COURSE STRUCTURE

For

B.Tech.

Electronics and Communication Engineering

(*for 2023 Admitted batch only)*

PRAGATI ENGINEERING COLLEGE

(An Autonomous Institution)
ADB Road, Surampalem, Kakinada District, A.P.-533 437
(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada)
(Recognized by UGC under sections 2 (f) and 12 (b) of UGC act, 1956)

Pragati Engineering College (Autonomous)

R23

Department of Electronics and Communication Engineering

COURSE STRUCTURE

INDUCTION PROGRAMME

S.No.	Course Name	Category	L	T	P	Credits
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0	0	6	0
2	Career Counselling	MC	2	0	2	0
3	Orientation to all branches -- career options, tools, etc.	MC	3	0	0	0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2	0	3	0
5	Proficiency Modules & Productivity Tools	ES	2	1	2	0
6	Assessment on basic aptitude and mathematical skills	MC	2	0	3	0
7	Remedial Training in Foundation Courses	MC	2	1	2	0
8	Human Values & Professional Ethics	MC	3	0	0	0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2	1	2	0
10	Concepts of Programming	ES	2	0	2	0

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Department of Electronics and Communication Engineering

I YEAR – I SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS&H	23BE101T	Communicative English	2	0	0	2
2	BS&H	23BM101T	Linear Algebra and Calculus	3	0	0	3
3	BS&H	23BC102T	Chemistry	3	0	0	3
4	Engineering Science	23CM101T	Basic Civil and Mechanical Engineering	3	0	0	3
5	Engineering Science	23CS101T	Introduction to Programming	3	0	0	3
6	Engineering Science	23ME102P	Engineering Workshop	0	0	3	1.5
7	BS&H	23BE101P	Communicative English Laboratory	0	0	2	1
8	Engineering Science	23CS101P	Computer Programming Laboratory	0	0	3	1.5
9	BS&H	23BC102P	Chemistry Laboratory	0	0	2	1
10	BS&H	23MH101P	Health and wellness, Yoga and sports	0	0	1	0.5
Total Credits							**19.5**

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Department of Electronics and Communication Engineering

I YEAR – II SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS&H	23BP201T	Engineering Physics	3	0	0	3
2	BS&H	23BM201T	Differential Equations and Vector Calculus	3	0	0	3
3	Engineering Science	23EE201T	Basic Electrical and Electronics Engineering	3	0	0	3
4	Engineering Science	23ME201T	Engineering Graphics	1	0	4	3
5	Professional Core	23EC201T	Network Analysis	3	0	0	3
6	BS&H	23BP201P	Engineering Physics Laboratory	0	0	2	1
7	Engineering Science	23EE201P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
8	Professional Core	23EC201P	Network Analysis and Simulation Laboratory	0	0	3	1.5
9	Engineering Science	23IT201P	IT Workshop	0	0	2	1
10	BS&H	23MH202P	NSS/NCC/Scouts and Guides/Community Service	0	0	1	0.5
Total Credits							**20.5**

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

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Department of Electronics and Communication Engineering

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COURSE STRUCTURE

II YEAR – I SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS	23EC301T	Probability theory and stochastic process	3	0	0	3
2	HSMC	23HM301T	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3
3	Engineering Science	23EC302T	Signals and Systems	3	0	0	3
4	Professional Core	23EC303T	Electronic Devices and Circuits	3	0	0	3
5	Professional Core	23EC304T	Switching Theory and Logic Design	3	0	0	3
6	Professional Core	23EC303P	Electronic Devices and Circuits Laboratory	0	0	3	1.5
7	Professional Core	23EC304P	Switching Theory and Logic Design Laboratory	0	0	3	1.5
8	Skill Enhancement Course	23CS301S	Data Structures using Python	0	1	2	2
9	Audit Course	23BC301T	Environmental Science	2	0	0	-
Total Credits							**20.5**

II YEAR – II SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	Management Course- I	23HM401T	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science	23EC402T	Linear Control Systems	3	0	0	3
3	Professional Core	23EC403T	Electromagnetic Waves and Transmission Lines	3	0	0	3
4	Professional Core	23EC404T	Electronic Circuit Analysis	3	0	0	3
5	Professional Core	23EC405T	Analog Communications	3	0	0	3
6	Professional Core	23EC401P	Signals and Systems Laboratory	0	0	3	1.5
7	Professional Core	23EC404P	Electronic Circuit Analysis Laboratory	0	0	3	1.5
8	Skill Enhancement course	23BE401S	Soft Skills	0	1	2	2
9	Engineering Science	23HM401P	Design Thinking &Innovation	1	0	2	2
Total Credits							**21**

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

B.Tech. III Year I Semester

S.No.	Course Code	Category	Title	L	T	P	C
1	23EC501T	Professional Core	Analog and Digital IC Applications	3	0	0	3
2	23EC502T	Professional Core	Digital communications	3	0	0	3
3	23EC503T	Professional Core	Antennas and Wave Propagation	3	0	0	3
4	1. 23EC504T 2. 23EC505T 3. 23EC506T 4. 23EC507T **MOOCs** 23EC508T	Professional Elective - I	1. Digital System Design through HDL 2. Optical Communications 3. Electronic Measurements and Instrumentation 4. Computer Organization and Architecture 5. Any one of 12 – WEEK SWAYAM NPTEL(MOOCs) i. Microelectronics Devices to Circuits ii. Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software iii. Applied Electromagnetics for Engineers	3	0	0	3
5	1. 23CE507T 2. 23EE508T 3. 23ME509T 4. 23CS506T	Open Elective-I	1. Construction Project Management 2. Renewable Energy Sources 3. Sustainable Energy Technologies 4. Introduction to Cloud Computing	3	0	0	3
6	23EC501L	Professional Core	Analog and Digital IC Applications Lab	0	0	3	1.5
7	23EC5015L	Professional Core	Analog and digital communications Lab	0	0	3	1.5
8	23EC5016L/ 23CS501S	Skill Enhancement course	Applications of Lab view for Instrumentation & Communications/ Sales force Administrator Explorer	0	1	2	2
9	23EC5017L	Engineering Science	Design of PCB and Antennas Lab	0	0	2	1
10	23EC501P	Community Service Project Internship		-	-	-	2
Total Credits				**15**	**1**	**10**	**23**

PRAGATI ENGINEERING COLLEGE

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(AUTONOMOUS)

Department of Electronics and Communication Engineering

B.Tech. III Year II Semester

S.No.	Course Code	Category	Title	L	T	P	C
1	23EC601T	Professional Core	VLSI Design	3	0	0	3
2	23EC602T	Professional Core	Microprocessors and Microcontrollers	3	0	0	3
3	23EC603T	Professional Core	Digital Signal Processing	3	0	0	3
4	1. 23EC604T 2. 23EC605T 3. 23EC606T 4. 23AM603T **MOOCs** 23EC607T	Professional Elective–II	1. Analog IC Design 2. Optical Communications 3. Smart and Wireless Instrumentation 4. Machine Learning 5. Any one of 12 – WEEK SWAYAM NPTEL(MOOCs) i. Simulation of Communication Systems using Mat lab ii. 5G Wireless Standard Design iii. Micro sensors and Nan sensors	3	0	0	3
5	1. 23EC608T 2. 23EC609T 3. 23EC6010T 4. 23AI602T **MOOCs** 23EC6011T	Professional Elective–III	1. Bio Medical Instrumentation 2. Microwave Engineering 3. Embedded Systems 4. Artificial Intelligence 5. Any one of 12 – WEEK SWAYAM NPTEL(MOOCs) iv. VLSI Design Flow: RTL to GDS v. Neural Networks in Signal Processing-I vi. Fundamentals of Micro and Nanofabrication	3	0	0	3
6	1. 23CE6012T 2. 23EE6012T 3. 23ME6012T 4. 23CS604T 5. 23HM601T	Open Elective – II	1. Disaster Management 2. Fundamental of Electric Vehicles 3. Additive manufacturing 4. Object oriented programming through Java 5. Entrepreneurship and Venture Creation	3	0	0	3
7	23EC601L	Professional Core	VLSI Design Lab	0	0	3	1.5
8	23EC602L	Professional Core	Microprocessors and Microcontrollers Lab	0	0	3	1.5
9	23AM603L/ 23CS602S	Skill Enhancement course	Machine Learning Lab/ Sales force Developer Catalyst	0	1	2	2
10	23EA601T	Audit Course	Research methodology and IPR	2	0	0	-
Total Credits				**20**	**1**	**08**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation							

Pragati Engineering College (Autonomous)

R23

I Year I Semester
LINEAR ALGEBRA AND CALCULUS
(Common to All Branches)

Course Category	Basic Sciences	**Course Code**	23BM101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Matrix Algebra, Limits, Continuity, Differentiability and integrability	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Develop and use of matrix algebra techniques that are needed by engineers for practical applications.	K3
CO2	Find the Eigen values and Eigen vectors and able to reduce the given quadratic form into canonical form by orthogonal transformation.	K3
CO3	Utilize mean value theorems to real life problems.	K3
CO4	Familiarize with functions of several variables which is useful in optimization & learn important tools of calculus in higher dimensions	K3
CO5	Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

COURSE CONTENT

UNIT I

Matrices:

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, **System of linear equations**: Solving system of Homogeneous linear equations and solving Non-Homogeneous linear equations by Gauss elimination method, Gauss Jacobi and Gauss Seidel Iteration Methods**.**

UNIT II

Eigenvalues, Eigenvectors and Orthogonal Transformation:

Eigenvalues, Eigenvectors and their properties, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Diagonalization of a matrix, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III

Calculus:

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems. Taylor's and Maclaurin series.

