3	3	2	2	1	-	-	-		-	-	1	-	-	1
CO5	3	3	2	2	1	-	-	-	-	-	-	1	-	-	1
CO	3	3	2	2	2	-	-	-	-	-	-	1	-	-	1

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191PH101 / ENGINEERING PHYSICS			3	0	0	3

COURSE OBJECTIVES

- ✓ The course aims to equip engineering undergraduates with principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.

SYLLABUS

UNIT-I	PROPERTIES OF SOLIDS	9

Elasticity, Hooke's law, stress -strain diagram, Poisson's ratio, Factors affecting elasticity, Bending moment, Depression of a cantilever, Young's modulus by uniform bending, Young's modulus by non-uniform bending (Theory and Experiment), Torsional stress and twisting couple, Torsional Pendulum ((Theory and Experiment) I-shaped girders.

UNIT-II	PRINCIPLES OF LASERS	9

Properties of laser radiation and their significance-wavelength, power, monochromaticity, coherence. Types of lasers working media and their radiation characteristics-Power, wavelength and operational modes of He-Ne, Carbon-dioxide. Physical principles of Laser beam delivery systems. Applications- Industry and Medical. Selection of lasers for various applications.

UNIT-III	OPTICAL FIBRE SYSTEMS	9

Optical Fibres, Propagation mechanism, Critical Angle, Snell's Law, Total Internal Reflection, Acceptance cone, Numerical aperture, Types of fibers, Attenuation, Active and passive fibre sensors
(Temperature and Displacement), Applications (Industry and Medical), communication in optical fiber, Endoscope.

UNIT-IV	WAVE NATURE OF PARTICLES	9

Introduction to Quantum mechanics, Black body radiation, Planck's Hypothesis, Compton Effect (Theory and Experiment), Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wavefunction, Schrodinger equation for one dimensional problems, particle in a box-SEM and TEM.

UNIT-V	SOLID STATE PHYSICS	9

Crystalline and non crystalline materials, Lattice, Unit cell, Bravais lattice, Lattice planes, Miller indices, Expression for inter planar spacin, Bragg's law, Diffraction of X-rays by crystal planes, Co-ordination number, Atomic packing factors (SC, FCC, BCC and HCP structures), Diamond and graphite structures (qualitative treatment) , Crystal growth techniques (Bridgman and Czochralski).

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Demonstrate the proficiency on the basics of properties of matter and its applications.
CO2	Expose the basic principles and working of Laser and for modern developments in industrial and medical applications.
CO3	Acquire the essentials on the concepts of propagation of waves in optical fibres and their applications.
CO4	Assimilate the physics concepts of quantum theory and its applications in electron microscope.
CO5	Analyze the structure of materials and different crystal growth techniques.

TEXT BOOKS

1. 'Engineering Physics', R.K. Gaur and S.L. Gupta, Dhanpat Rai Publications (P) Ltd., 8th Edition, New Delhi (2001).
2. Introduction to Solid State Physics, 7th Edition, Charles Kittel, Wiley, Delhi 2007.
3. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.

REFERENCES

1. Laser Fundamentals, William T. Silfvast, 2nd Edition, Cambridge University press, New York, 2004.
2. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York 2001.
3. E. Hecht, Optics, Pearson Education, 2008.

CO-PO&PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO 2	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO 3	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO 4	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO 5	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191CH101 / ENGINEERING CHEMISTRY			3	0	0	3

COURSE OBJECTIVES

- ✓ To acquaint the students with the developments of microscopic chemistry in terms of atomic, molecular, and intermolecular forces and acquires the knowledge of water treatment. The students will be able to analyze the properties and applications of polymer and advanced materials.

SYLLABUS

UNIT-I	CHEMICAL BONDING	9

Types of chemical bonds, bond polarity, dipole moment, partial ionic character, consequences. Weak Interactions, Hydrogen bonding, van der Waals forces, influence on properties of matter. Metallic bond, free electron theory, MO treatment, band theory-metals, semiconductors and insulators. Non-stoichiometric semiconductors, chalgogen semiconductors. Defect structures of crystals-Schottky and Frenkel defects.

UNIT-II	WATER CHEMISTRY	9

Hardness, determination (EDTA method). Water softening, zeolite and demineralization processes. Desalination by electro-dialysis and reverse osmosis. Water analysis by fluoride ion, Water quality parameters, Instrumental methods for water analysis- AAS, flame emission spectroscopy, ICP-MS and photocolorimetry.

UNIT-III	ELECTROCHEMISTRY	9

Electrode potential, standard and reference electrodes, Nernst equation, emf series, applications. Galvanic and concentration cells. Applications of potential measurements, glass electrode, pH measurement, acid- base titration, redox titration. Conductance measurement, applications - conductometric titrations.

UNIT-IV	POLYMERS	9

Classification, degree of polymerization, molecular weight – Mn and Mw. Polymerization reactions. Glass transition temperature, factors affecting Tg, determination by DSC. Polymer processing, compounding, outline of moulding techniques compression, injection, extrusion and blow moulding. Charge transport in conjugated polymers, doped conjugated polymers, glucose biosensor. Polymers for LED and LCD displays.

UNIT-V	ADVANCED MATERIALS	9

Carbon nanotubes and carbon fibers, graphene and polymer nano-composites, properties and applications - morphological studies by SEM and TEM. Solid oxide materials and polymer electrolytes, energy storing applications. Polymer blends and alloys, photo and electroluminescence materials, insulating materials, photopolymers and photoresists for electronics, polymer photovoltaics.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Analyse microscopic chemistry in terms of atomic, molecular and Intermolecular forces for real time applications of semiconductors.
CO2	Investigate the various water treatment and softening methods.
CO3	Appraise the types and mechanism of electrochemical reaction in batteries and fuel cells.
CO4	Explain the basic principle, types and mechanism of polymerization process and techniques.
CO5	Assess the properties, characterization and applications of advanced materials for energy storage.

TEXT BOOKS

1. Mary Jane Shultz, "Engineering Chemistry", Cengage Learning, USA, 2009.
2. Palanna O. G., "Engineering Chemistry", Tata Mc. Graw Hill Education Pvt. Ltd., New Delhi, 2009.

REFERENCES

1. Gesser H.D., "Applied Chemistry - A Textbook for Engineers and Technologies", Springer, New York, 2008.
2. Gowarikar V. R., Viswanathan N.V and JayadevSreedhar, "Polymer Science", New Age International (P) Ltd., New Delhi, 2011
3. Vijayamohanan K. Pillai and Meera Parthasarathy, "Functional Materials - A Chemist's Perspective" Universities Press, India, 2012.
4. Shashi Chawla, "A Text book of Engineering Chemistry", Dhanpat Rai& Co, New Delhi, 2005.

CO-PO&PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	2	-	-	-	-	2	1	-	-
CO2	3	3	2	2	-	2	2	-	-	-	-	2	1	-	-
CO3	3	3	2	2	-	2	2	-	-	-	-	2	1	-	-
CO4	3	3	2	2	-	2	2	-	-	-	-	2	1	-	-
CO5	3	3	2	2	-	2	2	-	-	-	-	2	1	-	-
CO	3	3	2	2	-	2	2	-	-	-	-	2	1	-	-

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191HS101 / ENGLISH FOR ENGINEERING STUDENTS			3	0	0	3

COURSEOBJECTIVES
✓ EquipstudentswiththeEnglishlanguageskillsrequiredforthesuccessfulundertakingofacademicstudies. ✓ Improve general and academic listening skills ✓ Provide guidance and practice in basic geranial and classroom conversation and to engage in specific academic speaking activities ✓ Strengthen the reading and writing skills of students of engineering

SYLLABUS		
UNIT-I	**VOCABULARY BUILDING**	**9**
Word formation, Prefixes and Suffixes, Root words from foreign languages, Synonyms, Antonyms, Compound Nouns, Standard Abbreviations.		
UNIT-II	**GRAMMATICAL COMPETENCY**	**9**
Noun, Verb, Adjective, Subject-Verb Agreement, Articles, Prepositions, Purpose expressions, Model Verbs.		
UNIT-III	**BASIC WRITING SKILLS**	**9**
Sentence structure, Phrases, Clauses, Coherence, Cohesion (using linking words), Paragraph Writing (Descriptive and Narrative)		
UNIT-IV	**READING SKILLS**	**9**
Reading Strategies, Skimming and Scanning, Reading Comprehension exercises with multiple choice and open ended questions, Transforming Information in the form of charts, Note Making.		
UNIT-V	**ORAL COMMUNICATION**	**9**
(This unit involves interactive practice sessions in Language Lab) • Listing Comprehension. • Pronunciation, Syllable and Stress, Rhythm and Intonation. • General conversations and dialogues, common in everyday situations. • Short Speech.		

COURSEOUTCOMES On completion of the course, students will be able to	
CO1	Infer meanings of unfamiliar words from context
CO2	Enable to achieve linguistic competence and be able to use grammar as a tool or resource in the comprehension and creation of oral and written discourse efficiently according to the situation.
CO3	Write cohesively, coherently and flawlessly with a wide range of vocabulary and organizing their ideas logically on a topic.
CO4	Activate and reinforce the habit of reading and writing effectively in their discipline.
CO5	Collaborate with multicultural environment.

TEXT BOOKS

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", Orient Blackswan, Chennai - 2012.
2. Dhanavel S. P, "English and Communication Skills for Students of Science and Engineering", Orient Blackswan, Chennai - 2011.
3. "Communication Skills", Sanjay Kumar and Pushp Lata, Oxford University Press, 2011.

REFERENCES

1. "Practical English Usage", Michael Swan. OUP. 1995.
2. "Remedial English Grammar", F.T. Wood. Macmillan. 2007.
3. "Study Writing", Liz Hamp-Lyons and Ben Heasly, Cambridge University Press, 2006.
4. "Exercises in Spoken English", Parts. I-II, CIEFL, Hyderabad. Oxford University Press.
5. "Practical English Usage", Michael Swan. OUP. 1995.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	3	3	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	3	3	3	-	2	-	-	-
CO3	-	-	-	-	-	-	-	3	3	3	-	2	-	-	-
CO4	-	-	-	-	-	-	-	3	3	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	3	3	3	-	2	-	-	-
CO	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191ME111 / BASIC CIVIL AND MECHANICAL ENGINEERING			3	0	0	3

COURSE OBJECTIVES

- ✓ To create awareness on fundamental knowledge on various domains of civil engineering
- ✓ To introduce the sources of water and treatment of water, sewage treatment and transportation modes
- ✓ To introduce the fundamentals of Power Plant Engineering
- ✓ To introduce the fundamentals of IC engines
- ✓ To introduce the fundamentals of Energy resources and refrigeration cycles

SYLLABUS

UNIT-I	SCOPE OF CIVIL ENGINEERING	9

Introduction, Functions and role of Civil Engineer, Branches of Civil Engineering, Materials, Properties, classification and characteristics of building stones, bricks, timber, cement and cement concrete, reinforcing steel, Components of residential building, Foundation, Types and necessity.

UNIT-II	WATER RESOURCES & ENVIRONMENTAL ENGINEERING	9

Sources of water, Hydrologic cycle, Rain water harvesting, importance, methods of rain water harvesting, Water demand estimation, Sources of water, Quality of water, Treatment of water. Water distribution. Sewerage, collection, treatment and disposal of sewage, Septic tanks.

UNIT-III	POWER PLANTS, PUMPS AND TURBINES	9

Introduction to Power Plant, Classification of Power Plants, Working principle of steam, Gas, Diesel, Hydro-electric, Geo-thermal and Nuclear Power plants, Merits and Demerits, Pumps and turbines, working principle of single acting and double acting Reciprocating pumps, Centrifugal Pump.

UNIT-IV	IC ENGINES	9

Introduction to Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and two stroke cycles, Comparison of four stroke and two stroke engines.

UNIT-V	RENEWABLE ENERGY AND REFRIGIRATION	9

Introduction to renewable energy sources, Non renewable energy sources, Comparison of Electrical Energy Storage Technologies. Vapour compression Refrigeration system, Vapour absorption refrigeration system.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Explain the usage of construction material and proper selection of construction materials.
CO2	Explain about water resources, sewage treatment and transportation systems.
CO3	Explain about the components use in power plants.
CO4	Describe the internal combustion engines.
CO5	Explain about the renewable energy sources and refrigeration cycles.

TEXT BOOKS

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co, New Delhi, 1996.

REFERENCES

1. T. Jha and S.K. Sinha, "Construction and Foundation Engineering", Khanna publishers, Delhi, 2003.
2. S.K. Garg, "Water Supply Engineering", Khanna publishers, Delhi, 2005.
3. Ramamrutham S, "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd. 1999.
4. Seetharaman S, "Basic Civil Engineering", Anuradha Agencies, 2005.
5. Venugopal K. and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, 2000.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	-	2	2	1	-	-	-	2	-	-	-
CO2	3	3	1	1	-	2	2	1	-	-	-	2	-	-	-
CO3	3	3	1	1	-	2	2	1	-	-	-	2	-	-	-
CO4	3	3	1	1	-	2	2	1	-	-	-	2	-	-	-
CO5	3	3	1	1	-	2	2	1	-	-	-	2	-	-	-
CO	**3**	**3**	**1**	**1**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191EE111 / BASIC ELECTRICAL AND ELCTRONICS ENGINEERING			3	0	0	3

COURSE OBJECTIVES

- ✓ To understand the structure of Electric Power Systems.
- ✓ To execute safety precautions.
- ✓ To study about Electric laws.
- ✓ To know about construction of meters.
- ✓ To understand about Electronics and Communication systems.

SYLLABUS

UNIT-I	INDIAN ELECTRICITY SCENARIO	9

Electric Power, Generation resources, Transmission types & Distribution system (levels of voltage, power ratings and statistics), Regulatory Authorities governing Indian Electricity Protection & Safety, Hazards of electricity-shock, effects of electricity on the human body. Electrical safety practices, Protection devices.

UNIT-II	BASICS OF ELECTRICAL COMPONENTS	9

Evolution of Electricity and Electrical inventions - Charge, Electric potential, voltage, current, power, energy, DC, AC, time period, frequency, phase, flux, flux density, RMS, Average, Peak, Phasor &Vector diagram.