UNIT IV

Partial differentiation and Applications (Multi variable calculus):

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V

Multiple Integrals (Multi variable Calculus):

Double integrals, change of order of integration, triple integrals, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS

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

REFERENCE BOOKS

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)
6. Advanced Engineering Mathematics by H. K Dass, S. Chand Publications, 2022, 22nd Edition (Reprint 2022).

WEB RESOURCES

1. https://en.wikipedia.org/wiki/System_of_linear_equations
2. https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
3. https://www.math.hmc.edu/calculus/tutorials/eigenstuff/
4. https://en.wikipedia.org/wiki/Quadratic_form
5. https://en.wikipedia.org/wiki/Calculus
6. https://en.wikipedia.org/wiki/Partial_derivative
7. https://www.whitman.edu/mathematics/calculus_online/section14.03.html
8. https://en.wikipedia.org/wiki/Multiple_integral
9. http://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx

Pragati Engineering College (Autonomous)

R23

I Year I Semester
CHEMISTRY
(Common to EEE, ECE, CSE(CS) and IT)

Course Category	Basic Science	**Course Code**	23BC102T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To familiarize chemistry and its applications
2	To train the students on the principles and applications of electrochemistry and polymers
3	To introduce instrumental methods and to explain the Green Principles and applications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	To introduce the quantum mechanical concepts of measurements for physical systems	K2
CO2	Apply the principle of Band diagrams in the application of conductors and semiconductors	K2
CO3	Compare the materials of construction for battery and electrochemical sensors	K2
CO4	Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.	K3
CO5	Summarize the concepts of Instrumental methods.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT -I

Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2. Molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π- molecular orbital of benzene, calculation of bondorder.

UNIT - II

Modern Engineering materials

Semiconductors – Introduction, types and applications.

Super Conductors-Introduction, types and applications.

Super capacitors: Introduction, Classification–Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, Carbon Nano tubes-Arc-Discharge & Chemical Vapour deposition method and Graphines Nano particles.

UNIT - III

Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry-potentiometric titrations (redox titrations), concept of conductivity, conductivitycell, conduct metric titrations (acid-base titrations).

potentiometric sensors with examples. Reference electrodes: Normal Hydrogen Electrode(NHE) and Calomel Electrode. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells- hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC)

UNIT - IV

Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation. Free radical, Cationic and Anionic Mechanisms.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of

– PVC, Teflon, Bakelite, Nylon-6,6, Urea-Formaldehyde resin. Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – Types, Polyacetylene, – Mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT -V

Instrumental Methods its Applications and **Non-conventional energy sources and Green Chemistry**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV Visible Spectroscopy electronic transition, Instrumentation, IR spectroscopy, fundamental modes and selection rules, Chromatography-Basic Principles,

Non-conventional energy sources: Solar energy- introduction to PV cell / Solar cell- construction, working and applications. Hydro power plant and Geo-thermal energy.

Green chemistry: Principles and applications.

TEXT BOOKS

1.Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.

2.Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,OxfordUniversity Press, 2010.

REFERENCE BOOKS

1.Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson,2007.

2.J.D.Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008

3.Text book of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

WEB RESOURCES

UNIT -I

Structure and BondingModels:https://archive.nptel.ac.in/courses/104/106/104106096/

UNIT - II

ModernEngineeringmaterials :https://nptel.ac.in/courses/118104008

UNIT - III

Electrochemistry and Applications:https://archive.nptel.ac.in/courses/113/105/113105102/

UNIT - IV

Polymer Chemistry:https://archive.nptel.ac.in/courses/104/105/104105124/

UNIT -V

Instrumental Methods & Applications:https://onlinecourses.nptel.ac.in/noc22_cy45/preview

Pragati Engineering College (Autonomous)

R23

I Year I Semester
BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to CE, EEE, ME, ECE, CSE (CS) and IT)

Course Category	Engineering Science	**Course Code**	23CM101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

PART-A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES	
1	Get familiarized with the scope and importance of Civil Engineering sub-divisions
2	Introduce the preliminary concepts of surveying.
3	Acquire preliminary knowledge on Transportation and its importance in nation's economy.
4	Get familiarized with the importance of quality, conveyance and storage of water.
5	Introduction to basic civil engineering materials and construction techniques.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	enlist various basic characteristics and sub-divisions of Civil Engineering, pre-fabricated materials and technology to appreciate their role in ensuring better society.	K2
CO2	illustrate the concepts of surveying and basics of Foundation Engineering.	K3
CO3	know the significance of various domains in transportation engineering and be acquitted with types of pavements. Get an overview about Environmental Engineering and Water Resource Engineering.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering -Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement- Aggregate - Bricks-Stones-Sand-Cement Concrete-Steel-Timber. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

Foundations: Types of foundations — Bearing capacity and settlement — Requirement of good foundations.

UNIT III

Transportation Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

TEXT BOOKS

1. Basic Civil Engineering, M.S.Palanisamy, Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

REFERENCE BOOKS

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

WEB RESOURCES

1. https://nptel.ac.in/courses/105101087
2. https://nptel.ac.in/courses/105104101
3. https://nptel.ac.in/courses/105104103

Pragati Engineering College (Autonomous)

PART – B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES	
1	Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2	Explain different engineering materials and different manufacturing processes.
3	Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the different manufacturing processes.	K2
CO2	Explain the basics of thermal engineering and its applications.	K3
CO3	Describe the working of different mechanical power transmission systems, power plants and basics of robotics and its applications.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	-	-	-	-	-	2	-

COURSE CONTENT

UNIT - I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT - II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT - III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I.
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications.
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

Web References:

1. https://ocw.mit.edu/courses/2-000-how-and-why-machines-work-spring-2002/
2. https://ocw.mit.edu/courses/2-008-design-and-manufacturing-ii-spring-2004/
3. https://ocw.mit.edu/courses/2-12-introduction-to-robotics-fall-2005/

Pragati Engineering College (Autonomous)

R23

I Year I Semester

INTRODUCTION TO PROGRAMMING

(Common to All Branches)

Course Category	Engineering Science	**Course Code**	23CS101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce students to the fundamentals of computer programming.
2	To provide hands-on experience with coding and debugging.
3	To foster logical thinking and problem-solving skills using programming.
4	To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
5	To encourage collaborative learning and teamwork in coding projects.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand basics of computers, the concept of algorithm and algorithmic thinking.	K3
CO2	Analyze a problem and develop an algorithm to solve it.	K4
CO3	Implement various algorithms using the C programming language.	K5
CO4	Understand more advanced features of C language.	K3
CO5	Develop problem-solving skills and the ability to debug and optimize the code.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

Pragati Engineering College (Autonomous)

COURSE CONTENT

UNIT -I

Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables and Constants, Basic Input and Output, Operations, Type Conversion and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT -II

Control Structures

Simple sequential programs, Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue, Programming Examples.

UNIT -III

Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Arrays Applications , Introduction to Strings, String input and output functions, String handling functions.

UNIT-IV

Pointers & User Defined Data types

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT -V

Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Storage Classes, Basics of File Handling.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

TEXT BOOKS

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 2005, 2nd Edition
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 4th edition, 2018

REFERENCE BOOKS

1. Computing fundamentals and C Programming, Balaguruswamy, E., McGraw-Hill Education, 7th Edition, 2017
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rdedition, 2009

WEB RESOURCES

1. http://nptel.ac.in/courses/106104128/
2. http://students.iitk.ac.in/programmingclub/course/#notes
3. http://c-faq.com/~scs/cclass/cclass.html

Pragati Engineering College (Autonomous)

R23

I Year I Semester
ENGINEERING WORKSHOP
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23ME102P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES
To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify workshop tools and their operational capabilities.	K2
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.	K3
CO3	Apply knowledge in preparation of pipe joints and practice of Plumbing tools.	K3
CO4	Apply basic electrical engineering knowledge for House Wiring Practice	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

1.**Demonstration**: Safety practices and precautions to be observed in workshop.

2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.

a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint

3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.

a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tire

5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.

a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.

8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Note: Minimum of 12 Experiments to be conducted from the above covering all the trades.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.

2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition

2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.

3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

Pragati Engineering College (Autonomous)

R23

I Year I Semester

COMMUNICATIVE ENGLISH LABORATORY

(Common to CE, EEE, ME, ECE, CSE (CS) and IT)

Course Category	Humanities	**Course Code**	23BE101P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites	LSRW Skills	**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning.
2	The students will get trained in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the different aspects of the English language proficiency with emphasison LSRW skills.	K2
CO2	Apply communication skills through various language learning activities.	K3
CO3	Analyze the English speech sounds, stress, rhythm, intonation and syllable divisionfor better listening and speaking comprehension.	K4
CO4	Evaluate and exhibit professionalism in participating in debates and group discussions.	K5
CO5	Able to present ideas effectively and manage interviews confidently.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT - I

Communication Skills & JAM.
Role Play or Conversational Practice.

UNIT - II

E-mail Writing.
Resume Writing, Cover letter, SOP.

UNIT - III

Vowels & Consonants.
Neutralization/Accent Rules.

UNIT - IV

Group Discussions-methods & practice.
Debates - Methods & Practice.

UNIT - V

PPT Presentations/ Poster Presentation.
Interviews Skills.

Laboratory Manual Lab Book

1. Strengthen Your Steps: A Multi-Model Course in Communication Skills published by Maruti Publications

REFERENCE BOOKS

1. Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India,2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed),Kindle, 2013

WEB RESOURCES

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured

3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Suggested Software:

1. Walden Infotech
2. Young India Films

Pragati Engineering College (Autonomous)

R23

I Year I Semester
COMPUTER PROGRAMMING LABORATORY
(Common to All Branches)

Course Category	Engineering Science	**Course Code**	23CS101P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES
The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Read, understand, and trace the execution of programs written in C language.	K3
CO2	Select the right control structure for solving the problem.	K3
CO3	Develop C programs which utilize memory efficiently using programming constructs like pointers.	K3
CO4	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

WEEK 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite stepsboth using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 2: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operatorsused in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
   a. A+B*C+(D*E) + F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and

for loop in addition to structured jump constructs like break and continue including when each ofthese statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops
Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

WEEK 7

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.
Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integerarrays.

Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

WEEK 9

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details alongwith the total.
v) Write a C program to implement realloc()

WEEK 10

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singlylinked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same withoutusing bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

WEEK 11

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing someexperiments by parameter passing using call by value. Basic methods of numerical integration **Suggested Experiments/Activities:**

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13

Objective: Explore the basic difference between normal and pointer variables, Arithmeticoperations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and other characters usingpointers.

WEEK 14

Objective: To understand data files and file handling with various file I/O functions. Explore thedifferences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

TEXT BOOKS

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum ' s Outline of Programming with C, McGraw Hill

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hallof India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

WEB RESOURCES

1. https://www.researchgate.net/publication/322908864_C_Programming_Lab_Manual
2. https://www.javatpoint.com/c-programs

R23

Pragati Engineering College (Autonomous)

I Year I Semester
CHEMISTRY LABORATORY
(Common to EEE, ECE, CSE (CS) and IT)

Course Category	Basic Science	**Course Code**	23BC102P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES
Verify the fundamental concepts with experiments.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Determine the cell constant and conductance of solutions.	K3
CO2	Prepare advanced polymer Bakelite materials.	K2
CO3	Estimate the given amount of dissolved compounds in a solution by using volumetric analysis and preparation of Nano particles	K3
CO4	Analyze the IR spectra of some organic compounds.	K4
CO5	Determine the concentration of different metal ions present in water by compelxo metric titrations.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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List of Experiments:

1. Determination of Hardness of a groundwater sample
2. Conduct metric titration of strong acid vs. strong base
3. Conduct metric titration of weak acid vs. strong base
4. Preparation of Nano particles. (Cu/Zn)
5. Determination of Vitamin-C
6. Estimation of $KMnO_4$ by using standard oxalic acid solution
7. Preparation of Phenol-formaldehyde resin (Bakelite)
8. Determination of total alkalinity of given sample of water
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nano materials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Reference:

"Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

Pragati Engineering College (Autonomous)

R23

I Year I Semester
HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Humanities	**Course Code**	23MH101P
Course Type	Theory	**L-T-P-C**	0-0-1-0.5
Prerequisites		**Continuous Evaluation**	90
		Viva Voce	10
		Total Marks	100

COURSE OBJECTIVES
The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		
CO1	Understand the importance of yoga and sports for Physical fitness and sound health.	
CO2	Demonstrate an understanding of health-related fitness components.	
CO3	Compare and contrast various activities that help enhance their health.	
CO4	Assess current personal fitness levels.	
CO5	Develop Positive Personality	

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT – II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress

management and yoga, Mental health and yoga practice.

Activities:

Yoga practices Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT – III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

R23

Pragati Engineering College (Autonomous)

I Year II Semester
ENGINEERING PHYSICS
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Basic Sciences	**Course Code**	23BP201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Intermediate Physics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization required to design instruments with higher resolution.
2	Impart the knowledge of Dielectric & Magnetic materials, for engineering Applications.
3	Understand the basics of Semiconductors and their working mechanism for their utility in Engineering applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the intensity variation of light due to polarization, interference and diffraction	K4
CO2	Familiarize with the basics of crystals and their structures.	K2
CO3	Applying the concepts of quantum mechanics for calculation of free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles	K3
CO4	Apply the basics of phenomenon related to dielectric materials and Magnetic Materials to study their dependence on temperature and frequency response.	K3
CO5	Understand the Band formation, electrical conductivities in semiconductors and study the types of semiconductors using Hall Effect.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT
UNIT - I

WAVE OPTICS

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

UNIT - II

CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X - ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT - III

DIELECTRIC AND MAGNETIC MATERIALS

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT - IV

QUANTUM MECHANICS AND FREE ELECTRON THEORY

Quantum Mechanics: Introduction-Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Introduction-Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT - V

BAND THEORY OF SOLIDS & SEMICONDUCTOR PHYSICS

BAND THEORY OF SOLIDS

Bloch's Theorem(Qualitative)-Kronig Penny Model(Qualitative)-E vs K diagram-V vs K diagram, Effective mass of electron- Classification of Crystalline Solids-Concept of hole

SEMICONDUCTOR PHYSICS

Semiconductors: Introduction-Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

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TEXT BOOKS

"A Text book of Engineering Physics"by M.N.Avadhanulu, P.G.Kshirsagar -S.Chand Publications,

"Engineering Physics" by Tirupati Naidu & Veeranjaneyalu, V G S Publishers

"Engineering Physics" by P.K Palanisamy,Sci Tech Publication

REFERENCE BOOKS

Kettles Introduction to Solid state Physics-Charles Kittel, Wiley India Edition

Solid State Physics ,AJ Dekker, I Edition, Macmillan Publishers India Private Limited

"Engineering Physics" by M.R.Srinivasan, New Age international publishers.

"Solid State Physics" by SO Pilai., - New age International Publishers

WEB RESOURCES

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

Unit I: https://nptel.ac.in/courses/122/107/122107035/#

Unit II: https://nptel.ac.in/courses/113/104/113104014/

Unit III: https://nptel.ac.in/courses/113/104/113104090/
https://youtu.be/DDLljK1ODeg

Unit IV : https://study.com/academy/lesson/the-de-broglie-hypothesis-definition-significance.html
https://nptel.ac.in/courses/115/101/115101107/
https://nptel.ac.in/courses/115/105/115105122/

Unit V : https://www.electronics-tutorials.ws/diode/diode_1.html
https://nptel.ac.in/courses/115/105/115105099/
https://nptel.ac.in/courses/108/108/108108122/

R23

Pragati Engineering College (Autonomous)

I Year II Semester
DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches)

Course Category	Basic Sciences	**Course Code**	23BM201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation, Integration and Partial Differentiation. Differential Equations (Variable Separable)	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To familiarize the students with the foundations of line, surface and volume integrals.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Solve the first order differential equations related to various engineering fields.	K3
CO2	Solve the higher order differential equations to various engineering fields.	K3
CO3	Identify solution methods for partial differential equations that model physical processes.	K3
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	K3
CO5	Estimate the work done against a field, circulation and flux using vector calculus.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

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COURSE CONTENT

UNIT I

Differential equations of first order and first degree:

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. **Applications**: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II

Linear differential equations of higher order (Constant Coefficients):

Definitions, homogenous and non-homogenous differential equations, complimentary function, particular integral, general solution, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III

Partial Differential Equations:

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients

UNIT IV

Vector differentiation:

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient and applications, Directional derivative, del applied to vector point functions- Divergence and Curl, vector identities.

UNIT V

Vector integration:

Line integral-circulation-work done by the force, Scalar potential, surface integral-flux, Green's theorem in a plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXT BOOKS

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

REFERENCE BOOKS

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint)
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

6. Advanced Engineering Mathematics by H. K Dass, S. Chand Publications, 2022, 22nd Edition (Reprint 2022).

WEB RESOURCES

1. https://mathworld.wolfram.com/First-OrderOrdinaryDifferentialEquation.html
2. https://en.wikipedia.org/wiki/Differential_equation
3. https://en.wikipedia.org/wiki/Partial_differential_equation
4. https://en.wikipedia.org/wiki/Vector_calculus
5. https://en.wikipedia.org/wiki/Vector_calculus

Pragati Engineering College (Autonomous)

R23

I Year II Semester
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23EE201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

PART-A :BASIC ELECTRICAL ENGINEERING

COURSE OBJECTIVES
To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the fundamental laws, operating principles of motors, generators, MC and MI instruments	K2
CO2	Apply the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.	K3
CO3	Apply the mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II

Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III

Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill, 2019, Fourth Edition

2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017

4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

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PART-B : BASIC ELECTRONICS ENGINEERING

COURSE OBJECTIVES	
1	To impart knowledge on semiconductor devices.
2	To introduce concepts of biasing and applications of diodes and transistors.
3	To introduce fundamentals of digital electronics.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basic concepts of diodes and transistors	K2
CO2	Understand the working principles of semiconductor devices and applications	K2
CO3	Understand number system, Boolean algebra, basics of combinational and sequential circuits	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	2										
CO3	2	2										

COURSE CONTENT

UNIT - I

SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT - II

BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Block diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT - III