UNIT-III	BASIC LAWS OF ELECTRIC SYSTEMS& MEASUREMENTS	9

Electric Circuits, Passive components (RLC), Ohm's law, KCL, KVL, Faraday's law, Lenz's law-Illustrative examples, Analog Moving Iron, Moving Coil and Digital meters, Types and usage.

UNIT-IV	BASICS ELECTRONICS	9

Electrical Vs Electronics, Electronic products and systems, Electronic Devices (Diode–Forward bias, reverse bias, Transistor (CE, CB, CC), Electronic components, Electronic Circuits-Rectifier, Regulator &IC-Basic Amplifiers and Oscillators- Communication system Block diagram (Transmitter and Receiver).

UNIT-V	BASICS OF COMMUNICATION ENGINEERING	9

Amplitude Modulation, AM, DSBSC, SSBSC, VSB–PSD, modulators and demodulators, Angle Modulation, PM and FM–PSD.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Summarizes about different structures of Power system and safety measures.
CO2	Explain about the basics of Electricity.
CO3	Discuss on various electric circuits and use of measuring instruments
CO4	Clarify the working of basic electronic devices such as diode, transistor and operational amplifiers
CO5	Infer about Digital Electronics and Communication System.

TEXT BOOKS

1. S Salivahanan Rangarajan, “Basic Electrical Electronics & Measurement Engineering”, Tata McGraw Hill Publishing Co Ltd.
2. “Basic Electric Engineering”, D P Kothari &Nagrath, Tata McGraw Hill.
3. C.L.Wadhwa, “Generation, Distribution and Utilisation of Electrical Energy”, New Age international pvt.ltd.,2003.

REFERENCES

1. Albert Paul Malvino, “Electronic Principles”, Tata McgrawHill, 2002.
2. Simon Haykin, “Communication Systems”, Wiley Eastern, Third Edition, 1996.
3. M.S. Sukhija and T.K. Nagsarkar, “Basic Electrical and Electronic Engineering”, Oxford, 2016.
4. M.Morris Mano, Digital Design, Third Edition, Pearson Publication.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-
CO5	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191ME112/ ENGINEERING GRAPHICS			2	2	0	3

COURSE OBJECTIVES

- ✓ To explain the importance of an engineering drawing and explain the role of computer aided design.
- ✓ To convey the basics of engineering drawing of curves and concepts of free hand sketching.
- ✓ To teach different methods of making views of simple objects resembling points, lines and surfaces.
- ✓ To teach different methods of making views of simple objects resembling points, lines and surfaces.
- ✓ To establish the importance of sections and developments made in drawing.
- ✓ To develop an intuitive understanding of underlying significance of using pictorial drawings.

SYLLABUS

UNIT-I	PLANE CURVES AND FREE HAND SKETCHING	9

Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of 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 orthographic views from single pictorial view of objects.

UNIT-II	PROJECTION OF POINTS, LINES AND PLANE SURFACES	9

Orthographic projections - Introduction - Principles -Principal planes-First angle projection. Projection of points located in all quadrants. Projection of straight lines inclined to both the principal planes, Determination of true lengths and true inclinations by rotating line method, traces. Projection of planes (regular polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT-III	PROJECTION OF SOLIDS	9

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

UNIT-IV	SECTION OF SOLIDS & DEVELOPMENT OF LATERAL SURFACES OF SOLIDS	9

Sectioning of simple solids in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids like Prisms, pyramids, cylinders and cones.

UNIT-V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	9

Principles of isometric projection – Isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, and cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids like Prisms, pyramids and cylinders by visual ray method.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Draw engineering curves and apply the concepts of free hand sketching.
CO2	Draw orthographic views of points, lines and surfaces.
CO3	Draw visualizations of simple solid objects as per orthographic projections.
CO4	Draw sections and developments made in drawing.
CO5	Draw pictorial drawings of simple objects.

TEXT BOOKS

1. N.D. Bhatt, Engineering Drawing, 49th edition, Charotar Publishing House, 2006.

REFERENCES

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008
3. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	-	3	1	-	-	-	1	1	1	-	-	-
CO2	1	1	2	-	3	1	-	-	-	1	1	1	-	-	-
CO3	1	1	2	-	3	1	-	-	-	1	1	1	-	-	-
CO4	1	1	2	-	3	1	-	-	-	1	1	1	-	-	-
CO5	1	1	2	-	3	1	-	-	-	1	1	1	-	-	-
CO	1	1	2	-	3	1	-	-	-	1	1	1	-	-	-

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191PH10A / PHYSICS LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ Students will be able to demonstrate an understanding of the scientific method, so that they may use the training beneficial in their higher pursuits.

LIST OF EXPERIMENT

1	Determination of Rigidity modulus – Torsion pendulum.
2	Determination of Young‘s modulus by non-uniform bending method.
3	Determination of Planck’s Constant and work function of materials using photo electric effect experiment.
4	Determination of wavelength, and particle size using Laser.
5	Determination of acceptance angle in an optical fiber.

DEMONSTRATION

1	Determination of wavelength of mercury spectrum – spectrometer grating.
2	Demonstration of Crystal Growth Technique.
3	Determination of fiber thickness – Air Wedge method.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Apply the principles of properties of matter in determining the various elastic properties.
CO2	Attains the practical knowledge to apply principles of optics for various engineering applications.
CO3	Demonstrate the technical knowledge on quantum mechanical concepts.

REFERENCES
1. Wilson J.D. and Hernandez C.A., “Physics Laboratory Experiments”, Houghton Mifflin Company, New York 2005.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO2	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO3	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-
CO	3	3	2	2	-	2	2	2	2	-	-	2	1	-	-

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE / COURSE TITLE	191CH10A / CHEMISTRY LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ To furnish the conceptual understanding of the basic principles involved in chemical analysis.
- ✓ To attain the analytical knowledge of students by conducting various experiments.

LIST OF EXPERIMENTS

1	Determination of total, permanent, temporary, calcium and magnesium hardness of water by EDTA method.
2	Conductometric titration - determination of strength of an acid.
3	Estimation of iron by potentiometry.
4	Determination of molecular weight of polymer by viscosity average method.
5	Determination of dissolved oxygen in a water sample by Winkler's method.
6	Determination of Na / K in water sample by Flame photometry (Demonstration).
7	Estimation of Copper in ore.
8	Estimation of nickel in steel.
9	Determination of total alkalinity and acidity of a water sample.
10	Determination of rate of corrosion by weight loss method.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Acquire knowledge on quantitative chemical analysis by instrumentation and volumetric method.
CO2	Analyze the water sample for hardness, chloride, sodium /potassium content, dissolved oxygen etc.
CO3	Solve analytical problems in spectrometer and flame photometer for the identification and quantification.

TEXT BOOK

1. Vogel's Textbook of quantitative chemical Analysis (8th edition, 2014).

CO-PO & PSO Mapping															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	-	2	2	1	2	-	-	2	1	-	-
CO2	3	3	2	2	-	2	2	1	2	-	-	2	1	-	-
CO3	3	3	2	2	-	2	2	1	2	-	-	2	1	-	-
CO	3	3	2	2	-	2	2	1	2	-	-	2	1	-	-

SEMESTER-II

S.No	Course Code	Name of the Course	Category	No of Hours/Week			C
THEORY				**L**	**T**	**P**	
1	191MA201	Engineering Mathematics II	BS	2	2	0	3
2	191HS201	Environmental Science and Engineering	HSS	3	0	0	3
3	191EE211	Network Analysis and Synthesis	ES	2	2	0	3
4	191CS211	Problem Solving and Python Programming	ES	3	0	0	3
5	191EC221	Semiconductor Devices	PC	3	0	0	3
PRACTICAL							
6	191ME21A	Engineering Practices Laboratory	ES	0	0	4	2
7	191CS21A	Problem Solving and Python Programming Lab	ES	0	0	2	1
8	191EC22A	Circuits and Devices Laboratory	PC	0	0	4	2
Total				**13**	**4**	**10**	**20**

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191MA201 / ENGINEERING MATHEMATICS II			2	2	0	3

COURSE OBJECTIVES

- ✓ To understand double and triple integrations and enable them to find area and volume using multiple integrals.
- ✓ To know the basics of vector calculus comprising gradient, divergence and curl and line, surface and volume integrals.
- ✓ To understand analytic functions of complex variables and conformal mappings.
- ✓ To know the basics of residues, complex integration and contour integration.
- ✓ To understand Laplace transform and use it to represent system dynamic models and evaluates their time responses.

SYLLABUS

UNIT-I	MULTIPLE INTEGRALS	9

Double integration, Cartesian and polar coordinates, Change of order of integration, Triple integration incartesian coordinates.

UNIT-II	VECTOR CALCULUS	9

Gradient, divergence and curl, Directional derivative, Irrotational and solenoidal vector fields, Simple problems on Vector differentiation, Vector integration, Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs).

UNIT-III	ANALYTIC FUNCTION	9

Functions of a complex variable, Analytic functions, Necessary conditions, Cauchy Riemann equations in Cartesian coordinates and sufficient conditions (excluding proofs), Properties of analytic function, Construction of analytic function by Milne Thomson method, Conformal mapping : $w = z + c$, cz , $1/z$, z^2 - bilinear transformation.

UNIT-IV	COMPLEX INTEGRATION	9

Statement and applications of Cauchy's integral theorem and Cauchy's integral formula (excluding proofs), Taylor's and Laurent's series expansions, Singularities, Residues, Cauchy's residue theorem (excluding proof), Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

UNIT-V	LAPLACE TRANSFORM	9

Laplace transform, Sufficient condition for existence, Transform of elementary functions, Basic properties, Transforms of unit step function and impulse functions, Transform of periodic functions. Inverse Laplace transform, Statement of Convolution theorem, Initial and final value theorems, Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Evaluate multiple integrals using change of variables.
CO2	Apply various integral theorems for solving engineering problems involving cubes and rectangular parallelepipeds.
CO3	Construct analytic functions of complex variables and transform functions using conformal mappings.
CO4	Estimate the real and complex integrals over suitable closed paths and contours.
CO5	Compute linear differential equations using Laplace transform techniques

TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, Delhi, 42nd Edition, 2012.
2. Kreyzig E., "Advanced Engineering Mathematics", John Wiley & Sons (Asia), Pvt, Ltd., Singapore, 10th Edition, 2010.

REFERENCES

1.Veerarajan T, "Engineering Mathematics" (for First Year), Tata McGraw Hill, Pub. Co. Ltd., New Delhi, Revised Edition, 2007.
2. Venkataraman M.K, "Engineering Mathematics", Volume - II, The National Pub. Co., Chennai, 2003.
3. Kandasamy P., Thilagavathy K. and Gunavathy K, "Engineering Mathematics", S. Chand & Co., New Delhi, 2008.
4. Arunachalam T. and Sumathi K, "Engineering Mathematics II", Sri Vignesh Publications, Coimbatore, Third Edition, 2011.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	1	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-	1	-	-	-
CO3	3	3	2	2	1	-	-	-	-	-	-	1	-	-	-
CO4	3	3	2	2	1	-	-	-		-	-	1	-	-	-
CO5	3	3	2	2	1	-	-	-	-	-	-	1	-	-	-
CO	3	3	2	2	1	-	-	-	-	-	-	1			

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191HS201 / ENVIRONMENTAL SCIENCE AND ENGINEERING			3	0	0	3

COURSE OBJECTIVES

- ✓ This course provides the basic knowledge of structure and function of ecosystem and better understanding of natural resources, biodiversity and their conservation practices.
- ✓ It describes the need to lead more sustainable lifestyles, to use resources more equitably.
- ✓ It helps to create a concern for our environment that will trigger pro-environmental action, including activities we can do in our daily life to protect it.
- ✓ Furthermore, it deals the social issues and ethics to develop quality engineer in our country.

SYLLABUS

UNIT-I	ENVIRONMENT – AN OVERVIEW	9
Ecosystem - concept, structure, function, types, Energy flow in ecosystem, Biodiversity and its conservation, values of biodiversity, threats to biodiversity conservation of biodiversity, Natural resources - types, uses.		
UNIT-II	**ENVIRONMENTAL IMPACT OF ENERGY SOURCES**	**9**
Sources of primary energy, present and future consumption of energy, environmental impacts of energy development- oil, natural gas, coal, hydro electric, nuclear power, wind mill and solar panels, Urban problems related to energy, case studies		
UNIT-III	**CLIMATIC CHANGE AND SOLID WASTE MANAGEMENT**	**9**
Environmental pollution- air, water, soil, marine and noise pollution- green house gases- causes, effects- global warming, ozone layer depletion, acid rain-sources and effects. Pollution control strategies, preventive measures, green technologies, green building concepts, standards and regulations, role of individuals, Sustainable development, Hazardous wastes, e-waste, source effect, management, Nuclear waste-sources, effects, management, Recycling of waste, Future challenges.		
UNIT-IV	**HUMAN POPULATION AND THE ENVIRONMENT**	**9**
Population growth, variation among nations, population explosion, family welfare programme, environment and human health, human rights, value education, HIV / AIDS, women and child welfare, role of information technology in environment and human health, Case studies.		
UNIT-V	**ENVIRONMENTAL LAW AND ETHICS**	**9**
Legal provision in India, environmental acts - air, water, forest, soil and wildlife. Environmental ethics, theories and codes, resource consumption patterns, equity-disparity, urban-rural equity issues, need for gender equity, preserving resource for future generation, right of animals, ethical basis of environment education and awareness, ethical problem solving- changing attitude, conservation ethics and traditional value systems of India, Effect of social media on the adolescent.		

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Interpret the concept of ecosystem, biodiversity and its conservation.
CO2	Demonstrate the environmental impacts of energy development.
CO3	Categorize the various environmental pollutions and select suitable preventive measures.
CO4	Perceive the environmental effects of human population and the implementation of welfare programs.
CO5	Recall the environmental ethics and legal provisions.

TEXT BOOKS

1. ErachBharucha, "Text book for Environmental sciences for Undergraduate courses", UGC, 2004.
2. Kaushik, A &Kaushik, CP, Environmental Science and engineering", 3rd Edition, New Age International (P) Limited, New Delhi, 2009.
3. Henry, JG &Heinke, GW, "Environmental Science and Engineering", 2nd Edition, PHI Learning Private limited, New Delhi, 2011.