DIGITAL ELECTRONICS

Overview of Number Systems, BCD codes, Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XORand XNOR. Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

1. Robert. L. Boylestad & Louis Nashelsky, Electronic Devices & Circuit Theory, Pearson

Education, 2021.
2. Digital Design by Morris Mano, 3E, Prentice Hall, India, 2001

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Web References:

1. NPTEL- https://archive.nptel.ac.in/courses/108/108/108108122/
2. Neso Academy- https://www.nesoacademy.org/ec/05-digital-electronics

Pragati Engineering College (Autonomous)

R23

I Year II Semester
ENGINEERING GRAPHICS
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23ME201T
Course Type	Theory	**L-T-P-C**	1-0-4-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
2	To impart knowledge on the projection of points, lines and plane surfaces.
3	To improve the visualization skills for better understanding of projection of solids.
4	To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
5	To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.	K2
CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.	K3
CO3	Understand and draw projection of solids in various positions in first quadrant.	K3
CO4	Explain principles behind development of surfaces.	K2
CO5	Prepare isometric and perspective sections of simple solids.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT - I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT - II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT - III

Projections of Solids: Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT - IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT - V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://www.cadtutor.net/tutorials/autocad/

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R23

I Year II Semester
NETWORK ANALYSIS
(ECE)

Course Category	Professional Core	**Course Code**	23EC201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basic knowledge about resistor, inductor and capacitor.	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
2	To impart knowledge on applying appropriate theorem for electrical circuit analysis
3	To explain transient behavior of circuits in time and frequency domains
4	To teach concepts of resonance
5	To introduce open circuit, short circuit, ABCD, h parameters and their interrelationship.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze RLC network to solve network parameters using Mesh and Nodal and Apply star-delta transformations wherever necessary.	K4
CO2	Analyze a network, solve parameters using Network Theorems, Laplace Transform	K4
CO3	Analyze transient circuit using Differential equation and Laplace Transform techniques	K4
CO4	Analyze resonant circuit and coupled circuit.	K4
CO5	Analyze two-port network to compute Z, Y, ABCD and h parameters.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Course Outcomes towards achievement of Program Outcomes (1–Low,2-Medium, 3–High)														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3											3	3
CO2	3	3											3	3
CO3	3	3											3	3
CO4	3	3											3	3
CO5	3	3											3	3

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COURSE CONTENT

UNIT-I

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality examples.

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion.

UNIT-II

Network Theorems: Thevenin's, Norton's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, problem solving using dependent sources also.

Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, problem solving using Laplace transform.

UNIT-III

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

UNIT-IV

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT-V

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, ABCD-parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also, Image and iterative impedances (Qualitative treatment only)

Text Books

1. Network Analysis — ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017

Reference Books

1. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.
2. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education

Web References:

1. NPTEL Lectures- https://youtube.com/playlist?list=PLbRMhDVUMngfNnABo5mre45ZbHqJE2sUn&feature=shared

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R23

I Year II Semester
ENGINEERING PHYSICS LABORATORY
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Basic Sciences	**Course Code**	23BP201P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites	Intermediate Physics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The student will have exposure to various experimental skills which is essential for an Engineering student.
2	To gain practical knowledge by applying the experimental methods to correlate with the Theoretical Physics.
3	Apply the Analytical techniques and graphical analysis to the experimental data

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basics of Interference, Diffraction in Physics using instruments like Spectrometer, Travelling microscope.	K2
CO2	Study the Mechanical Laws, Strength of materials, Magnetic and Dielectric constants of materials.	K3
CO3	Apply the basics of Current Electricity and Semiconductors in engineering application	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-

COURSE CONTENT (Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode).

1. Determination of radius of curvature of a given Plano-convex lens by Newton's Rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of wavelength of Laser light using diffraction grating.
5. Estimation of Planck's constant using photoelectric effect.
6. Sonometer: Verification of laws of stretched string.
7. Determination of young's modulus for the given material of wooden scale by non- uniform bending

(or double cantilever) method.

8. Determination of rigidity modulus of the material of the given wire using Torsional pendulum
9. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
10. Determination of magnetic susceptibility by Kundt's tube method.
11. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
12. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
13. Determination of dielectric constant using charging and discharging method.
14. Determination of the resistivity of semiconductors by four probe methods.
15. Determination of energy gap of a semiconductor using p-n junction diode.
16. Determination of temperature coefficients of a thermistor.
17. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

TEXT BOOKS

College Customized Manual

REFERENCE BOOKS

A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017

WEB RESOURCES

1. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype
2. www.vlab.co.in

R23

Pragati Engineering College (Autonomous)

I Year II Semester
ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23EE201P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

PART-A: ELECTRICAL ENGINEERING WORKSHOP

COURSE OBJECTIVES
To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the Electrical circuit design concepts; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.	K2
CO2	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.	K3
CO3	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.	K3
CO4	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.	K4
CO5	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Measurement of Three- phase power in Three-phase induction motor using two wattmeter method.
5. Speed control of DC shunt motor.
6. Measurement of Power and Power factor using Single-phase wattmeter
7. Measurement of Earth Resistance using Megger
8. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING WORKSHOP

COURSE OBJECTIVES
To impart knowledge on the principles of digital electronics and fundamentals ofelectron devices & its applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO6	Identify & testing of various electronic components.	K3
CO7	Understand the usage of electronic measuring instruments.	K3
CO8	Plot and discuss the characteristics of various electron devices.	K3
CO9	Explain the operation of a digital circuit.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO6	2	2		2	2							
CO7	2	2		2	2							
CO8	2	2		2	2							
CO9	2	2		2	2							

List of experiments:

1. Introduction to Active and Passive devices must be experiment-1 (includes Resistors, Capacitors, Inductors, Diodes, Transistors, Power supplies, Ammeter(s), Voltmeter(s),

necessary devices)

2. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
3. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
4. Determine ripple factor of full wave rectifier.
5. Plot Input & Output characteristics of BJT in CE and CB configurations.
6. Determining CE Amplifier input and output impedance with and without bypass capacitor.
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gatesusing ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters,AC Voltmeters, CROs, all the required active devices. Multisim/PSPICE software for Simulation.

References:

1. Robert. L. Boylestad & Louis Nashelsky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

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I Year II Semester
NETWORK ANALYSIS AND SIMULATION LABORATORY
(ECE)

Course Category	Professional Core	**Course Code**	23EC201P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Basic knowledge about resistor, inductor and capacitor.	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To gain hands on experience in verifying Kirchoff's laws and network theorems
2	To study RLC elements behavior of circuits (transient and resonant)
3	To determine 2-port network parameters

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Verify Kirchoff's laws and network theorems.	K3
CO2	Measure time constants, Analyze behavior of RLC circuits	K3
CO3	Characterize and model the network in terms of all network parameters.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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PART-A

The following experiments need to be performed using Hardware:

1. Study of Components of a circuit and verification of KCL and KVL
2. Perform Mesh and Nodal Analysis of a given circuit.
3. Verification of principle of Superposition theorem for linear bilateral and unilateral networks.
4. Verification of principle of Maximum power transfer theorem
5. Verification of Thevenin and Norton theorems.
6. Find the Bandwidth, then determine the Q Factor of a Series Resonance circuit.
7. Verification of Z and Y Parameters of a simple T-two-port network (Only Hardware Implementation).
8. Verification of h-parameters of a simple T-two-port network (Only Hardware Implementation).
9. Verification of ABCD Parameters for a simple T-two-port network (Only Hardware Implementation).

PART-B

The experiments need to be simulated using software

1. Determination of transient response of current in RL and RC circuits with step voltage input.
2. Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases.
3. To study frequency response of 1st order RL and RC networks

Hardware Requirements:

1. Regulated Power supplies
2. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Software requirements:

i. Multisim/ Pspice/Equivalent simulation software tool.
ii. Computer Systems with required specifications.

References:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.

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R23

I Year II Semester
IT WORKSHOP
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23IT201P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS.
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning.
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Perform Hardware troubleshooting.	K3
CO2	Understand Hardware components and inter dependencies.	K3
CO3	Safeguard computer systems from viruses/worms.	K3
CO4	Document/ Presentation preparation.	K3
CO5	Perform calculations using spreadsheets.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

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

COURSE CONTENT

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your

instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows, Linux / BOSS on the personal computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux / BOSS Lab instructor should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and howto use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

WORD

Task 1 – Word Orientation: The mentor needs to give an overview of Microsoft (MS) office or equivalent (FOSS) tool word: Importance of MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using word – Accessing, overview of toolbars, saving files, Usinghelp and resources, rulers, format painter in word.

Task 2: Using Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be

covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentencesto see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: Whatis the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2--3.
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2-13, 3rd edition.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2-12, 2nd edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft).
5. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition.
6. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition.