REFERENCES

1. Masters, GM &Ela, WP, "Introduction to Environmental Engineering and Science", 3rd Edition, PHI Learning Private limited, New Delhi, 2009.
2. Encyclopedia of environmental ethics and philosophy. Available at www.gmu.ac.ir/download/booklibrary /e-library/Encyclopaedia of Environmental Ethics and philosophy.pdf.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	3	3	-	-	-	2	1	-	-
CO2	3	3	2	2	-	2	3	-	-	-	-	2	1	-	-
CO3	3	3	2	2	-	2	3	-	-	-	-	2	1	-	-
CO4	3	3	2	2	-	2	3	-	-	-	-	2	1	-	-
CO5	3	3	2	2	-	2	3	3	-	-	-	2	1	-	-
CO	3	3	2	2	-	2	3	3	-	-	-	2	1	-	-

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191EE211 / NETWORK ANALYSIS ANDSYNTHESIS			2	2	0	3

COURSE OBJECTIVES
✓To Analysis the basic of DC and AC circuits behaviors. ✓To Study the transient and steady state response of the circuits subjected to step and sinusoidal excitation. ✓To analysis the time and frequency domain response of a network. ✓Construct and appraise properties of two port networks and synthesis

SYLLABUS		
UNIT-I	**Networks Laws and Theorems**	**9**
Kirchoff's Laws- Loop and Nodal analysis, Superposition, Thevenin's and Norton's, Maximum power transfer, Reciprocity theorems, Tellegen'stheorem, Source and Wye-Delta transformation.		
UNIT-II	**Time domain analysis**	**9**
Transient analysis: Series and Parallel RC, RL, RLCnetworks, Significance of time constant, Natural frequency, Resonance, Qfactor. Steady state sinusoidal analysis of reactive networks.		
UNIT-III	**Frequency domain analysis**	**9**
The concept of complex frequency, Solution of network equations using Laplace transforms. Network functions: driving point and transfer functions, Poles and Zeros, their locations and effects on the time and frequency domain responses, Restriction of poles and zeros in the driving point and transfer function, Time domain behavior from the pole-zero plot.		
UNIT-IV	**Two portnetworks**	**9**
Analysis of two port network: Network parameters- Impedance, admittance, transmission and hybrid, Conversion formulae. Equivalents of T, Π, Ladder, bridged T and Lattice networks, Analysis of interconnected two port networks - parallel, series, and cascade connections, zerosoftransmission.		
UNIT-V	**Synthesis of Networks**	**9**
ElementsofRealizabilityTheory:Stability-HurwitzPolynomials-PositiveRealFunctions-Elementary Synthesis Procedures – Cauer and Foster forms. Synthesis of One Port and two port Networks: Properties and synthesis of R-L, R-C, L-C Impedance and Admittance Functions. Filters and attenuators.		

TEXT BOOKS

1. VanValkenberg, *Network Analysis*, Prentice- Hall of India, ThirdEdition,2007.
2. William HHayt& Jack EKemmerly,*Engineering Circuit Analysis*,TataMcGrawHill,7th edition, 2010
3. FranklinF.Kuo,*NetworkAnalysisandSynthesis*,WileyIndia,SecondEdition,2006

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1. VanValkenberg,S*ynthesis,* Prentice-Hallof India, ThirdEdition,2007.
2. MahmoodNahviandJosephEdminister:ElectricCircuits5thEd,Schaum"sOutlines,Tata McGraw-Hill, 2016
3. JohnD Ryder, "Networks, LinesandFields", Second Edition,PHI,2007
4. UmeshSinha, "Network Analysis and Synthesis" SatyaprakashanPublishers,2013.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Apply the circuit theorems in real time application
CO2	Evaluate transient response, steady state response of RC,RL,RLC circuits
CO3	Identify the properties and characteristics of network function and verify mathematic constraint for the physical realization
CO4	Construct and appraise property of two port networks
CO5	Synthesize one port two port using Foster and Causer, design attenuation and equalization

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	-	-	-	-	1	2	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	1	2	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	1	2	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	1	2	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	1	2	-	-	-
CO	3	3	3	2	-	-	-	-	-	-	1	2	-	-	-

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191CS221 / PROBLEM SOLVING AND PYTHON PROGRAMMING			3	0	0	3

COURSE OBJECTIVES
✓ To know the basics of algorithmic problem solving. ✓ To read and write simple Python programs. ✓ To develop Python programs with conditionals and loops. ✓ To define Python functions and call them. ✓ To use Python data structures – lists, tuples, dictionaries. ✓ To do input/output with files in Python.

SYLLABUS		
UNIT-I	**ALGORITHMIC PROBLEM SOLVING**	**9**
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion) Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, Guess an integer number in a range, Towers of Hanoi.		
UNIT-II	**DATA, EXPRESSIONS, STATEMENTS**	**9**
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.		
UNIT-III	**CONTROL FLOW, FUNCTIONS**	**9**
Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.		
UNIT-IV	**LISTS, TUPLES, DICTIONARIES**	**9**
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.		
UNIT-V	**FILES, MODULES, PACKAGES**	**9**
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.		

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Develop algorithmic solutions for simple computational problems.
CO2	Write and execute simple python programs.
CO3	Implement Python program with control structures and function for solving problems.
CO4	Represent compound data using Python list, tuples, and dictionaries.
CO5	Read and write data from/to files in Python programs.

TEXT BOOKS

1. AllenB.Downey,``ThinkPython:HowtoThinkLikeaComputerScientist‘‘,2ndedition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016(http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised andupdatedfor Python 3.2,NetworkTheory Ltd., 2011.

REFERENCES

1. JohnV Guttag,―Introduction to Computation and Programming Using Python‘‘,Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd.,2016.
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,,2015.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	-	-	-	-	-	-	1	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO5	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO	3	2	1	1	-	-	-	1	-	-	-	1	-	-	-

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191EC221/SEMICONDUCTOR DEVICES			3	0	0	3

COURSE OBJECTIVES

- ✓ To understand the concept of semiconductor diode
- ✓ To learn the operation and characteristics of BJT and FET transistors.
- ✓ To study various types of special semiconductor devices, power devices

SYLLABUS

UNIT-I	SEMICONDUCTOR DIODE	9

PN junction diode ,Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics, Transition and Diffusion Capacitances Break down in PN Junction Diodes

UNIT-II	BIPOLAR JUNCTION TRANSISTOR	9

BJT-Types NPN, PNP-Operations -Earlyeffect- Current equations– Input and Output characteristics of Common Emitter, Common Base and Common Collecto r-h- parameter model, Ebers Moll Model- Gummel Poon- model, Multi Emitter Transistor.

UNIT-III	FIELD EFFECT TRANSISTORS	9

JFETs–Drain and Transfer characteristics ,-Current equations –Pinch off voltage and its significance –MOSFET -Characteristics-Threshold voltage- Channel length modulation, D-MOSFET ,E-MOSFET Characteristics, Comparison of MOSFET with JFET.

UNIT-IV	SPECIAL SEMICONDUCTOR DEVICES	9

Metal-Semiconductor Junction-MESFET, Dual GATE MOSFET FINFET, PINFET, CNTFET, Schottky barrier diode-Zener diode-Varactor diode–Tunnel diode-Gallium Arsenide device,LASERdiode,LDR.

UNIT-V	POWER DEVICES AND DISPLAY DEVICES	9

Operation and Characteristics of UJT, SCR, DIAC, TRIAC, Power BJT-Power MOSFET-LED,LCD, Photo Diode, Photo transistor, Charge Coupled Device.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Apply the knowledge of basic types of semiconductor devices on single junction devices
CO2	Analyze the performance bipolar junction devices in different configuration and its characteristics
CO3	To understand the concept of semiconductor diode
CO4	To learn the operation and characteristics of BJT and FET transistors.
CO5	To study various types of special semiconductor devices, power devices.

TEXT BOOKS

1. Donald A Neaman, “Semiconductor Physics and Devices”, Third Edition, Tata McGrawHill Inc.2007.
2. Robert Boylestad and Louis Nashelsky, “Electron Devices and Circuit Theory” Pearson PrenticeHall,10thedition,July 2008.

REFERENCES

1. Yang,“FundamentalsofSemiconductordevices”,McGrawHillInternationalEdition,1978.
2. R.S.Sedha,―ATextBookofAppliedElectronics‖S.Chand Publications,2006.
3. Salivahanan.S,SureshKumar.N,Vallavaraj.A,―ElectronicDevicesandcircuits‖,ThirdEdition,TataMcGraw-Hill, 2008.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	2	2	-	-	-	2	-	-	-
CO2	3	2	2	2	2	-	2	2	-	-	-	2	-	-	-
CO3	3	2	2	2	2	-	2	2	-	-	-	2	-	-	-
CO4	3	2	2	2	2	-	2	2	-	-	-	2	-	-	-
CO5	3	2	2	2	2	-	2	2	-	-	-	2	-	-	-
CO	3	2	2	2	2	-	2	2	-	-	-	2	-	-	-

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191ME21A/ENGINEERING PRACTICES LABORATORY			0	0	4	2

COURSE OBJECTIVES

- ✓ To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

LIST OF EXPERIMENTS

GROUP A (CIVIL &MECHANICAL)	
CIVIL ENGINEERING PRACTICE	
BUILDINGS:	
1	Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.
PLUMBING WORKS:	
1	Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2	Study of pipe connections requirements for pumps and turbines.
3	Preparation of plumbing line sketches for water supply and sewage works.
4	Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5	Demonstration of plumbing requirements of high-rise buildings.
CARPENTRY USING POWER TOOLS:	
1	Study of the joints in roofs, doors, windows and furniture.
2	Hands-on-exercise: Wood work, joints by sawing, planning and cutting.
MECHANICAL ENGINEERING PRACTICES	
WELDING:	
1	Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
2	Gas welding practice.
BASIC MACHINING	

1	Simple Turning and Taper turning.
2	Drilling Practice.
SHEET METAL WORK	
1	Forming & Bending.
2	Model making – Trays and funnels.
3	Different type of joints.
MACHINE LABORATORY PRACTICES	
1	Study of centrifugal pump.
2	Study of air conditioner.
DEMONSTRATION ON	
1	Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
2	Foundry operations like mould preparation for gear and step cone pulley. Fitting – Exercises – Preparation of square fitting and V-fitting models.
GROUP B (ELECTRICAL & ELECTRONICS)	
ELECTRICAL ENGINEERING PRACTICES	
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5	Measurement of energy using single phase energy meter.
6	Measurement of resistance to earth of an electrical equipment.
ELECTRONICS ENGINEERING PRACTICE	
1	Study of Electronic components and equipments - Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2	Study of logic gates AND, OR, EX-OR and NOT.
3	Generation of Clock Signal.
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5	Measurement of ripple factor of HWR and FWR.

LIST OF EXPERIMENTS		
REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
CIVIL		
SI NO	**DESCRIPTION OF THE EQUIPMENT**	**QUANTITY REQUIRED**
1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2	Carpentry vice (fitted to work bench)	15 Nos
3	Standard woodworking tools	15 Sets
4	Models of industrial trusses, door joints, furniture joints	5 Each
5	Power Tools: a) Rotary Hammer b) Demolition Hammer c) Circular Saw d) Planer e) Hand Drilling Machine f) Jigsaw	 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos
MECHANICAL		
1	Are welding transformer with cables and holders	5 Nos
2	Welding booth with exhaust facility	5 Nos
3	Welding accessories like welding shield, chipping hammer, wire brush, etc.,	5 Nos
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5	Centre lathe	2 Nos
6	Hearth furnace, anvil and smithy tools	2 Nos
7	Moulding table, foundry tools	2 Nos
8	Power Tool : Angle Grinder	2 Nos
9	Study-Purpose items: Centrifugal pump, air-conditioner	One Each
ELECTRICAL		
1	Assorted electrical components for house wiring	15 Nos

2	Electrical measuring instruments	10 Nos
3	Study purpose items: Iron box, fan and regulator, emergency lamp	1 Nos
4	Megger (250V/500V)	1 Nos
5	Power Tools: (a) Range Finder (b) Digital Live-wire detector	 2 Nos 2 Nos
ELECTRONICS		
1	Soldering guns	10 Nos
2	Assorted electronic components for making circuits	50 Nos
3	Small PCBs	10 Nos
4	Multimeters	10 Nos
5	Study purpose items: Telephone, FM radio, low-voltage power supply	

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Use mechanical and civil engineering equipments to join the structures and perform basic machining operations and fabricate models in sheet meta
CO2	Use electrical and electronics engineering equipments to test the respective electrical and electronic parameters

CO-PO&PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	3	2	-	-	-	1	1	3	1	-	-
CO2	1	2	3	2	3	2	-	-	-	1	1	3	1	-	-
CO	1	2	3	2	3	2	-	-	-	1	1	3	1	-	-

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191CS21A PROBLEM SOLVING AND PYTHON PROGRAMMING LAB			0	0	2	1

COURSE OBJECTIVES

- ✓ To write, test, and debug simple Python programs.
- ✓ To implement Python programs with conditionals and loops.
- ✓ Use functions for structuring Python programs.
- ✓ Represent compound data using Python lists, tuples, and dictionaries.
- ✓ Read and write data from/to files in Python.

LIST OF EXPERIMENTS

1	Compute the GCD of two numbers.
2	Find the square root of a number (Newton‘s method)
3	Exponentiation (power of a number)
4	Find the maximum of a list of numbers
5	Linear search and Binary search
6	Selection sort, Insertion sort
7	Merge sort
8	First n prime numbers
9	Multiply matrices
10	Programs that take command line arguments(word count)
11	Find the most frequent words in a text read from a file
12	Simulate elliptical orbit sin Pygame
13	Simulate bouncing ball using Pygame **PLATFORM NEEDED** Python3 interpreter for Windows /Linux

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Solve problems using conditionals and loops in Python.
CO2	Develop Python programs by defining functions.
CO3	Represent lists, Tuples and dictionaries for compound data.
CO4	Develop Python programs using files.

CO-PO&PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	1	3	3	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1	3	2	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1	3	2	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1	3	2	1
CO	3	2	1	-	-	-	-	-	-	-	-	1	3	2	1

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE / COURSE TITLE	191EC22A/CIRCUITS AND DEVICES LABORATORY			0	0	4	2

COURSE OBJECTIVES

- ✓ To learn the characteristics of basic electronic devices such as Diode, BJT, FET,SCR.
- ✓ To understand the application of PN junction diode.
- ✓ To differentiate the operation of oscillators.

LIST OF EXPERIMENTS

1	Characteristics of PN Junction Diode.
2	Zener diode Characteristics & Regulator using Zener diode.
3	Common Emitter input-output Characteristics.
4	Common Emitter input-output Characteristics.
5	Common Base input-output Characteristics.
6	FET Characteristics.
7	SCR Characteristics.
8	Clipper and Clamper & FWR.
9	Verifications of Thevenin & Norton theorem.
10	Verifications of maximum power transfer & reciprocity theorem.
11	Verifications of Super Position Theorem.
12	Verifications of KVL & KCL.
13	Determination of Resonance Frequency of Series & Parallel RLC Circuits.

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Acquires the Simulate electric circuits.
CO2	Understand the circuit theorems and concepts in engineering applications
CO3	Apply the circuit Devices and concepts in engineering applications.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	-	-	1	1	-	-	2	-	-	-
CO2	3	3	1	-	-	-	-	1	1	-	-	2	-	-	-
CO3	3	3	1	-	-	-	-	1	1	-	-	2	-	-	-
CO	3	3	1	-	-	-	-	1	1	-	-	2	-	-	-

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191EC321/DIGITAL LOGIC CIRCUIT DESIGN			3	0	0	3

COURSE OBJECTIVES

- ✓ To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- ✓ To familiarize with the design of various combinational digital circuits using logic gates
- ✓ To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- ✓ To explain the various semiconductor memories and related technology

SYLLABUS

UNIT-I	Boolean Algebra	9

Boolean algebra – Basic postulates, Theorems - Switching functions, canonical forms-logic gates- Simplification of logic functions using K-maps and QuineMcClusky method - Implementation using logic gates.

UNIT-II	Combinational Logic Circuits	9

Analysis and Design of combinational circuits, Design of Half and Full Adders, Half and Full Subtractors, Decoders, Encoders, Multiplexers and Demultiplexers, Binary/ BCD adder, subtractor- Carry look ahead adder- magnitude comparator- parity generator and checker-Code convertors.

UNIT-III	Synchronous Sequential Logic Circuits	9

General model of sequential circuits- flip-flops- latches - Master slave configuration - Mealy/Moore models – state diagram - state table, state reduction procedures - Design of synchronous sequential circuits -up/down counter, modulo N counters - shift registers – universal Shift Register , Ring counter, Johnson counter.

UNIT-IV	Asynchronous Sequential Logic Circuits	9

Introduction to asynchronous sequential circuits - Analysis and Design of asynchronous sequential circuits - fundamental mode and pulse mode circuits, races-cycles- race free state assignment, Hazards, Essential Hazards, Design of Hazard free circuits.

UNIT-V	Memory and Verilog	9

Classification of memories- ROM- RAM- SRAM- DRAM - Introduction to PLDs- PROM- PAL- PLA- Implementation of functions using PLDs.
Introduction to Hardware Description Language- Verilog description of combinational logic circuits. Verilog description of sequential logic circuits

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Apply the theorems and postulates of Boolean algebra, for simplification of logic functions.
CO2	Design combinational logic circuits for various applications and implement using logic gates.
CO3	Design and implement synchronous sequential logic circuits using different flip flops.
CO4	Analyze the given Asynchronous sequential logic circuit to determine its function.
CO5	Implementation of PLD's and simulate of combinational and sequential circuits using HDL.

TEXT BOOKS

1. M.Morris Mano & Michael D.Ciletti, Digital Design, First impression, Pearson, 2012.
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.

REFERENCES

1. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
2. Stephen D. Brown, and ZvonkoVranesic, "Fundamentals of Digital Logic with VerilogDesign, 2nd Edition," McGraw Hill, June, 2007
3. J.Baskar, "A Verilog HDL Primer", Third Edition,2005,Star Galaxy publishing

William Kleitz, "Digital Electronics: A Practical Approach with VHDL", Ninth Edition, Pearson,2002.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	1	3	2	1
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	2	1
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	1
CO4	3	3	3	2	-	-	-	-	-	-	-	-	3	3	1
CO5	3	3	3	2	2	-	-	-	-	-	2	2	3	3	1
CO	3	3	3	2	2	-	-	-	-	-	2	2	3	3	1

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191EC322/ ELECTRONIC CIRCUITS I			3	0	0	3

COURSE OBJECTIVES

- ✓ To understand the methods of biasing transistors
- ✓ To design and analyze single stage amplifier circuits
- ✓ To design and analyze multistage and differential amplifier circuits.
- ✓ To analyze the frequency response of amplifiers

SYLLABUS

UNIT-I	BIASING OF DISCRETE BJT, FET AND RECTIFIERS	9
DC Load Line and Bias Point – Various biasing methods of BJT – Bias Circuit Design - Thermal stability - Stability factors - Bias compensation techniques using Diode, thermistor and senses tor – Various biasing methods of JFET and MOSFET -Rectifiers and Filters		
UNIT-II	**SMALL SIGNAL ANALYSIS OF BIPOLAR JUNCTION TRANSISTOR**	**9**
AC Load line-Small Signal Hybrid π equivalent circuit of BJT – Early effect - Analysis of CE, CC and CB amplifiers using Hybrid π equivalent circuits-Current sources circuits-Small signal analysis of active load circuits.		
UNIT-III	**SMALL SIGNAL ANALYSIS OF FIELD EFFECT TRANSISTOR**	**9**
Small Signal Hybrid π equivalent circuit of JFET and MOSFET - Analysis of CS, CD and CG amplifiers using Hybrid π equivalent circuits		
UNIT-IV	**MULTISTAGE AND DIFFERENTIAL AMPLIFIERS**	**9**
Need for multistage amplifier-Gain of multistage amplifier– Cascade amplifiers-Cascode amplifiers-Darlington amplifiers-Differential amplifier – Basic Differential pair BJT and FET - Frequency response of the Differential amplifier-CMRR.		
UNIT-V	**FREQUENCY RESPONSEOFAMPLIFIERS**	**9**
Amplifier frequency response – Frequency response of transistor amplifiers with circuit capacitors– BJT frequency response – short circuit current gain - cut off frequency – fα, fβ and unity gain bandwidth – Miller effect - frequency response of FET - High frequency response of transistor circuits - Transistor Switching Times.		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Understand the varies biasing techniques of BJT and FET
CO2	Interpret the performance of small signal equivalent BJT amplifier
CO3	Evaluate the performance of small signal JFET and MOSFET amplifier
CO4	Analyze the performance of multistage and differential amplifier.
CO5	Design and analyze the frequency response of amplifier in BJT and FET

TEXT BOOKS

1. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, McGraw Hill Education (India)Private Ltd., 2010.
2. Robert L. Boylestadand Louis Nasheresky, -Electronic Devices and Circuit Theory‖, 11th Edition, Pearson Education, 2013.

REFERENCES

1.Millman J, Halkias.C.and SathyabradaJit, Electronic Devices and Circuits, 4th Edition, McGraw Hill Education (India) Private Ltd., 2015.
2. Floyd, Electronic Devices, Ninth Edition, Pearson Education, 2012.
3. David A. Bell, Electronic Devices & Circuits, 5th Edition, Oxford University Press, 2008.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	-	-	-	-	-	-	1	2	-	-
CO2	3	3	3	2	1	-	-	-	-	-	-	1	2	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-	1	2	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	1	2	-	-
CO5	3	3	2	2	1	-	-	-	-	-	-	1	2	2	2
CO	3	3	3	2	1	-	-	-	-	-	-	1	2	2	2

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191EC323/ SIGNALS AND SYSTEMS			3	0	0	3

COURSE OBJECTIVES

- ✓ To familiarize with the basic concepts and properties of Signals & Systems
- ✓ To analyze continuous time signals and systems using Fourier and Laplace transform
- ✓ To understand the methods of characterization of LTI systems in time domain
- ✓ To analyze discrete time signals and systems in the Fourier and Z transform domain

SYLLABUS

UNIT-I	Classification of signals and systems	9
Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids - Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Static &Dynamic ,Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.		
UNIT-II	**Analysis of Continuous time signals**	**9**
Fourier series for periodic signals - Fourier Transform and its properties- Laplace transforms and its properties		
UNIT-III	**Linear Time Invariant continuous time systems**	**9**
Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.		
UNIT-IV	**Analysis of Discrete time signals**	**9**
Fourier Transform of discrete time signals (DTFT) – Properties of DTFT - Z Transform & Properties- Baseband signal Sampling – Sampling and aliasing.		
UNIT-V	**Linear Time Invariant- Discrete time systems**	**9**
Impulse response – Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Determine the various properties of signals and systems.
CO2	Analyze Continuous time signals using Fourier and Laplace Transforms.
CO3	Compute the output of continuous time LTI systems using Fourier and Laplace Transforms.
CO4	Analyze Discrete time signals using Z transform and DTFT.
CO5	Compute the output of Discrete time LTI systems using Z transform and DTFT.

TEXT BOOKS

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2015.

REFERENCES

2. B. P. Lathi, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
3. E. Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
3.John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	-	-	-	-	1	1	2	1	-
CO2	3	3	1	1	1	1	-	-	-	-	1	1	2	1	-
CO3	3	3	2	2	1	1	-	-	-	-	1	1	2	1	-
CO4	3	3	1	1	1	1	-	-	-	-	1	1	2	1	-
CO5	3	3	2	2	1	1	-	-	-	-	1	1	2	1	-
CO	3	3	2	2	1	1	-	-	-	-	1	1	2	1	-

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191MA304/Linear Algebra and Partial Differential Equations			2	2	0	3

COURSE OBJECTIVES

- ✓ To introduce the basic notions of groups, rings, fields which will then be used to solve related problems
- ✓ To understand the concepts of vector space, linear transformations and diagonalization.
- ✓ To apply the concept of inner product spaces in orthogonalization.
- ✓ To understand the procedure to solve partial differential equations.
- ✓ To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

SYLLABUS

UNIT-I	VECTOR SPACES	12

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

UNIT-II	LINEAR TRANSFORMATION AND DIAGONALIZATION	12

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of a linear transformations - Eigenvalues and eigenvectors – Diagonalizability.

UNIT-III	INNER PRODUCT SPACES	12

Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation.

UNIT-IV	PARTIAL DIFFERENTIAL EQUATIONS	12

Formation – Solutions of first order equations – Standard types and equations reducible to standard types – Singular solutions – Lagrange‟s linear equation – Integral surface passing through a given curve – Classification of partial differential equations - Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.

UNIT-V	FOURIER SERIES SOLUTIONS OF PARTIAL DIFFERENTIAL	12

Dirichlet‟s conditions – General Fourier series – Half range sine and cosine series - Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Analyze the vectors in Rn geometrically and algebraically.
CO2	Relate the concepts of Span, Dimension and basics to various vector spaces.
CO3	Apply Gram – Schmidt process to find linearly independent vectors.
CO4	Understand how to solve the given standard partial differential equations.
CO5	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional Heat flow problems

TEXT BOOKS

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Friedberg, A.H., Insel, A.J. and Spence, L., “Linear Algebra”, Prentice Hall of India, New Delhi, 2004

CO-PO&PSOMapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	1	-	-	-	-	-	-	1	3	1	1
CO 2	3	3	2	2	1	-	-	-	-	-	-	1	3	1	1
CO 3	3	3	2	2	1	-	-	-	-	-	-	1	3	1	1
CO 4	3	3	2	2	1	-	-	-	-	-	-	1	3	1	1
CO 5	3	3	2	2	1	-	-	-	-	-	-	1	3	1	1
CO	3	3	**2**	**2**	1	-	-	-	-	-	-	1	3	1	1

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191CS311/ Data Structures in C			3	0	0	3

COURSE OBJECTIVES

- ✓ To learn the features of C
- ✓ To learn the linear and non-linear data structures
- ✓ To explore the applications of linear and non-linear data structures
- ✓ To learn to represent data using graph data structure
- ✓ To learn the basic sorting and searching algorithms

SYLLABUS

UNIT-I	C Programming Basics	9

Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs – sorting, searching – matrix operations.

UNIT-II	Functions, Pointers, Structures and Unions	9

Functions – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic. Structures and unions - definition – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

UNIT-III	Linear Data Structures	9

Arrays and its representations – Stacks and Queues – Linked lists – Linked list-based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT-IV	Non-Linear Data Structures	9

Trees – Binary Trees – Binary tree representation and traversals –Binary Search Trees – Applications of trees. Set representations - Union-Find operations. Graph and its representations – Graph Traversals.

UNIT-V	Searching and Sorting Algorithms	9

Linear Search – Binary Search. Bubble Sort, Insertion sort – Merge sort – Quick sort - Hash tables – Overflow handling.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Describe the basics of C programming language
CO2	Illustrate the concepts of functions, pointers, structures and unions for the given application
CO3	Interpret and implement linear data structure operations in C
CO4	Analyze and evaluate nonlinear data structure for the given application
CO5	Apply the hashing concepts and choose the appropriate sorting and searching algorithm for an application

TEXT BOOKS

1. PradipDey and ManasGhosh, —Programming in C, Second Edition, Oxford University Press, 2011.
2. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

REFERENCES

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithms, Pearson Education, 1983.
3. Robert Kruse, C.L.Tondo, Bruce Leung, ShashiMogalla , — Data Structures and Program Design in C, Second Edition, Pearson Education, 2007
4. Jean-Paul Tremblay and Paul G. Sorenson, —An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, 1991.

CO-PO&PSOMapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1	1	1	-	-	-	-	-	1	2	2	1
CO 2	3	2	2	1	1	1	-	-	-	-	-	1	2	2	1
CO 3	3	2	2	1	1	1	-	-	-	-	1	1	2	2	1
CO 4	3	2	2	1	1	1	-	-	-	-	1	1	2	2	1
CO 5	3	2	2	1	1	1	-	-	-	-	1	1	2	2	1
CO	3	2	2	1	1	1	-	-	-	-	1	1	2	2	1

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191HS301/MANAGEMENT SCIENCE			3	0	0	3

COURSE OBJECTIVES

- ✓ It makes the students aware of what is management
- ✓ Students learn how to overcome unexpected problems themselves
- ✓ It makes them active listeners by which they can be effective speakers
- ✓ Students become expertise in their written communication particularly
- ✓ It improves the academic standards and the employability skills

SYLLABUS

UNIT-I	Managerial Skills	9

Management Introduction - Time Management – Stress Management - employability and career Skills—grooming as a professional with values - General awareness of Current Affairs.