Web References:

1. PC Hardware & Software Installation:
   Peripheral Devices: Computer Peripherals - Wikipedia
   Components in a CPU: CPU Components and Their Functions - Guru99
2. Internet & World Wide Web:
   TCP/IP and Networking Basics: TCP/IP Explained - Lifewire
   Internet Browsing and Configuration: How Web Browsing Works - HowStuffWorks
3. Word:
   Microsoft Word Tutorials: Microsoft Word Basics - GCFGlobal
4. Excel:
   Excel Tutorial and Functions: Excel Tutorial - Microsoft
5. AI Tools - ChatGPT:
   GPT-3.5 and ChatGPT Information: GPT-3.5 Guide - OpenAI

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R23

I Year II Semester
NSS/NCC/SCOUTS AND GUIDES/COMMUNITY SERVICE
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Humanities	**Course Code**	23MH202P
Course Type	Theory	**L-T-P-C**	0-0-1-0.5
Prerequisites		**Continuous Evaluation**	90
		Viva Voce	10
		Total Marks	100

COURSE OBJECTIVES
The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		
CO1	Understand the importance of discipline, character and service motto.	
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.	
CO3	Explore human relationships by analyzing social problems.	
CO4	Determine to extend their help for the fellow beings and downtrodden people.	
CO5	Develop leadership skills and civic responsibilities.	

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I: Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT – II: Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT – III: Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M. Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

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Department of Electronics and Communication Engineering

R23

II YEAR I SEMESTER

PROBABILITY THEORY AND STOCHASTIC PROCESS

Course Category	Basic Science	**Course Code**	23EC301T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of probability	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	The basic concepts of probability, theorems along with mathematical solution, and distribution of random variables
2	The operations that can be performed on random variables.
3	To know the temporal characteristics of random process
4	To know the spectral characteristics of random process.
5	This gives the concept of noise sources and information theory

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO	Understand the concept of a Random variable and its classification	K2
CO	Perform operations on single and multiple Random variables	K3
CO	Determine temporal characteristics of Random Signals.	K3
CO	Determine the Spectral characteristics of Random Signals.	K3
CO	Understand the concepts of Noise and Information theory in Communication systems	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT - I Probability & Random Variable:
Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, Random Variable-Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT - II Operations on Single & Multiple Random Variables – Expectations: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable. Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence. Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT - III Random Processes – Temporal Characteristics:
The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT - IV Random Processes – Spectral Characteristics:
The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT - V Noise Sources & Information Theory:
Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR

TEXT BOOKS:
1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4 th Ed, TMH, 2001.
2. Taub and Schilling - Principles of Communication systems, TMH, 2008

REFERENCE BOOKS:
1. Bruce Hajck - Random Processes for Engineers, Cambridge unipress, 2015
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002.
3. B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003.
4. S.P Eugene Xavier -Statistical Theory of Communication, New Age Publications, 2003

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

Department of Electronics and Communication Engineering

R23

II YEAR I SEMESTER

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY and ETHICAL HUMAN CONDUCT

(Common to CE, EEE, ME, ECE, CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS) and CSE(CYBER SECURITY)

Course Category	HSMC	**Course Code**	23HM301T
Course Type	Theory	**L-T-P-C**	2-1-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Blooms Taxonomy Level**
CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	K1
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	K2
CO3	Understand the role of a human being in ensuring harmony in Family And Society.	K1
CO4	Appraise the role of a human being in ensuring harmony in Nature/Existence.	K2
CO5	Distinguish between ethical and unethical practices to actualize a harmonious environment wherever they work.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, self-exploration as the Process for Value Education, Continuous Happiness and Prosperity-the basic human aspirations, Happiness and Prosperity- Current Scenario, Method to Fulfill the Basic Human Aspirations.
Practice Sessions: PS1 Sharing about Oneself , PS2 Exploring Human Consciousness, PS3 Exploring Natural Acceptance

UNIT – II Harmony in Human Being: Understanding Human being as the Co-existence of the self and the body, Distinguishing between the Needs of the self and the body, The body as an Instrument of the self, Understanding Harmony in the self, Harmony of the self with the body, Programme to ensure self - regulation and Health
Practice Sessions: PS4 Exploring the difference of Needs of self and body, PS5 Exploring Sources of Imagination in the self, PS6 Exploring Harmony of self with the body

UNIT – III Harmony in the Family and Society: Harmony in the family - the Basic Unit of Human Interaction, 'Trust' - the Foundational Value in Relationship, 'Respect' - as the Right Evaluation, Other Feelings, Justice in Human – to - Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.
Practice Sessions: PS7 Exploring the Feeling of Trust, PS8 Exploring the Feeling of Respect,
PS9 Exploring Systems to fulfil Human Goal

UNIT – IV Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual fulfillment among the Four Orders of Nature, Realizing Existence as Co- existence at All Levels, The Holistic Perception of Harmony in Existence
Practice Sessions: PS10 Exploring the Four Orders of Nature, PS11 Exploring Co-existence in Existence

UNIT – V Implications of the Holistic Understanding - a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value- based Life and Profession.
Practice Sessions: PS12 Exploring Ethical Human Conduct, PS13 Exploring Humanistic Models in Education, PS14 Exploring Steps of Transition towards Universal Human Order

Text books and Teachers Manual

1. A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 - R R Gaur, R Asthana, G P Bagaria
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2 - R R Gaur, R Asthana, G P Bagaria

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth- by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal

Web References:

1. https://fdp-si.aicte-india.org
2. https://www.youtube.com/playlist?list=PLWDeKF97v9SP_Kt6jqzA3pZ3yA7g_OAQz

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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R23

II YEAR I SEMESTER
SIGNALS AND SYSTEMS

Course Category	Engineering Science	**Course Code**	23EC302T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Calculus	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To study about signals and systems
2	To analyze the spectral characteristics of signal using Fourier series and Fouriertransforms
3	To understand the characteristics of systems
4	To introduce the concept of sampling process
5	To know various transform techniques to analyze the signals and systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Differentiate the various classifications of signals and systems	K1
CO2	Analyze the frequency domain representation of signals using Fourier concepts	K4
CO3	Classify the systems based on their properties and determine the response of LTISystems	K3
CO4	Know the sampling process and various types of sampling techniques	K2
CO5	Apply Laplace and z-transforms to analyze signals and Systems(continuous & discrete)	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS0O1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO5	3	2	-	-	-	-	-	-	-	-	-	-	3	1

COURSE CONTENT

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time- scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closedor complete set of orthogonal functions, Orthogonality in complex functions. Related problems.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction**,** Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant(LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal band width, system band width, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time

UNIT–IV: CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presenceof noise by correlation, Extraction of signal from noise by filtering.

SAMPLINGTHEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to B and Pass sampling, Related problems.

UNIT–V: LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transformof certain signals using waveform synthesis.

Z–TRANSFORMS: Concept of Z-Transform of a discrete sequence. Region of convergence in Z- Transform, constraints on ROC for various classes of signals, Inverse Z- transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

TEXTBOOKS:

1. Signals, Systems & Communications- B.P.Lathi, BSPublications,2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willskyand S.H.Nawab, PHI, 2nd Edn,1997
3. Signals & Systems – Simon Haykin and VanVeen,Wiley,2ndEdition,2007

REFERENCEBOOKS:

1. Principles of Linear Systems and Signals–BP Lathi, Oxford University Press,2015
2. Signals and Systems–TK Rawat, Oxford University press,2011

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R23

II YEAR I SEMESTER

ELECTRONIC DEVICES AND CIRCUITS

Course Category	Professional Core	**Course Code**	23EC303T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Engineering Physics, Network Analysis	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn and understand the basic concepts of semiconductor physics and study the physical phenomena of PN junction diode.
2	Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes, to learn and understand the application of diodes.
3	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor, to learn and understand the purpose of transistor biasing and its significance.
4	understand the small signal low frequency equivalent circuit analysis of BJT transistor amplifiers and compare different configurations.
5	understand different types of FETs, their operation, characteristics, and analysis

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the basic concepts of semiconductor physics and understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation	K2
CO2	Know the construction, working principle of special diodes and applications of diodes.	K3
CO3	Understand the construction of BJT, principle of operation of BJT with their V-I characteristics in different configurations. Apply the concepts of transistor biasing, various biasing techniques for BJT	K2
CO4	Perform the analysis of small signal low frequency transistor amplifier circuits using BJT	K3
CO5	Understand the construction of FET, principle of operation of FET with characteristics in different configurations	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	3	3	2										2	2
CO2	3	3	2										2	2
CO3	3	3	2										2	2
CO4	3	3	2										2	2
CO5	**3**	3	2	2									2	2

COURSE CONTENT

UNIT-I: Review of Semiconductor Physics: Mobility and Conductivity, Intrinsic and extrinsic semiconductors**,** Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors. **(Text book: 1)**
Junction Diode Characteristics : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in p-n junction Diode, Diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance. **(Text book: 1)**

UNIT-II: Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, Varactor Diode, LED, Photodiode, Tunnel Diode, UJT, PNPN Diode, SCR, Construction, operation and V-I characteristics. (Text book: 1)
Diode Circuits: The Diode as a circuit element, The Load-Line concept, The Piecewise Linear Diode model, Clipping (limiting) circuits, Clipping at Two Independent Levels, Peak Detector, Clamping circuits, Comparators, Sampling Gate, Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, Filters, Inductor filter, Capacitor filter, π-section Filter, comparison of various filter circuits in termsof ripple factors. **(Text book: 1, 2)**

UNIT- III: Transistor Characteristics: Junction transistor, transistor current components, transistor equation in CB configuration, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll modelof a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values. (Text book: 1)
Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, ($S,S^{'},S^{''}$), Bias compensation, Thermal runaway, Thermal stability. **(Text book: 1)**

UNIT- IV: Small Signal Low Frequency Transistor Amplifier Models
BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversionof h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. **(Text book: 1, 2)**

UNIT- V: FET: FET types, JFET operation, characteristics, small signal model of JFET. **(Text book: 1)MOSFET:** MOSFET Structure, Operation of MOSFET: operation in triode region, operation in saturation region, MOSFET as a variable resistor, derivation of V-I characteristics of MOSFET, Channel length modulation, MOS transconductance, MOS device models: MOS small signal model, PMOS Transistor, CMOS Technology, Comparison of Bipolar and MOS devices. **(Text book: 3)CMOS amplifiers:** General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FETamplifiers. **(Text book: 3)**

Text Books:

1. Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and SatyabrataJit, Mc-Graw Hill Education, 4th edition, 2015.
2. Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.
3. Fundamentals of Microelectronics-Behzad Razavi, Wiley, 3rd edition, 2021.

References:

1. Basic Electronics-Priciples and Applications, Chinmoy Saha,Arindam Halder,Debarati Ganguly, Cambridge University Press.
2. Electronics devices & circuit theory- Robert L.Boylestad and LouiNashelsky,Pearson,11th edition, 2015.
3. Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008
4. Electronic Devices and Circuits- S. Salivahanan, N. Suresh Kumar, Mc-Graw Hill, 5thedition, 2022

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II YEAR I SEMESTER

SWITCHING THEORY and LOGIC DESIGN

Course Category	Professional Core	**Course Code**	23EC304T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Universal Logic Gates	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Number systems, generate codes, Boolean logic and realize simple combinational logic
2	Minimizing switching functions, adders, sub tractors, code converters using Boolean theorems, K-Map and Tabular Methods
3	Higher order combinational circuits implementation using basic gates and PLDs
4	The working of Flip-Flops, Registers, Counters
5	Mealy and Moore machines and design sequential logic using them

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply Knowledge Of Number Systems To Generate Codes, Boolean Logic To Realize Simple Combinational Logic.	K3
CO2	Minimize And Realize Switching Functions, Adders, Sub tractors, Code Converters Using Boolean Theorems, K-Map And Tabular Methods	K3
CO3	Implement Higher Order Combinational Circuits Using Basic Gates And Plds	K3
CO4	Understand The Working Of Flip-Flops And Registers And Apply The Knowledge To Design Counters	K3
CO5	Design And Analyze Mealy And Moore Machines	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I

REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r- 1's compliments and r's compliments of signed members. Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems. Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits.

UNIT – II

MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine - mcclus key method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4- bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a- head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :

Design of encoder ,decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits . Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder

INTRODUCTION OF PLD's : PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV

SEQUENTIAL CIRCUITS I:

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip- flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi- directional shift register, universal shift, register

Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V

SEQUENTIAL CIRCUITS II :

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping)

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj. K.Jha 3rdEdition,Cambridge UniversityPress,2009
2. Digital Design by M.Morris Mano, Michael D Ciletti,4th editionPHIpublication,2008
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCES:

1. Fundamentals of Logic Design by Charles H. Roth Jr,JaicoPublishers,2006
2. Digital electronics by R S Sedha. S.Chand &companylimited,2010
3. Switching Theory and Logic Design by A. Anand Kumar, PHI Learningpvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengagelearning,2006. TTL 74-Seriesdatabook

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R23

II YEAR I SEMESTER

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Course Category	Professional Core	**Course Code**	23EC303P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Identification of Components	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To plot the V-I characteristics of various devices -clippers, clampers, transistors, etc…
2	To calculate ripple factor and efficiency of rectifiers
3	To plot the frequency response of different amplifier circuits

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basic knowledge and analyze the characteristics of clippers, clampers, Transistor, FET, UJT and SCR.	K2
CO2	Calculate the ripple factor for half wave and full wave rectifiers with and without filters	K2
CO3	Analyze CE and CC amplifiers.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2					1		2	1			1	1
CO2	1	1							2	1			1	1
CO3	1	1					1		2	1			1	1

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. clipper circuit using diode
2. Clamping circuit using diode
3. Rectifiers (without and with c-filter) Part A:Half-wave Rectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics (CEConfiguration) Part A: Input Characteristics
   Part B: Output Characteristics
5. FET Characteristics(CSConfiguration) Part A: Drain Characteristics
   Part B:TransferCharacteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies
2. Analog/ Digital Storage Oscilloscopes
3. Analog/ Digital Function Generators
4. Digital Multi-meters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters(Analog or Digital)
8. Voltmeters(Analog or Digital)
9. Active& Passive Electronic Components

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II YEAR I SEMESTER

SWITCHING THEORY and LOGIC DESIGN LABORATORY

Course Category	Professional Core	**Course Code**	23EC304P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
1. The working of logic gates
2. The interconnection of logic gates to create a combinational circuit and its working
3. The interconnection of logic gates to create a sequential circuit and its working

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Verify the functionality of logic gates Flip-Flops using ICs	K3
CO2	Verify the functionality of combinational circuits using ICs	K3
CO3	Verify the functionality of sequential circuits using ICs	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	2	2			2								2	2
CO2	2	2			2								2	2
CO3	2	2			2								2	2

List of Experiments:

1. Verification of truth tables of the following Logic gates
   Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
3. Verification of functional table of 3 to 8-line Decoder /De-multiplexer
4. 4 variable logic function verification using 8 to1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of (i) JK Edge triggered Flip–Flop (ii) JK Master SlaveFlip–Flop (iii) D Flip-Flop
7. Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output.
8. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes ofoperation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output waveforms.
11. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketchthe output waveforms.
12. (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.

Additional Experiments:

1. Design BCD Adder Circuit and Test the Same using Relevant IC
2. Design Excess-3 to 9- Complement convertor using only four Full Adders and test theCircuit.
3. Design an Experimental model to demonstrate the operation of 74154 De-Multiplexerusing LEDs for outputs.
4. Design of any combinational circuit using Hardware Description Language
5. Design of any sequential circuit using Hardware Description Language

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II YEAR II SEMESTER
DATA STRUCTURES USING PYTHON
(Common to ECE)

Course Category	Professional Core	**Course Code**	23CS301S
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Understand basic data structures in python like Lists, Tuples, Dictionaries, Sets and Maps
2	Design and analyze simple linear data structures.
3	Identify and apply the suitable data structure for the given real world problem.
4	Design and analyze non linear data structures.
5	Gain knowledge in practical applications of data structures

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand various data representation techniques in the real world.	K3
CO2	Implement linear and non-linear data structures.	K3
CO3	Analyze various algorithms based on their time and space complexity.	K3
CO4	Develop real-time applications using suitable data structure.	K5
CO5	Identify suitable data structure to solve various computing problems	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

List of Experiments:

1. Write a Python program for class, Flower, that has three instance variables of type str, int, and float that respectively represent the name of the flower, its number of petals, and its price. Your class must include a constructor method that initializes each variable to an appropriate value, and your class should include methods for setting the value of each type, and retrieving the value of each type.
2. Develop an inheritance hierarchy based upon a Polygon class that has abstract methods area( ) and perimeter( ). Implement classes Triangle, Quadrilateral, Pentagon, that extend this base class, with the obvious meanings for the area( ) and perimeter( ) methods. Write a simple program that allows users to create polygons of the various types and input their geometric dimensions, and the program then outputs their area and perimeter
3. Write a python program to implement Method Overloading and Method Overriding.
4. Write a Python program to illustrate the following comprehensions: a) List Comprehensions b) Dictionary Comprehensions c) Set Comprehensions d) Generator Comprehensions
5. Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list. Example: Original list: [1, 2, 3, 4, 5, 6, 7, 8, 9] Combinations of 2 distinct objects: [1, 2] [1, 3] [1, 4] [1, 5] [7, 8] [7, 9] [8, 9].
6. Write a program for Linear Search and Binary search.
7. Write a program to implement Bubble Sort and Selection Sort.
8. Write a program to implement Merge sort and Quick sort.
9. Write a program to implement Stacks and Queues.
10. Write a program to implement Singly Linked List.
11. Write a program to implement Doubly Linked list.
12. Write a program to implement Binary Search Tree.

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II YEAR I SEMESTER
ENVIRONMENTAL SCIENCE
(Common to all branches)

Course Category	BASIC SCIENCES	**Course Code**	23BC301T
Course Type prerequisites	Theory	**L-T-P-C** **Internal Assessment** **Semester End Examination** **Total Marks**	2 -0-0--0 30 70 100

S.No.	**Course Objectives**
1	To make the students to get awareness on environment
2	To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
3	To save earth from the inventions by the engineers.

COURSE OUTCOMES		**Cognitive Level**
Upon successful completion of the course, the student will be able to:		
CO1	Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources.	K2
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	K2
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	K2
CO4	Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	K2
CO5	Illustrate the casus of population explosion, value education and welfare programmes.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	0	1	0	0	1	2	0	0	0	1	0
CO2	0	1	0	0	0	0	1	0	0	0	0	0
CO3	0	0	0	0	2	0	1	0	0	0	0	0
CO4	0	0	0	0	1	1	3	0	0	0	0	0
CO5	0	0	0	0	0	0	3	1	0	0	0	0

COURSE CONTENT

UNIT – I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies, Energy resources- Renewable and non-renewable resources (Biomass).