UNIT-II	Listening Skills	9

Importance of listening – Active listening - Asking questions – Responding to the questions - Listen to the Audio – visual components – Listening Comprehension

UNIT-III	Speaking Skills	9

General Conversation – Question and Answer sessions - Role play activities - Telephone skills - Public Speaking

UNIT-IV	Writing Skills	9

Effective writing - Letter writing – E-mail writing – Paragraph writing – Report writing

UNIT-V	Presentation Skills	9

Introduction to Presentation –Building up confidence - Effective Presentation – Body Language - Poster presentations – seminars relevant to Management

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Overcome the stress in their respective field
CO2	Be an active listener so as to respond accurately and effectively
CO3	Raise and respond to the queries without any hesitation
CO4	Write effectively and to draft letters, E-mails impressively.
CO5	Deliver presentations confidently

TEXT BOOKS

1. Dhanavel, S. P. English and Communication Skills for Students of Science and Engineering, Orient Blackswan, Chennai – 2011.
2. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
3. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
4. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

REFERENCES

1. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms, Pearson Education, 1983.
3. Robert Kruse, C.L.Tondo, Bruce Leung, ShashiMogalla , ― Data Structures and Program Design in C, Second Edition, Pearson Education, 2007
4. Jean-Paul Tremblay and Paul G. Sorenson, ―An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, 1991.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	2	2	3	2	3	-	-	-
CO2	-	-	-	-	-	-	-	2	2	3	2	3	-	-	-
CO3	-	-	-	-	-	-	-	2	2	3	2	3	-	-	-
CO4	-	-	-	-	-	-	-	2	2	3	2	3	-	-	-
CO5	-	-	-	-	-	-	-	2	2	3	2	3	-	-	-
CO	-	-	-	-	-	-	-	2	2	3	2	3	-	-	-

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191EC32A/ Analog and Digital Electronics Laboratory			0	0	4	2

COURSE OBJECTIVES

- ✓ Study the Frequency response of CE, CB and CC Amplifier
- ✓ Learn the frequency response of CS Amplifiers
- ✓ Study the Transfer characteristics of differential amplifier
- ✓ Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
- ✓ Perform SPICE simulation of Electronic Circuits
- ✓ Design and implement the Combinational and sequential logic circuits

LIST OF EXPERIMENTS

	Analog Experiments
1	Frequency Response of CE, CB, CC and CS amplifiers
2	Darlington Amplifier
3	Differential Amplifier Transfer characteristics, CMRR Measurement
4	Cascode and Cascade amplifiers
5	Determination of bandwidth of single stage and multistage amplifiers
6	Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software like Spice
7	Analysis of Cascode and Cascade amplifiers using Spice
8	Analysis of Frequency Response of BJT and FET using Spice
	Digital Experiments
9	Design and implementation of code converters using logic gates(i) BCD to excess 3 code and vice versa (ii) Binary to gray and vice-versa
10	Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
11	Design and implementation of Multiplexer and De multiplexer using logic gates
12	Design and implementation of encoder and decoder using logic gates
13	Construction and verification of 4 bit ripple counter and Mod -10 / Mod-12 Ripple counters
14	Design and implementation of 3-bit synchronous up/down counter

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Design and analyze bandwidth of single stage and multi stage of BJT/FET amplifiers.
CO2	Simulate and analyze amplifier circuits using PSPICE.
CO3	Build combinational logic circuits for a given application using logic gates, multiplexers, decoders and encoders

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	-	-	-	-	1	2	3	3	3
CO2	2	3	3	3	2	1	-	-	-	-	1	2	3	3	3
CO3	3	3	3	3	2	1	-	-	-	-	1	2	3	3	3
CO	3	3	3	3	2	1	-	-	-	-	1	2	3	3	3

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191CS31A/ Data Structures in C Laboratory			0	0	2	1

COURSE OBJECTIVES

- ✓ To understand and implement basic data structures using C
- ✓ To apply linear and non-linear data structures in problem solving
- ✓ To learn to implement functions and recursive functions by means of data structures
- ✓ To implement searching and sorting algorithms

LIST OF EXPERIMENTS

Analog Experiments

1	Basic C Programs – looping, data manipulations, arrays
2	Programs using strings – string function implementation
3	Programs using structures and pointers
4	Programs involving dynamic memory allocations
5	Array implementation of stacks and queues
6	Linked list implementation of stacks and queues
7	Application of Stacks and Queues
8	Implementation of Trees, Tree Traversals
9	Implementation of Binary Search trees
10	Implementation of Linear search and binary search
11	Implementation Insertion sort, Bubble sort, Quick sort and Merge Sort
12	Implementation Hash functions, collision resolution technique

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Illustrate the basic and advanced program in C.
CO2	Implement the different operations of stack, queue, linked list and search trees.
CO3	Demonstrate the graph traversal algorithms.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	1	1	1	1	1	-	1	2	2	1
CO2	3	2	2	1	-	1	1	1	1	1	-	1	2	2	1
CO3	3	2	2	1	-	1	1	1	1	1	-	1	2	2	1
CO	3	2	2	1	-	1	1	1	1	1	-	1	2	2	1

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE / COURSE TITLE	191HS30B / INTERPERSONAL SKILLS/LISTENING&SPEAKING			0	0	2	1

COURSE OBJECTIVES

- ✓ Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- ✓ Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- ✓ Improve general and academic listening skills
- ✓ Make effective presentations.

SYLLABUS

UNIT-I	6

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT-II	6

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT-III	6

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT-IV	6

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT-V	6

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Listen and respond appropriately.
CO2	Participate in group discussions
CO3	Make effective presentations
CO4	Participate confidently and appropriately in conversations both formal and informal

CO-PO & PSO Mapping															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	-	-	3	3	2	2	-	-	-
CO2	-	-	-	-	-	-	-	-	3	3	2	2	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	2	2	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	2	2	-	-	-
CO	-	-	-	-	-	-	-	-	3	3	2	2	-	-	-

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191EC421/Analog communication			3	0	0	3

COURSE OBJECTIVES

- ✓ To introduce the concept of various amplitude modulations and their spectral characteristics.
- ✓ To be familiarized with noise theory and its effects in communication systems.
- ✓ To understand the performance of various receivers
- ✓ To gain knowledge of information and coding techniques.

SYLLABUS

UNIT-I	Amplitude Modulation	9

Amplitude Modulation- DSBSC, DSBFC, SSB, VSB - Modulation index, Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator, SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope –comparison of different AM techniques.

UNIT-II	Analog Modulation	9

Phase and frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth - FM modulation –Direct and Indirect methods, FM Demodulation – FM to AM conversion, FM Discriminator - PLL as FM Demodulator.

UNIT-III	Noise Theory	9

Narrow band noise – PSD of in-phase and Quadrature noise –Noise performance in AM systems – Noise performance in FM systems – Pre-emphasis and de-emphasis – Capture effect, threshold effect. Noise sources and types – Noise figure and noise temperature – Noise in cascaded systems.

UNIT-IV	Receivers	9

Radio receiver – receiver types – Tuned Radio Frequency receiver, Super heterodyne receiver, RF section and Characteristics – Frequency changing and tracking, Intermediate frequency, AGC, FM receiver, Comparison with AM receiver

UNIT-V	Information Theory and Coding	9

Measure of information –Entropy - Discrete Memory less channels - Channel Capacity -Hartley - Shannon law - Source coding theorem - Huffman & Shannon - Fano codes.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Apply the amplitude modulation techniques for band pass communication.
CO2	Describe various analog modulation techniques and bandwidth utilized.
CO3	Analyze the noise performance in AM and FM system.
CO4	Gain the knowledge of the components used in communication receivers
CO5	Evaluate source information and coding techniques used to minimize errors

TEXT BOOKS

J.G.Proakis, M.Salehi, ―Fundamentals of Communication Systems‖, Pearson Education 2014.
2. Simon Haykin, ―Communication Systems‖, Wiley Publication, New Delhi, 2011.

REFERENCES

1. Simon Haykin, ―Analog and digital communication, Wiley Publication, New Delhi, 2011.
2.WayneTomasi,'Advanced Electronic communication system,'6th Edition Pearson Education 2009.
3.Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

CO-PO&PSOMapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	2	1	1	-	-	-	-	-	1	3	2	1
CO 2	3	3	2	2	1	1	-	-	-	-	-	1	3	2	1
CO 3	3	3	2	2	1	1	-	-	-	-	-	1	3	3	1
CO 4	3	3	2	2	1	1	-	-	-	-	-	1	3	3	1
CO 5	3	2	2	2	1	1	-	-	-	-	-	1	3	3	1
CO	3	3	2	2	1	1	-	-	-	-	-	1	3	3	1

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191EC422/ELETRONIC CIRCUITS-II			3	0	0	3

COURSE OBJECTIVES

- ✓ To give a comprehensive exposure to all types of amplifiers and oscillators, constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits
- ✓ To understand the analysis and design of LC and RC oscillators, amplifiers, multivibrator and power amplifiers

SYLLABUS

UNIT-I	Feedback Amplifiers	9

Basic principles and types of feedback - Gain of an amplifier employing feedback - Effect of feedback (negative) on gain, stability, distortion and bandwidth of amplifier-Input and output impedances-Frequency compensation.

UNIT-II	Oscillators	9

Use of positive feedback -Barkhausen criterion for oscillation – Different oscillator circuits -Phase shift, Wien bridge, Twin T - Hartley &Colpitt‘s oscillators – Clapp oscillator-Tuned oscillators, Ring oscillators and crystal oscillators – oscillator amplitude stabilization.

UNIT-III	Tuned Amplifiers	9

Coil losses, unloaded and loaded Q of tank circuits, Analysis of single tuned amplifier, double tuned, stagger tuned amplifiers, instability of tuned amplifiers, stabilization techniques, Narrow band neutralization using coil, Broad banding using Hazeltineneutralization,ClassCtunedamplifiersandtheirapplications.EfficiencyofClassCtunedAmplifier.

UNIT-IV	Wave Shaping and Multivibrator Circuits	9

Pulse circuits – RC integrator and differentiator circuits – diode clampers and clippers –Multivibrators Astable, monostable, bitable- Schmitt Trigger- UJT waveform generator.

UNIT-V	Power Amplifiers	9

Difference between voltage and power amplifiers - Importance of impedance matching in amplifiers - Class A, Class B, Class AB, and Class C amplifiers –Switched mode Power Amplifier (SMPA)-Power BJTs.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Describe the Basic Concepts of Feedback Amplifiers
CO2	Construct and develop the various types of Oscillators
CO3	Analyze the performance of Tuned Amplifiers
CO4	Design the different types of Wave Shaping and Multivibrator Circuits
CO5	Examine the performance of Power Amplifiers and Dc Convertors

TEXT BOOKS

1.Sedra and Smith, ―Micro Electronic Circuits‖; Sixth Edition, Oxford University Press, 2011.
2. Jacob Millman, Microelectronics, McGraw Hill, 2nd Edition, Reprinted, 2009.

REFERENCES

1. Robert L.Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory‖, 10th Edition, Pearson Education / PHI, 2008
2. David A.Bell, ―Electronic Devices and Circuits, Fifth Edition, Oxford UniversityPress, 2008.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	-	-	-	-	1	1	3	3	3
CO2	3	3	3	3	2	1	-	-	-	-	1	1	3	3	3
CO3	3	3	3	3	2	1	-	-	-	-	1	1	3	3	3
CO4	3	3	3	3	2	1	-	-	-	-	1	1	3	2	2
CO5	3	3	3	3	1	1	-	-	-	-	1	1	3	2	2
CO	3	3	3	3	2	1	-	-	-	-	1	1	3	3	3

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191EC423/ELECTROMAGNETIC FIELDS			2	2	0	3

COURSE OBJECTIVES

- ✓ To gain conceptual and basic mathematical understanding of electric and magnetic fields in free space and in materials.
- ✓ To understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations.
- ✓ To understand wave propagation in lossless and in lossy media.
- ✓ To be able to solve problems based on the above concepts.

SYLLABUS

UNIT-I	Introduction and Vector Analysis	12

Nature of scalar and vectors , Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Vector differential operator, Gradient, Divergence, Curl operators, Divergence theorem, Stoke's theorem, Null identities, Helmholtz's theorem.

UNIT-II	Electrostatics	12

Electric field intensity , Electric flux density- Electric field intensity due to different charge distribution, Coulomb's law, Gauss's law and applications, Gauss divergence theorem, Boundary conditions, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy and energy density

UNIT-III	Magnetostatics	12

Magnetic field intensity, , Magnetic flux density, Biot- Savart law and applications , Ampere's circuital law, Lorentz force equation, Scalar and Vector magnetic potential, Boundary conditions, Inductor-Inductance evaluation of Toriod, Coaxial cable, Transmission line, electromagnetic boundary condition

UNIT-IV	Time-Varying Fields and Maxwell's Equations	12

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields.

UNIT-V	Plane Electromagnetic Waves	12

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Describe the fundamental electromagnetic laws and concepts.
CO2	Solve simple problems requiring estimation of electric quantities based on these concepts and laws
CO3	Executing simple problems requiring the estimation of magnetic quantities based on these concepts.
CO4	Reviewing Maxwell's equations in integral, differential forms and their physical meaning.
CO5	Experimenting electromagnetic wave propagation in lossy and in lossless media.

TEXT BOOKS

1. D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 1989 (UNIT I, II,III IV,V).
2.W.H. Hayt and J.A. Buck, Engineering electromagnetics, 7th ed., McGraw-Hill (India), 2006 (UNIT I-V).

REFERENCES

1. M.N.O Sadiku and S.V Kulkarni, Principles of electromagnetic, 6th ed., Oxford(Asian Edition), 2015
2. D.J Griffiths, Introduction to electrodynamics, 4th ed., pearson (India), 2013.
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	1	-	-	-	-	-	1	1	1	-
CO2	3	3	2	2	-	1	-	-	-	-	1	1	1	2	-
CO3	3	3	2	2	-	1	-	-	-	-	1	1	1	2	1
CO4	3	3	2	2	1	1	-	-	-	-	1	1	1	2	1
CO5	3	3	2	2	1	1	-	-	-	-	1	1	1	1	1
CO	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**2**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191EC424/ LINEAR INTEGRATED CIRCUITS			3	0	0	3

COURSE OBJECTIVES

- ✓ To learn the basics concepts, characteristics and linear and non-linear applications of operational Amplifier.
- ✓ To understand the operation and applications of Timer 555 and PLL.
- ✓ To learn the need and types of ADC and DAC
- ✓ To learn the operation of Voltage Regulators and concepts of waveform generation.

SYLLABUS

UNIT-I	Operational Amplifiers and its Characteristics	9

Introduction to OP-AMPs- Characteristics of an Ideal Operational Amplifier –AC Characteristics-CMRR-Slew Rate - Frequency response-DC Characteristics-JFET OP-AMP TL082-Open and closed loop configurations:- Inverting and Non inverting amplifiers - Voltage Follower.

UNIT-II	Applications of operational amplifier	9

Summing amplifier - Differential amplifier-Log and Antilog amplifier - Instrumentation amplifier - Integrator and Differentiator – V-I and I-V Convertors. Active filters - Low pass, High pass, Band pass and Band stop Butterworth filters - Precision diode- Half Wave and Full wave Rectifiers –Comparators-Clipper and Clamper.

UNIT-III	Timer IC and Phase Locked Loop	9

IC 555 Timer Functional block diagram and description – Astable and Monostable operation - Voltage Controlled Oscillator-PLL: - Principle of operation - Building blocks - Characteristics - Derivations of expressions for Lock and Capture ranges - Applications: Frequency Synthesis - Frequency Translation - AM and FM detection.

UNIT-IV	A-D and D-A Converters	9

Digital to Analog converters - Binary weighed and R-2R Ladder types - Analog to digital converters - Sample and Hold circuit - successive approximation, single, dual slope and parallel types - DAC/ADC performance characteristics.

UNIT-V	Waveform Generators and Voltage Regulators	9

Sinusoidal Oscillators-Wein Bridge, RC Phase oscillators – Multivibrators using IC741-Astable, Monostable and Schmitt Trigger. Voltage Regulators- Series and Shunt regulators- Current limiting and protection circuits - Switched mode power supplies – IC723 General purpose voltage regulators.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Analyze the internal circuit of OP-AMP and its Characteristics.
CO2	Interpret the Linear and Non-Linear Applications of OP-AMP.
CO3	Describe the operation of PLL, VCO and its applications.
CO4	Design Analog to Digital and Digital to Analog Convertor by using OP-AMP.
CO5	Construct various waveforms using OP-AMP circuits and Special Function ICs.

TEXT BOOKS

1.Roy Choudhury and Shail Jain "Linear Integrated Circuits", Wiley Eastern, New Delhi,5th Edition,Reprint 2018.
2.Sonde, B.S, ―Introduction to System Design using Integrated Circuits‖, Second Edition, Wiley Eastern Limited, New Delhi, 1994.

REFERENCES

1. Gayakwad. A.R ―OP- AMPS and Linear Integrated Circuits‖, Fourth edition, Prentice Hall of India, New Delhi, 2003.
2.Michael Jacob. J, ―Analog Integrated Circuits and Applications‖, First edition, Prentice Hall of India, New Delhi, April 2000.
3.Robert F Coughlin and Fedrick F Driscoll ―Operational amplifiers and linearIntegrated Circuits‖, Fifth edition, Prentice Hall of India,New Delhi 2001

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	-	-	-	-	-	1	3	2	-
CO2	3	2	2	1	1	-	-	-	-	-	-	1	3	2	1
CO3	3	2	2	1	1	-	-	-	-	-	-	1	3	2	1
CO4	3	2	2	2	1	1	-	-	-	-	-	1	3	2	1
CO5	3	2	2	2	1	-	-	-	-	-	-	1	3	2	1
CO	**3**	**2**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191EC425/MICROPROCESSORS AND MICROCONTROLLERS			3	0	0	3

COURSE OBJECTIVES

- ✓ To understand the Architecture of Microprocessor and Microcontroller
- ✓ To interface Microcontroller with supporting chips.
- ✓ To study the Architecture of RISC Processor.
- ✓ To design a microcontroller-based system

SYLLABUS

UNIT-I	THE 8086 MICROPROCESSOR	9
Overview of Microprocessors, 8086 – Architecture, Signals, Addressing modes , Instruction set and assembler directives ,Assembly language programming , Stacks , Procedures ,Macros , Interrupts and interrupt service routines , System bus timing.		
UNIT-II	**8051 MICROCONTROLLERS**	**9**
Functional block diagram and pin diagram of 8051- Power supply, clock and reset circuit- Program Counter and ROM space in 8051-Program and Data Memory organization-addressing modes. Instruction Set: data transfer, arithmetic and logical, program branching instructions and Boolean variable manipulation.		
UNIT-III	**ON-CHIP PERIPHERALS AND PROGRAMMING TECHNIQUES**	**9**
Parallel Port Structure and bit-manipulation programming, timer/counter-Operating Modes-Programming 8051 Timers - Counter Programming-Serial Communication: Basics of Serial Communication-UART-Operating Modes-RS232 Standards-8051 connection to RS232-Serial Port Programming. Interrupt: 8051 Interrupt- External and Internal Interrupts- Programming timer Interrupts, external hardware interrupts and serial communication interrupts -Interrupt Priority and Programming. Power Saving Modes.		
UNIT-IV	**PERIPHERAL INTERFACING AND PROGRAMMING**	**9**
Parallel communication interface, Serial communication interface, D/A and A/D Interface, Timer, Keyboard /display controller ,Traffic Light control and Stepper Motor Interfacing Techniques		
UNIT-V	**RISC ARCHITECTURE**	**9**
Overview of RISC processor, Hybrid architecture, Advantages of RISC, Features of RISC, Design issues of RISC Processor, Performance issues in pipelined system, Architecture of ARM7 and Sun Ultra SPARC.		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Analyze and implement programs on 8086 microprocessor.
CO2	Interpret 8051 Microcontrollers architecture and its functionalities.
CO3	Design and develop microcontroller based systems for real time applications
CO4	Interface the peripherals and I/O devices using 8051 microcontroller.
CO5	Analyze the architecture of RISC processors.

TEXT BOOKS

1. Muhammad Ali Mazidi, J.G. Mazidi, R.D. McKinlay,"The 8051 Microcontroller and Embedded Systems", Second Edition, Prentice Hall of India Pvt. Ltd., 2007.
2. A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

REFERENCES

1. Krishna Kant, — "Microprocessors and Microcontrollers- Architecture, programming and system design 8085, 8086, 8051,8096", Prentice Hall of India, New Delhi, 2007.
2. Kenneth J Ayala, — "The 8051 Microcontroller – Architecture, Programming and Applications", Penram International Publications, Mumbai India, 1996.
3.Doughlas V.Hall,"Microprocessors and Interfacing, Programming and Hardware", TMH, 2012

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	2	1
CO3	3	3	3	2	2	1	-	-	-	-	-	-	3	2	1
CO4	3	3	3	2	2	1	-	-	-	-	-	-	3	2	1
CO5	3	3	3	2	2	1	-	-	-	-	-	1	3	2	1
CO	**3**	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191MA401/ PROBABILITY AND RANDOM PROCESS			2	2	0	3

COURSE OBJECTIVES

- ✓ Acquire skills in handling situations involving more than one random variable and functions of random variables.
- ✓ Be introduced to the notion of sampling distributions and have acquired knowledge of statistical techniques useful in making rational decision in management problems.
- ✓ Be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.

SYLLABUS

UNIT-I	Probability And Random Variables	9

Probability -Axioms of probability – Conditional probability –Baye's theorem - Random variable - Probability mass function - Probability density function - Cumulative distribution function - Moments - Moment generating functions.

UNIT-II	Standard Distributions	9

Discrete distributions - Binomial, Poisson, Geometric distributions - Continuous distributions- Uniform- Exponential, and Normal distributions

UNIT-III	Two Dimensional Random Variables	9

Random variables-One and two dimensional random variables-Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression.

UNIT-IV	Random Processes	9

Random process-Classification – definition and examples-Stationary process –first and second order-strict and wide sense process-problems - Ergodic process – Markov process-Poisson process.

UNIT-V	Correlation and Spectral Densities	9

Auto correlation-Cross correlation-properties-problems-Power spectral density-Cross spectral density-properties-Relationship between cross power spectrum and cross correlation function.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Demonstrate and apply the basic probability axioms and concepts in their core areas.
CO2	Apply the concepts of probability distributions in an appropriate place of science and Engineering.
CO3	Calculate the relationship of two dimensional random variables using correlation techniques and to study the properties of two dimensional random variables.
CO4	Estimate the functions of time when the probability measure is associated through random process.
CO5	Evaluate the concept of spectral density functions.

TEXT BOOKS

1. Ibe.O.C., "Fundamentals of Applied Probability and Random Process",Elaevier,1st Indian Reprint,2007.
2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCES

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
2. Stark. H., and Woods. J.W., "Probability and Random Processes with Applications to Signal Processing", 3rd Edition,Pearson Education, Asia, 2002.
3. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.

CO-PO&PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	-	-	-	-	-	-	1	3	1	1
CO2	3	3	1	2	-	-	-	-	-	-	-	1	3	1	1
CO3	3	3	1	2	-	-	-	-	-	-	-	1	3	1	1
CO4	3	3	1	2	-	-	-	-	-	-	-	1	3	1	1
CO5	3	3	1	2	-	-	-	-	-	-	-	1	3	1	1
CO	**3**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**1**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191EC42A/INTEGTATED CIRCUITS AND SIMULATION LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ To gain hands on experience in designing electronic circuits
- ✓ To learn simulation software used in circuit design
- ✓ To learn the fundamental principles of amplifier circuits
- ✓ To differentiate feedback amplifiers and oscillators.
- ✓ To differentiate the operation of various multivibrators

LIST OF EXPERIMENTS

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS	
1	Series and Shunt feedback amplifiers Frequency response, Input and output impedance
2	Inverting, Non-inverting and differential amplifiers
3	RC Phase shift oscillator and Wien Bridge Oscillator Using transistor and IC741.
4	Hartley Oscillator and Colpitts Oscillator
5	Single Tuned Amplifier
6	Integrator and Differentiator circuits in active and passive mode.
7	Astable and Monostable multivibrators using transistor and IC NE 555.
8	Instrumentation amplifier
SIMULATION USING SPICE	
9	Tuned Collector Oscillator Using transistor
10	Twin T Oscillator/ Wein Bridge Oscillator Using IC741
11	Double and Stagger tuned Amplifiers Using transistor
12	BistableMultivibrator Using IC741
13	Schmitt Trigger circuit with Predictable hysteresis
14	Analysis of power amplifier Using transistor

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Analyze various applications using Transistors.
CO2	Simulate feedback amplifiers, oscillators and multivibrators using SPICE Tool.
CO3	Design and Analyze various applications using IC 741 operational Amplifier.

CO-PO & PSO Mapping															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	2	-	-	-	-	-	-	2	3	1	-
CO2	3	2	2	2	2	-	-	-	-	-	-	2	3	2	-
CO3	3	2	2	2	2	-	-	-	-	-	-	2	3	1	-
CO	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**1**	**-**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191EC42B/MICROPROCESSORS ANDMICROCONTROLLERSLABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ To Introduce ALP concepts, features and Coding methods
- ✓ Write ALP for arithmetic and logical operations in 8086 and8051
- ✓ Differentiate Serial and Parallel Interface
- ✓ Interface different I/Os with Microprocessors
- ✓ Be familiar withMASM

LIST OF EXPERIMENTS

8086 Programs using kits and MASM	
1	Basic arithmetic and Logical operations
2	Move a data block without overlap
3	Code conversion, decimal arithmetic and Matrix operations.
4	Floating point operations, string manipulations, sorting and searching
5	Password checking, Print RAM size and system date
6	Counters and Time Delay
Peripherals and Interfacing Experiments	
7	Traffic light controller
8	Stepper motor control
9	Digital clock
10	Key board and Display
11	Printer status
12	Serial interface and Parallel interface
13	A/D and D/A interface and Waveform Generation
8051 Experiments using kits and MASM	
14	Basic arithmetic and Logical operations
15	Square and Cube program, Find 2‘s complement of a number
16	Unpacked BCD toASCII

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Implement the ALP Programmes for fixed and Floating Point and Arithmetic operations
CO2	Demonstrate the interfacing circuits for different I/Os using microprocessor
CO3	Implement the basic programs in 8051 microcontroller

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	2	-	-	-	-	-	2	2	1	1
CO3	3	2	2	2	2	-	-	-	-	-	2	2	2	1	1
CO	**3**	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**1**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE / COURSE TITLE	191MC46A/INTERNSHIP / TRAINING-I			2	0	0	0

All the students admitted to engineering programs have to undergo a mandatory Internship of 02 weeks during the intervening period of III and IV semesters. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequently after satisfying the internship requirements. The faculty coordinator or mentor shall monitor the students' internship progress and interact with them for the successful completion of the internship.

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE / COURSE TITLE	191EC521/DIGITAL COMMUNICATION			3	0	0	3

COURSE OBJECTIVES
✓ To introduce the basic concepts of Digital Communication in baseband and pass banddomains. ✓ To study signal space representation of signals and discuss the process ofsampling, quantization and coding that are fundamental to the digitaltransmission of analog signals. ✓ To understand baseband and bandpass signal transmission and reception techniques. ✓ To learn error control coding which encompasses techniques for the encodingand decoding of digital data streams for their reliable transmission over noisychannels.