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a)Forest ecosystem, b)Grassland ecosystem, c)Desert ecosystem, e)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)(Primary Treatment)

Biodiversity and Its Conservation : Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hotspots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of: a)Air Pollution, b)Water pollution, c)Soil pollution, d)Marine pollution, e)Noise pollution, f)Thermal pollution, g)Nuclear hazards (Primarytreatment)

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics (Issues and possible solutions) –Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human Population and The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Viral infections -Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
6. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science
- http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf
- https://www.youtube.com/watch?v=5QxxaVfgQ3k

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

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Department of Electronics and Communication Engineering

R23

II YEAR II SEMESTER
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to CE, EEE, ECE, CSE, and CSE(CYBER SECURITY)

Course Category	Management Course - I	**Course Code**	23HM401T
Course Type	Theory	**L-T-P-C**	2 -0 -0-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO 1	Understand of the concepts of managerial economics and demand in managerial decision making and predicting demand for goods and services	K1
CO 2	Assess the functional relation among production, cost of production, cost concepts and Break-Even Analysis.	K3
CO 3	Classify market structures for price and output decisions and Appraise the forms of business organizations and trade cycles in economic growth.	K1
CO 4	Apply capital budgeting techniques in financial decision making	K3
CO 5	Make use of the final accounting statements and analysis in financial decision making	K3

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

Unit – I

Managerial Economics: Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

Unit – II

Production and Cost Analysis: Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquantsand Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

Unit – III

Business Organizations and Markets: Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic - Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

Unit – IV

Capital Budgeting: Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects - Pay Back Period Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

Unit – V

Financial Accounting and Analysis: Introduction - Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books :

1. Suma Damodaran - Managerial Economics - Oxford - 2011.
2. Vanitha Agarwal - Managerial Economics - Pearson Publications- 2011.
3.V.Maheswari - Financial Accounting- Vikas Publications - 2018
4. S. A. Siddiqui & A. S. Siddiqui - Managerial Economics and Financial Analysis - New Age International Publishers – 2012

Web References: https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

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LINEAR CONTROL SYSTEMS

Course Category	Engineering Science	**Course Code**	23EC402T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Learn the fundamental concepts of Control systems and mathematical modeling of the system difference between open loop control system and closed loop control system
2	Learn the representation of various control systems transfer functions in the form of block diagrams and signal flow graphs and obtain a simplified transfer function, and Study the time domain specifications
3	The concept of stability using Routh criterion and root locus
4	Understand the Concept of frequency response analysis
5	Understand the concept of Compensation techniques– State Space Analysis of Continuous Systems state variable analysis

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Represent the mathematical model of a system and transfer function of mechanical & electrical systems.	K2
CO2	Determine the response of servo motor and reduction techniques and time domain response	K2
CO3	Analyze the stability in S-domain and root locus of systems	K2
CO4	Determine the frequency response using various plots-bode plot, polar plot, etc	K2
CO5	Know the design techniques and state space approach for the analysis ofcontrol systems	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	3	2	1										2	2
CO2	3	2	1										2	2
CO3	3	2	1										2	2
CO4	3	2	1										2	2
CO5	3	2	1										2	2

COURSE CONTENT

UNIT I - INTRODUCTION

Concepts of System, Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions. Translational and Rotational mechanical systems

UNIT II – TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro-transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples –Block diagram algebra–Representation by Signal flow graph-Reduction using mason's gain formula.

IME RESPONSE ANALYSIS

Standard test signals – Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems – Time domain specifications – Steady state response - Steady state errors and error constants.

UNIT III – STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability100

Root Locus Technique:

The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT IV

Frequency response analysis: Introduction, Correlation between time and frequencyresponse, Polar Plots, Bode Plots, Nyquist Stability Criterion

UNIT V – CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design infrequency Domain, PIDControllers. State Space Analysis of Continuous Systems Concepts of state, statevariables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B.C.Kuo – Johnwiley and son's, 2003.
2. Control Systems Engineering –by I. J.Nagrathand M.Gopal, New Age International (P)Limited, Publishers, 2nd edition, 2007
3. Modern Control Engineering–by Katsuhiko Ogata–Pearson Publications, 5th edition, 2015.

REFERENCE BOOKS:

1. Control Systems by A.Nagoorkani, RB Apublications, 3 edition, 2017.
2. Control Systems by A.Anandkumar, PHI, 2 Edition, 2014.

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II YEAR II SEMESTER

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Course Category	Professional Core	**Course Code**	23EC403T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of vector calculus, Review of Co-ordinate Systems	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Understand the fundamentals of electric fields, coulomb's law and gauss law
2	Familiar with of Biot-Savart Law, Ampere's Circuital Law and Maxwell equations
3	Aware of electromagnetic wave propagation in dielectric and conducting media
4	Study the equivalent circuit of transmission lines and parameters of the transmissionlines
5	Learn the working of smith chart and its usage in the calculation of transmission line parameters

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Determine electric field intensity using coulomb's law and Gauss law	K2
CO2	Determine magnetic field intensity using Biot-Savarts Law and Ampere's Circuital Law	K2
CO3	Analyze the electromagnetic wave propagation in dielectric and conducting media	K3
CO4	Examine the primary and secondary constants of different types of transmission lines	K3
CO5	Derive the expressions for input impedance, reflection coefficient, and VSWR oftransmission lines and calculate these parameters using smith chart	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I:

Review of Co-ordinate Systems, **Electrostatics:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT II:

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and VectorPotentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

UNIT III:

EM Wave Characteristics : Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

UNIT IV:

Transmission Lines - I : Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT V:

Transmission Lines – II: Input Impedance Relations, Reflection Coefficient, VSWR, Average Power, Shorted Lines, Open Circuited Lines, and Matched Lines, Low loss radio frequency and UHF Transmission lines, UHF Lines as Circuit Elements, Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

TEXT BOOKS:

1. Elements of Electromagnetic – Matthew N. O. Sadiku, Oxford University Press, 7th edition, 2018.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2008.

REFERENCE BOOK:

1. Engineering Electromagnetics – William H. Hayt, John A. Buck, Jaleel M. Akhtar,TMH, 9th edition, 2020.
2. Electromagnetic Field Theory and Transmission Lines –G. S. N. Raju, PearsonEducation 2006
3. Electromagnetic Field Theory and Transmission Lines: G SasiBhushana Rao,Wiley India2013.
4. Networks, Lines and Fields John D. Ryder, Second Edition, Pearson Education, 2015.

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II YEAR II SEMESTER

ELECTRONIC CIRCUIT ANALYSIS

Course Category	Professional Core	**Course Code**	23EC404T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn hybrid- π parameters a thigh frequency and compare with low frequency parameters
2	To make students learn the purpose of cascading of single stage amplifiers and derive the overall voltage gains
3	Analyze the effect of negative feedback on amplifier characteristics and derive the Characteristics
4	Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits
5	To develop the basic understanding and analyze different Power amplifiers like Class A, Class B, Class C, Class AB and other types tuned of amplifiers

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**BTL**
CO1	Design and analysis of small signal high frequency transistor amplifier using BJT andFET	K3
CO2	Design and analysis of multistage amplifiers using BJT and FET and Differentialamplifier using BJT	K3
CO3	Design and analyze the different types of feedback amplifiers	K3
CO4	Derive the expressions for frequency of oscillation and condition for oscillation of RCand LC oscillators and their amplitude and frequency stability concept	K2
CO5	Know the classification of the power and tuned amplifiers and their analysis with performance comparison	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O1**	**PSO 2**	**PSO 3**
CO1	3	2	2	2	-	-	-	--	-	-	-	-	2	2	3
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	2	3
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	2	3
CO4	2	1	1	2	-	-	-	--	-	-	-	-	2	2	3
CO5	2	1	1	-	-	-	-	-	-	-	-	-	2	2	3

COURSE CONTENT

UNIT-I Small Signal High Frequency Transistor Amplifier models:
BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid πconductance, Hybrid π capacitances, validity of hybrid π model, determination of high- frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.
FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II
Multistage Amplifiers: Classification of amplifiers, methods of coupling**, c**ascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT-III
Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT-IV
Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC- phase shift and Wien bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators.

UNIT-V
Power Amplifiers: Classification of amplifiers(A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks.
Tuned Amplifiers**: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, , staggered tuned amplifiers**

Text Books:
1. Integrated Electronics- J.Millman and C.C.Halkias, Tata McGraw-Hill, 1972.
2. Electronic Devices and Circuits Theory –Robert L.Boylestad and Louis Nashelsky, Pearson/ Prentice Hall, Tenth Edition, 2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications,2006

References:
1. Electronic Circuit Analysis and Design –Donald A.Neaman, McGrawHill, 2010.
2. Micro electronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, SixthEdition, 2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy,Pearson Publications

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ANALOG COMMUNICATIONS

Course Category	Professional Core	**Course Code**	23EC405T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To know the basics of Analog Communication
2	To extend the modulation techniques for better communication.
3	To know the concepts of Frequency Modulation
4	To study the transmitting & receiving phenomenon by using different receivers & transmitters types
5	To study various effects of noise on Communication Systems. And To study about different Pulse Modulation techniques

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the concepts of amplitude modulation	K2
CO2	ComparedifferenttypesofAmplitudeModulationandDemodulationtechniques	K2
CO3	Interpret the Radio Transmitters completely, Analyze the concepts of generation and detection of Angle Modulated signals	K3
CO4	Outline the Radio Receivers with different sections	K2
CO5	Illustrate the noise performance in Analog Modulation techniques and also the concepts of Pulse Analog Modulation and Demodulation techniques	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 -Medium, 3 – High)

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

COURSE CONTENT

Unit – I

Amplitude Modulation: Introduction to Fourier transform, Introduction to communication system, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Time domain and Frequency domain descriptions, Single tone modulation, Power relations in AM waves, Generation of AM waves: Square law Modulator, Switching modulator, Detection of AM Waves: Square law detector, Envelope detector, Related problems.