SYLLABUS		
UNIT-I	**Digital Communication System**	**9**
Introduction to Analog Pulse Communication Systems – Digital Communication Systems–Functional description, Channel classification, Performance Measure; Geometricrepresentation of Signals, Bandwidth , Mathematical Models of Communication Channel.		
UNIT-II	**Baseband Formatting Techniques**	**9**
Sampling – Impulse sampling, Natural Sampling, Sampler Implementation; Quantization– Uniform and Non-uniform; Encoding Techniques for Analog Sources- Temporalwaveform encoding, Spectral waveform encoding, Model-based encoding, Comparisonof speech encoding methods.		
UNIT-III	**Baseband Coding Techniques**	**9**
Error Control Codes - Block Codes, Convolutional Codes, Concept of Error FreeCommunication; Classification of line codes, desirable characteristics and powerspectra of line codes.		
UNIT-IV	**Baseband Reception Techniques**	**9**
Noise in Communication Systems; Receiving Filter – Correlator type, Matched Filtertype; Equalising Filter - Signal and system design for ISI elimination, Implementation, Eye Pattern analysis; Synchronization; Detector – Maximum Likelihood Detector, ErrorProbability, Figure-of-Merit for Digital Detection.		
UNIT-V	**Band pass Signal Transmission And Reception**	**9**
Memory less modulation methods - Representation and Spectral characteristics, ASK,PSK, QAM, QPSK, FSK; Bandpass receiving filter, Error performance – Coherent andNon-coherent detection systems.		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Understand the basic concepts of digital communication for designing digital systems
CO2	Generate baseband signals by using baseband formatting techniques
CO3	Apply concept of error coding techniques to generate error free signals
CO4	Implement various filters to rectify errors after reception of signals.
CO5	Design the transmitter and receiver using pass band communication techniques.

TEXT BOOKS

1. Amitabha Bhattacharya, “Digital Communications”, Tata McGraw Hill, 2006.

REFERENCES

1. John.G. Proakis, “Fundamentals of Communication Systems”, Pearson Education,2006.
2. Simon Haykin, “Digital Communications”, John Wiley, 2006.
3. Bernard Sklar, Digital Communication, 2nd Edition, Paerson Education, 2006
4. Herbert Taub& Donald L Schilling – Principles of Communication Systems (3rdEdition) – Tata McGraw Hill, 2008.
5. Leon W. Couch, Digital and Analog Communication Systems, 6th Edition, PearsonEducation, 2001.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO 1	3	3	2	1	1	1	1	-	-	1	-	1	2	2	2
CO 2	3	3	2	1	1	1	1	-	-	1	-	1	2	2	2
CO 3	3	3	2	1	1	1	1	-	-	1	-	1	2	2	2
CO 4	3	3	2	1	1	1	1	-	-	1	-	1	2	2	2
CO 5	3	3	2	1	1	1	1	-	-	1	-	1	2	2	2
CO	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**2**	**2**	**2**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE / COURSE TITLE	191EC522/DIGITAL SIGNAL PROCESSING			2	2	0	3

COURSE OBJECTIVES

- ✓ To familiarize the concepts of Discrete Fourier transform, properties of DFT and its application to linear filtering
- ✓ To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
- ✓ To understand the effects of finite precision representation on digital filters
- ✓ To study the concept of Multi-rate and adaptive filters

SYLLABUS

UNIT-I	Discrete Fourier transform	12

Review of signals and systems, Discrete Fourier transform (DFT) - properties of DFT, Linear filtering using DFT, Filtering long data sequences - overlap save and overlap add method, Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT), Linear filtering using FFT.

UNIT-II	Infinite Impulse Response Filters	12

Structure of IIR filter, Characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain.

UNIT-III	Finite Impulse Response Filters	12

FIR filter structures - linear phase structure and direct form realizations, Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method, using windows (Rectangular, Hamming and Hanning window), Frequency sampling method.

UNIT-IV	Finite Word Length effects	12

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow

UNIT-V	Introduction to Digital Signal Processor and its applications	12

DSP architecture, – Fixed and Floating point architecture principles, Multi-rate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor– Adaptive Filters: Introduction, Applications of adaptive filtering to equalization

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Apply DFT for the analysis of digital signals & systems
CO2	Design IIR filters
CO3	Design FIR filters
CO4	Characterize the effects of finite precision representation on digital filters
CO5	Evaluate the Fundamentals of Digital signal processor and its applications

TEXT BOOKS

1. John G. Proakis&DimitrisG.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES

1. Emmanuel C. Ifeachor& Barrie. W. Jervis, ―Digital Signal Processing, Second Edition, Pearson Education / Prentice Hall, 2002.
2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, ―Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2004.
3. Sanjit K. Mitra, ―Digital Signal Processing – A Computer Based Approach, Tata McGraw Hill, 2007.
4. Andreas Antoniou, ―Digital Signal Processing‖, Tata McGraw Hill, 2006.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	2	1	-	-	-	-	1	1	3	3	3
CO 2	3	3	3	3	3	1	-	-	-	-	1	1	3	3	3
CO 3	3	3	3	3	3	1	-	-	-	-	1	1	3	3	3
CO 4	3	3	3	3	2	1	-	-	-	-	1	1	3	2	2
CO 5	3	3	2	2	2	1	-	-	-	-	1	1	3	2	2
CO	**3**	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE / COURSE TITLE	191EC523/TRANSMISSION LINES AND RF SYSTEMS			3	0	0	3

COURSE OBJECTIVES
✓ To introduce the various types of transmission lines and its characteristics ✓ To give thorough understanding about high frequency line, power and impedance measurements ✓ To impart technical knowledge in impedance matching using smith chart ✓ To impart knowledge on waveguide theories ✓ To get acquaintance with RF system transceiver design

SYLLABUS		
UNIT-I	**Transmission Line Theory**	**9**
General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short-circuited lines - reflection factor and reflection loss.		
UNIT-II	**High Frequency Transmission Lines.**	**9**
Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short-circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.		
UNIT-III	**Impedance Matching in High Frequency Lines**	**9**
Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.		
UNIT-IV	**Waveguides**	**9**
General Wave behavior along uniform guiding structures – Transverse Electromagnetic Waves, Transverse Magnetic Waves, Transverse Electric Waves – TM and TE Waves between parallel plates. Field Equations in rectangular waveguides, TM and TE waves in rectangular waveguides, Bessel Functions, TM and TE waves in Circular waveguides.		
UNIT-V	**RF System Design Concepts**	**9**
High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Basic concepts of RF design, Mixers, Low noise amplifiers, voltage control oscillators, Power amplifiers, transducer power gain and stability considerations.		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Understand the basic concept of signal propagation through transmission lines
CO2	Illustrate the concept of the design of high frequency transmission lines
CO3	Design high frequency components and systems with proper matching
CO4	Analyze the characteristics of TE and TM waves
CO5	Design a RF receiver for Wireless Communication

TEXT BOOKS

1. John D Ryder, ―Networks, lines and fields‖, 2nd Edition, Prentice Hall India, 2015. (UNIT I-IV)
2. Mathew M. Radmanesh, ―Radio Frequency &Microwave Electronics‖, Pearson Education Asia, Second Edition,2002. (UNIT V)

REFERENCES

1. Reinhold Ludwig and Powel Bretchko,‖ RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition,2001.
2. D. K. Misra, ―Radio Frequency and Microwave Communication Circuits- Analysis and Design‖, John Wiley & Sons, 2004.
3. E.C.Jordan and K.G. Balmain, ―Electromagnetic Waves and Radiating Systems Prentice Hall of India, 2006.
4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	-	-	1	2	-	-	-	-	-	3	2	-	2
CO 2	-	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO 3	2	3	-	-	-	-	-	-	-	-	-	1	-	2	3
CO 4	1	-	3	2	3	-	-	-	2	1	2	2	-	3	-
CO 5	1	-	3	-	3	-	-	-	2	2	2	1	2	-	2
CO	**2**	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE / COURSE TITLE	191EE512/ CONTROL SYSTEMS ENGINEERING			3	0	0	3

COURSE OBJECTIVES
✓ To introduce the components and their representation of control systems ✓ To learn various methods for analyzing the time response, the frequency response ✓ To learn various methods of stability analysis of the systems. ✓ To learn different types of the compensator design to improve stability

SYLLABUS		
UNIT-I	**Systems Components and Their Representation**	**9**
Introduction to the control problem-Terminology and Basic Structure-Feed forward and Feedback control theory-Electro Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models		
UNIT-II	**Time Domain Analysis**	**9**
Introduction-Performance Specification-Transient Response-Steady state error constants and system-Type number -Characteristics of Proportional mode of control-Characteristics of Integral mode of control-Characteristics of Derivative mode of control, PID Controllers		
UNIT-III	**Frequency Domain Analysis**	**9**
Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system- Bode Plots-Polar plots.		
UNIT-IV	**S Domain Analysis and System Stability**	**9**
Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion		
UNIT-V	**Compensator Design**	**9**
Introduction to Design and Compensation -Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation- Design using Bode plots.		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Discuss about systems and its classification and to develop the mathematical model.
CO2	Examine time response analysis of LTI systems and to conclude about steady state error
CO3	Solve frequency domain analysis of control systems required for stability analysis
CO4	Formulate with analysis of the system in s-domain and to attain the stability of the system

CO5	Design varioustypes of compensation required for stability analysis using bode plot

TEXT BOOKS

1. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 4th Edition, 2012.
2. Nagrath I.J and Gopal M., "Control Systems Engineering", New Age International Publishers, 5th Edition (Reprint), 2016.

REFERENCES

1. Benjamin C. Kuo, "Automatic Control systems", Pearson Education, New Delhi, 2009.
2. K. Ogata, 'Modern Control Engineering', 5th edition, PHI, 2012.
3. S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013.
4. Richard.C. Dorf and Robert H. Bishop, "Modern Control Systems", Addidon – Wesley, 2011.
5. Salaivahanan. S, Rengaraj. R, Venkatakrishnan. G. R., "Control Systems Engineering", Pearson India Education Services Pvt. Ltd., 2015.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	1	-	-	-	-	2	2	2	2	3	2	3
CO 2	3	2	2	2	-	-	1	-	2	2	2	2	3	1	2
CO 3	1	2	2	2	-	-	-	1	2	2	2	1	1	2	2
CO 4	2	3	2	2	-	1	-	-	2	2	2	1	2	1	2
CO 5	2	1	2	1	-	-	1	-	1	2	-	-	2	1	2
CO	**2**	**2**	**2**	**2**	**-**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE / COURSE TITLE	191EC52A/ COMMUNICATION SYSTEMS LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ To visualize the effects of sampling and TDM
- ✓ To Implement AM & FM modulation and demodulation.
- ✓ To implement PCM & DM
- ✓ To design FSK, PSK and DPSK circuits and simulate the results.
- ✓ To implement Error control coding schemes and verify results.

LIST OF EXPERIMENTS

Design communication experiments and verify results using equipment kits and simulate using MATLAB / SCILAB or equivalent software

1	Signal Sampling and reconstruction.
2	Time Division Multiplexing.
3	AM Modulator and Demodulator
4	FM Modulator and Demodulator
5	Pulse Code Modulation and Demodulation
6	Delta Modulation and Demodulation
7	Observation (simulation) of signal constellations of BPSK, QPSK and QAM.
8	Line coding schemes.
9	FSK, PSK and DPSK schemes (Simulation)
10	Error control coding schemes – Linear Block Codes (Simulation)

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Simulate & validate the various functional modules of a communication system
CO2	Demonstrate their knowledge in base band signaling schemes through implementation.
CO3	Apply various channel coding schemes & demonstrate their capabilities.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	1	1	1	1	-	1	-	1	2	1	1
CO2	3	2	2	2	1	1	1	1	-	-	-	1	2	2	2
CO3	3	3	3	2	2	2	1	1	-	1	-	1	2	1	1
CO	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**2**	**1**	**1**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE / COURSE TITLE	191EC52B/DIGITAL SIGNAL PROCESSING LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ To perform basic signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation and Frequency analysis in MATLAB
- ✓ To implement FIR and IIR filters in MATLAB and DSP Processor
- ✓ To study the architecture of DSP processor
- ✓ To design a DSP system to demonstrate the Multi-rate and Adaptive signal processing concepts.

LIST OF EXPERIMENTS

MATLAB / Equivalent Software Package	
1	Generation of elementary Discrete-Time sequences
2	Linear and Circular convolutions
3	Auto correlation and Cross Correlation
4	Frequency Analysis using DFT
5	Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation
6	Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations
DSP Processor Based Implementation	
1	Study of architecture of Digital Signal Processor
2	Perform MAC operation using various addressing modes
3	Generation of various signals and random noise
4	Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
5	Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering
6	Implement an Up-sampling and Down-sampling operation in DSP Processor

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Carryout basic signal processing operations
CO2	Demonstrate their abilities towards MATLAB based implementation of various DSP systems
CO3	Design and Implement the FIR and IIR Filters in DSP Processor.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	2	3	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**2**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE / COURSE TITLE	191EC621/ANTENNAS AND MICROWAVE ENGINEERING			3	0	0	3

COURSE OBJECTIVES
✓ To understand the basic principles in antenna and microwave system design ✓ To enhance the knowledge in the area of various antenna designs. ✓ To enhance the knowledge in the antenna arrays ✓ To enhance the knowledge in the area of microwave components and antenna for practical applications ✓ To deal with the microwave generation

SYLLABUS		
UNIT-I	**Introduction to Microwave Systems and Antennas**	**9**
Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature,Microwave frequency bands,Friis transmission equation, Link budget and link margin, Noise Characterization of a microwave receiver.		
UNIT-II	**Radiation Mechanisms and Design Aspects**	**9**
Radiation from oscillating dipole, Half wave dipoleand Loop antennas Horn antenna, Reflector antenna, Slot antennas, Microstrip antennas Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic.		
UNIT-III	**Antenna Arrays and Applications**	**9**
Two-element array, Array factor, Pattern multiplication, Uniformly spaced arrays with uniform and non-uniform excitation amplitudes, Smart antennas		
UNIT-IV	**Passive and Active Microwave Devices**	**9**
Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers. Crystal and Schottkey diode detector and mixers, PIN diode switch, Gunn diode oscillator, IMPATT diode oscillator and amplifier, Varactor diode		
UNIT-V	**Microwave Generation and Design Principles**	**9**
High frequency effects in vacuum Tubes, Theory and application of Two cavity Klystron Amplifier, Reflex Klystron oscillator, traveling wave tube amplifier, Magnetron oscillator using Cylindrical,Microwave Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Understand the basic principles in antenna and microwave system design.
CO2	Develop the knowledge in the area of various antenna designs.
CO3	Analyse the different antenna arrays and smart antennas.
CO4	Enhance knowledge in the area of microwave components and antenna for practical applications.
CO5	Generate Microwave signals and design of microwave amplifiers.

TEXT BOOKS

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation: Fourth Edition, Tata McGraw-Hill, 2006. (UNIT I, II, III)
2. David M. Pozar, "Microwave Engineering", Fourth Edition, Wiley India, 2012.(UNIT I,IV,V)

REFERENCES

1. Constantine A.Balanis, ―Antenna Theory Analysis and Design‖, Third edition, John Wiley India Pvt Ltd., 2005.
2. R.E.Collin,"Antennas and Radiowave Propagation", McGraw Hill 1985.
3. Constantine.A.Balanis "Antenna Theory Analysis and Design", Wiley Student Edition, 2006.
4. R.E.Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press, 2001
5. Robert E Colin, "Foundations for Microwave Engineering", John Wiley & Sons Inc, 2005

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	2	2	-	-	-	-	-	1	2	3	2
CO 2	3	3	2	2	-	-	-	-	-	-	-	-		2	
CO 3	2	3	3	-	-	-	-	-	-	-	-	1	1	2	3
CO 4	3	3	3	3	2	2	-	-	2	2	1	1	2	-	2
CO 5	3	3	3	2	2	-	-	-	2	1	1	1	-	3	-
CO	**3**	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**2**	**1**	**1**	**2**	**2**	**2**	**2**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE / COURSE TITLE	191EC622/ DIGITAL VLSI DESIGN			3	0	0	3

COURSE OBJECTIVES

- ✓ Study the fundamentals of CMOS circuits and its characteristics.
- ✓ Learn the design and realization of combinational & sequential digital circuits.
- ✓ Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
- ✓ Learn the different FPGA architectures and testability of VLSI circuits

SYLLABUS

UNIT-I	Introduction to MOS Transistor	9

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT-II	Combinational MOS Logic Circuits	9

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL. Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT-III	Sequential Circuit Design	9

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.

UNIT-IV	Design of Arithmetic Building Blocks and Memories	9

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, power and speed tradeoffs. Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry

UNIT-V	Implementation Strategies and Testing	9

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability:
Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Realize the concepts of digital building blocks using MOS transistor
CO2	Design combinational MOS circuits and power strategies.
CO3	Design and construct Sequential Circuits.
CO4	Model the architecture of digital systems.
CO5	Analyze the implementation and testing techniques of chip design using programmable devices

TEXT BOOKS

1.Neil H.E. Weste, David Money Harris ―CMOS VLSI Design: A Circuits and Systems Perspective‖, 4th Edition, Pearson , 2017 (UNIT I,II,V)

2.Jan M. Rabaey ,AnanthaChandrakasan, Borivoje. Nikolic, ‖Digital Integrated Circuits: A Design perspective‖, Second Edition , Pearson , 2016.(UNIT III,IV)

REFERENCES

1.M.J. Smith, ―Application Specific Integrated Circuits‖, Addisson Wesley, 1997

2. Sung-Mo kang, Yusuf leblebici, Chulwoo Kim ―CMOS Digital Integrated Circuits:Analysis& Design‖,4th edition McGraw Hill Education,2013

3.Wayne Wolf, ―Modern VLSI Design: System On Chip‖, Pearson Education, 2007

4.R.Jacob Baker, Harry W.LI., David E.Boyee, ―CMOS Circuit Design, Layout and Simulation‖, Prentice Hall of India 2005.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CO 2	3	3	3	3	3	1	-	-	-	-	2	2	3	3	1
CO 3	3	3	3	3	3	1	-	-	-	-	2	2	3	-	1
CO 4	3	2	2	2	2	1	-	-	-	-	2	2	3	2	3
CO 5	2	2	3	3	3	1	-	-	-	-	2	2	3	1	2
CO	**3**	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**2**	**2**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE / COURSE TITLE	191EC62A/DIGITAL VLSI DESIGN LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ To learn Hardware Descriptive Language(Verilog/VHDL)
- ✓ To learn the fundamental principles of VLSI circuit design in digital and analog domain
- ✓ To familiarize fusing of logical modules on FPGAs
- ✓ To provide hands on design experience with professional design (EDA) platforms

LIST OF EXPERIMENTS

1	Design an Adder (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
2	Design a Multiplier (4 Bit Min) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
3	Design a Shift Register using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
4	Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
5	Design Memories using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
6	Design and simulate a CMOS inverter using digital flow
7	Design and simulate a CMOS Basic Gates and Flip-Flops
8	Design and simulate a 4-bit synchronous counter using a Flip-Flops
9	Design and Simulate a CMOS Inverting Amplifier
10	Design and simulate simple 5 transistor differential amplifier. Analyze Gain, Bandwidth and CMRR by performing Schematic Simulations.

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Write HDL code for basic as well as advanced digital integrated circuits.
CO2	Import the logic modules into FPGA boards, Synthesize, Place and Route the digital IPs and compare the various routing algorithms.
CO3	Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**2**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE / COURSE TITLE	191EC62B/MICROWAVE ENGINEERING LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ Know about the behavior of the microwave components.
- ✓ Practice microwave measurement procedures
- ✓ Gain knowledge about the antenna design parameters

LIST OF EXPERIMENTS

Antenna and Microwave Experiment	
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.
6	Impedance Measurement and Impedance Matching
7	Microwave IC – Filter Characteristics
List of equipment for a batch of 30 students 3 students per experiment:	
1	Microwave test Bench at X band to determine Directional coupler characteristics. - 2 Nos
2	Microwave test Bench at X band and Antenna turn table to measure Radiation pattern of Horn antenna, Horn antennas. - 2 Nos
3	Microwave test Bench at X band to determine VSWR for Isolator and Circulator, VSWR meter,Isolator, Circulator, E Plane Tee, H plane Tee. - 2 Nos
4	Microwave test Bench at X band, Variable attenuator, Detector and 20 MHz Digital / Analog Oscilloscope. - 2 Nos

Notes:Microwave test bench comprises of Reflex klystron or Gunn diode with power supply, Gunn oscillator, PIN modulator, Isolator, Fixed and Variable Attenuator, frequency meter, Slotted section, Wave guides, detector with mount, Termination, Movable short, Slide screw tuner, Horn antenna, Directional coupler and 20 MHz Digital / Analog Oscilloscope.

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Understand the Microwave System design
CO2	Analyse the radiation pattern of antenna.
CO3	Test the various microwave components.

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	-	-	-	-	-	2	3	2	2
CO2	3	3	3	2	-	-	-	-	-	-	-	1	3	2	1
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	2	2
CO	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**	**2**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE / COURSE TITLE	191EC721/EMBEDDED AND REAL TIME SYSTEMS			3	0	0	3

COURSE OBJECTIVES
✓ Understand the concepts of embedded system design and analysis ✓ Learn the architecture and programming of ARM processor ✓ Be exposed to the basic concepts of embedded programming ✓ Learn the real time operating systems

SYLLABUS		
UNIT-I	INTRODUCTION TO EMBEDDEDSYSTEM DESIGN	**9**
Complex systems and microprocessors– Embedded system design process –Design example: Model train controller- Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques - Designing with computing platforms – consumer electronics architecture – platform-level performance analysis.		
UNIT-II	ARM PROCESSOR AND PERIPHERALS	**9**
ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.		
UNIT-III	EMBEDDED PROGRAMMING	**9**
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-IV	REAL TIME SYSTEMS	**9**
Structure of a Real Time System — Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation – Clock Synchronization.		
UNIT-V	PROCESSES AND OPERATING SYSTEMS	**9**
Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE. - Distributed embedded systems – MPSoCs and shared memory multiprocessors. – Design Example - Audio player, Engine control unit – Video accelerator.		

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Describe the architecture and programming of ARM processor
CO2	Outline the concepts of embedded systems
CO3	Explain the basic concepts of real time operating system design
CO4	Model real-time applications using embedded-system concepts
CO5	Describe the processes and operating systems

TEXT BOOKS

1.Marilyn Wolf, ―Computers as Components - Principles of Embedded Computing System Design‖, Third Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, V)
2. Jane W.S.Liu,‖ Real Time Systems‖, Pearson Education, Third Indian Reprint, 2003.(UNIT IV)

REFERENCES

1.LylaB.Das, ―Embedded Systems : An Integrated Approach‖ Pearson Education, 2013.
2. Jonathan W.Valvano, ―Embedded Microcomputer Systems Real Time Interfacing‖, Third Edition Cengage Learning, 2012.
3. David. E. Simon, ―An Embedded Software Primer‖, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
4. Raymond J.A. Buhr, Donald L.Bailey, ―An Introduction to Real-Time Systems- From Design to Networking with C/C++‖, Prentice Hall, 1999.
5. C.M. Krishna, Kang G. Shin, ―Real-Time Systems‖, International Editions, McGraw Hill 1997
6. K.V.K.K.Prasad, ―Embedded Real-Time Systems: Concepts, Design & Programming‖, Dream Tech Press, 2005.
7. Sriram V Iyer, Pankaj Gupta, ―Embedded Real Time Systems Programming‖, Tata McGraw Hill, 2004.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	1	-	-	-	-	-	1	1	2	-	1
CO2	3	3	2	2	1	-	-	-	-	-	1	1	2	-	1
CO3	3	3	3	2	1	-	-	-	-	-	1	1	2	2	1
CO4	3	3	2	2	1	-	-	-	-	-	1	1	2	2	1
CO5	3	3	3	2	1	-	-	-	-	-	1	1	2	2	1
CO	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**2**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE / COURSE TITLE	191EC722/OPTICAL COMMUNICATION AND NETWORKS			3	0	0	3

COURSE OBJECTIVES
✓ To study about the various optical fibers, modes and configuration. ✓ To analysis various losses in optical fibers. ✓ To learn about the various optical sources and detectors. ✓ To explore various idea about optical fiber measurements and various coupling techniques. ✓ To enrich the knowledge about optical communication systems and networks

SYLLABUS		
UNIT-I	**Introduction to Optical Fibers**	**9**
Evolution of fiber optic system- Element of an Optical Fiber Transmission link– Total internal reflection- Acceptance angle –Numericalaperture-Optical Fiber **Modes** and Configurations -Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers- Graded Index fiber structure.		
UNIT-II	**Transmission Characteristic of Optical Fiber**	**9**
Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion, Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Design Optimization of SM fibers-RI profile and cut-off wavelength.		
UNIT-III	**Fiber Optical Sources and Coupling**	**9**
Direct and indirect Band gap materials-LED structures -Light source materials -Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies -Temperature effects, Fiber amplifiers, Lencing schemes, Fiber -to- Fiber joints, Fiber splicing, Detector response time.		
UNIT-IV	**Fiber Optic Receiver and Measurements**	**9**
Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error .Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.		
UNIT-V	**Optical Networks**	**9**
Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks –Wavelength Routed Networks – Link Power budget -Rise time budget- Solutions – Optical CDMA – Ultra High Capacity Networks, High speed light wave Links-OADM configuration-Optical ETHERNET		

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Realize basic elements in optical fibers, different modes and configurations
CO2	Analyze the transmission characteristics associated with dispersion and polarization techniques.
CO3	Design optical sources and detectors with their use in optical communication system.
CO4	Construct fiber optic receiver systems, measurements and coupling techniques.
CO5	Design optical communication systems and its networks

TEXT BOOKS

1.Gerd Keiser, "Optical Fiber Communication" McGraw -Hill International, 4th Edition.,2010.
2. John M. Senior , “Optical Fiber Communication”, Second Edition, Pearson Education,2007.

REFERENCES

1.P Chakrabarti, "Optical Fiber Communication‖, McGraw Hill Education (India)Private Limited, 2016
2.GredKeiser,"Optical Fiber Communication‖, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1
CO 2	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1
CO 3	3	3	3	2	1	-	-	-	-	-	1	2	2	2	1
CO 4	3	3	2	2	1	-	-	-	-	-	1	2	2	2	1
CO 5	3	3	3	2	1	-	-	-	-	-	1	2	2	2	1
CO	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**	**2**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE / COURSE TITLE	191EC72A/EMBEDDED SYSTEM LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ Learn the working of ARM processor
- ✓ Understand the Building Blocks of Embedded Systems
- ✓ Learn the concept of memory map and memory interface
- ✓ Write programs to interface memory, I/Os with processor
- ✓ Study the interrupt performance

LIST OF EXPERIMENTS

1	Study of ARM evaluation system
2	Interfacing ADC and DAC.
3	Interfacing LED and PWM.
4	Interfacing real time clock and serial port.
5	Interfacing keyboard and LCD.
6	Interfacing EPROM and interrupt.
7	Mailbox.
8	Interrupt performance characteristics of ARM and FPGA.
9	Flashing of LEDS.
10	Interfacing stepper motor and temperature sensor.
11	Implementing zigbee protocol with ARM

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Write programs in ARM for a specific Application
CO2	Interface peripherals like memory, ADC ,DAC, interrupt , keyboard, display, motor and sensor with ARM system
CO3	Formulate a mini project using embedded system

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	-	-	1	1	1	-	2	3	1
CO2	3	3	3	3	3	1	-	-	1	1	1	-	2	3	1
CO3	3	3	3	3	3	1	-	2	2	2	2	-	2	3	1
CO	**3**	**3**	**3**	**3**	**3**	**1**	**-**	**2**	**1**	**1**	**1**	**-**	**2**	**3**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE / COURSE TITLE	191EC72B/ OPTICAL COMMUNICATION LABORATORY			0	0	2	1

COURSE OBJECTIVES

- ✓ Develop understanding of simple optical communication link
- ✓ Analysis attenuation in optical fiber
- ✓ Understand the working principle of optical sources, detector, fibers
- ✓ Understand the calculation of BER
- ✓ Understand the calculate Numerical Aperture

LIST OF EXPERIMENTS

1	Measurement of fiber attenuation losses
2	Measurement of connector losses
3	Bending Loss measurement
4	Fiber Numerical Aperture measurement
5	Fiber Mode Characteristics of Fibers
6	DC Characteristics of LED and PIN Photo diode
7	Fiber optic Analog - frequency response
8	Fiber optic Digital Link- frequency response
9	Fiber optic Analog – BER Calculation
10	Fiber optic Digital – BER Calculation

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1						1	1	2	-	1
CO2	3	3	2	2	1						1	1	2	-	1
CO3	3	3	3	2	1						1	1	2	2	1
CO	**3**	**3**	**2**	**2**	**1**						**1**	**1**	**2**	**2**	**1**