Unit – II

DSB & SSB Modulation: Double sideband suppressed carrier modulator: Time domain and frequency domain description, Generation of DSBSC Waves: Balanced Modulator, Ring Modulator, Detection of DSBSC Waves: Coherent detection, Quadrature Null Effect, COSTAS Loop, Squaring Loop.

Single sideband suppressed carrier modulator: Time domain and Frequency domain description, Generation of SSBSC Waves: Frequency discrimination method, Phase discrimination method, Demodulation of SSB Waves: Coherent Detection.

Vestigial sideband modulation: Time domain description, Frequency domain description, Generation of VSB Modulated wave, Envelope detection of a VSB Wave pulse Carrier, Comparison of different AM Techniques, Applications of different AM Systems, Related problems.

Unit – III

Angle Modulation: Introduction, Basic concept of phase modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave, Generation of FM Waves: Direct Method, Indirect Method, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM, Related problems.

Unit – IV

Radio Transmitters: Classification of Transmitters, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter: Variable reactance type and Phase modulated FM Transmitter, Frequency stability in FM Transmitter.

Radio Receivers: Receiver Types: Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics, Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Amplitude limiting, Comparison of FM & AM Receivers, Communication Receivers, Extension of super heterodyne principle and additional circuits.

Unit – V

Noise: Review of noise and noise sources, Noise figure, Noise in Analog communication Systems: Noise in DSB & SSB Systems, Noise in AM System and Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & De-emphasis.

Pulse Analog Modulation: Types of Pulse modulation, PAM (Single polarity, double polarity), PWM: Generation & Detection of PWM, PPM: Generation and Detection of PPM, Time Division Multiplexing, TDM Vs FDM**.**

Text Books:

1. Communication Systems, Simon Haykin, Michael Moher, Wiley, 5th Edition, 2009.
2. Principles of Communication Systems, H Taub, D L Schilling, Gautam Sahe, TMH, 4th Edition,2017.
3. Modern Digital and Analog Communication Systems, B.P.Lathi, Zhi Ding, Hari Mohan Gupta,Oxford University Press, 4th Edition, 2017.

Reference Books:

1. Electronics & Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna, TMH, 6th Edition, 2017.
2. Communication Systems, R P Singh, S D Sapre, TMH, 3nd Edition, 2017.
3. Communication Systems (Analog and Digital), Dr. Sanjay Sharma, Katson Books, 7th ReprintEdition, 2018

Web Links:

1. http://nptel.ac.in/courses/117102059/ Prof. Surendra Prasad.
2. https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication- CommunicationSystems-4ed-Haykin.pdf.
3. https://www.scribd.com/document/266137872/sanjay-sharma-pdf.
4. http://bayanbox.ir/view/91440908351988908 6/Book-Modern-Digital-And-AnalogCommunication- Systems-4th-edition-by-Lathi.pdf.
5. https://soaneemrana.org/onewebmedia/ELECTRONICS%20COMMUNICATION%20SYSTEM%20BY%20GEORGE%20KENNEDY.pdf

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

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Department of Electronics and Communication Engineering

R23

II YEAR II SEMESTER
SIGNALS AND SYSTEMS LABORATORY

Course Category	Professional Core	**Course Code**	23EC404P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Concepts of Signals and Systems	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To gain knowledge on topics like vector space, basis dimension, inner product, norm and orthogonal basis of signals using programming
2	To develop relationship for linear systems and response of LTI system using convolution using Programming.
3	To apply the concepts of Laplace, transform and Z-transform for analyzing continuous and discrete time signals and systems respectively with the help of Programming.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.	K3
CO2	Develop input output relationship for linear systems and Classify systems based on their properties and determine the response of LTI system using convolution	K2
CO3	Apply the Laplace transform and Z-transform for analyze of continuous and discrete time signals and systems respectively.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

List of Experiments:

I. Generation of Basic Signals (Analog and Discrete)

1. Unit step
2. Unit impulse
3. Unit Ramp
4. Sinusoidal
5. Signum

II. Operations on signals

1. Addition & Subtraction
2. Multiplication & Division
3. Maximum & minimum

III. Energy and power of signals ,even and odd signals

IV. Transformation of the independent variable

1. Shifting (Delay & Advance)
2. Reversing
3. Scaling

V. Convolution & Deconvolution

VI. Correlation

VII. Fourier Series Representation

VIII. Fourier Transform and Analysis of Fourier Spectrum

IX. Laplace Transform

X. Z-Transforms

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II YEAR II SEMESTER
ELECTRONIC CIRCUIT ANALYSIS LABORATORY

Course Category	Professional Core	**Course Code**	23EC404P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Concepts of Amplifiers	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
1. To analyze frequency response of multistage amplifiers.
2. To illustrate the effect of feedback on the performance of the amplifier.
3. To design oscillators and power amplifiers for the given specifications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the frequency response of multistage amplifiers.	K2
CO2	Explain the effect of feedback on the performance of the amplifier.	K2
CO3	Design Oscillators and Power amplifiers for the given specifications.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

List of Experiments:

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. Determination of Ft of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Boots trapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required: Software:

i. Multisim/Equivalent Industrial Standard Licensed simulation software tool.
ii. Computer Systems with required specifications

Hardware Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

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II YEAR II SEMESTER
SOFT SKILLS

Course Category	Humanities	**Course Code**	20BE401S
Course Type	Laboratory	**L-T-P-C**	0-1-2-2
Prerequisites	LSRW Skills	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To prepare to face global competition for employment and excellence in the profession.
2	To help the students understand and build intrapersonal and interpersonal skills that will enable them to lead meaningful professional lives.

S.NO	**COURSE OUTCOME**		**Cognitive Level**
1	CO1	Assimilate and understood the meaning and importance of soft kills and learn how to develop them.	K1
2	CO2	Understand the significance of skills in the working environment for Professional excellence.	K2
3	CO3	Prepare to undergo the placement process with confidence and clarity.	K3
4	CO4	Ready to face any situation in life and equip themselves to handle them effectively.	K6
5	CO5	Understand and learn the importance of etiquette in both professional and personal life.	K2

K1- Remembering, K2- Understanding, K3-Applying, K-4 Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	-	-	-	-	2	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	3	-	-	-

COURSE CONTENT

UNIT I
Introduction:
Introduction: Emergence of life skills, definition, Importance& need, reasons for skill gap, Analysis--Soft Skills vs. hard skills, Linkage between industry and soft skills, Challenges, Personality Developments. Soft Skills, Soft Skills vs English - Improving Techniques.

UNIT II
Intra-Personal:
Definition-Meaning–Importance- SWOT analysis, Johari windows- Goal Setting – quotient skills - Emotional Intelligence- Attitudinal skills - Right thinking- Problem Solving-Time management, stress management.

UNIT III
Inter-Personal:
Definition–Meaning–Importance-Communications skills-Teamwork, managerial skills
-Negotiation skills -Leadership skills, corporate etiquettes**.**

UNIT IV
Verbal Skills:
Definition and Meaning-Listening skills, need- types, advantages, Importance-Improving Tips for Listening, Speaking, need- types, benefits, Importance- Improving Tips, Reading- Writing Skills, Report, Resume, statement of purpose, need- types, advantages, Importance-Improving Tips.

UNIT V
Non Verbal Skills & Interview skills

Definition and Meaning – Importance- Facial Expressions- Eye Contact – Proxemics- Haptics -Posture, cross cultural body language, body language in the interview room, appearance and dress code–Kinetics-Para Language-tone, pitch, pause, neutralization of accent, use of appropriate language, Interview skills, interview methods, and questions.

TEXT BOOKS

1. Sherfield, M. Robert at al, Cornerstone Developing SoftSkills,4/e, Pearson Publication, New Delhi, 2014.
2. Alka Wadkar, Life Skills for Success, 1/e, Sage Publications India Private Limited, 2016.

REFERENCE BOOKS

1. Sambaiah .M. Technical English, Wiley Publishers India. New Delhi. 2014.
2. Gangadhar Joshi, From Campus to Corporate, SAGE TEXT.
3. Alex. K, Soft Skills, 3rd ed. S. Chand Publication, New Delhi, 2014.
4. Meenakshi Raman and Sangita Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2009.
5. Shalini Varma, Body Language for Your Success Mantra, 4/e, S. Chand Publication, New Delhi, 2014.
6. Stephen Covey, Seven Habits of Highly Effective People, JMDBook, 2013.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc20_hs60/preview
2. http://www.youtube.com/@softskillsdevelopment6210
3. https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q&si=Fs05Xh8ZrOPsR8F4
4. https://www.coursera.org/learn/people-soft-skills-assessment?language=English
5. https://www.edx.org/learn/soft-skills

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II YEAR II SEMESTER

DESIGN THINKING & INNOVATION

(Common to CE, EEE, ME, ECE, CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS) and CSE(CYBER SECURITY)

Course Category	BS&H	**Course Code**	23HM401P
Course Type	Theory	**L-T-P-C**	1 -0 -2-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO 1	Define the concepts related to design thinking.	K1
CO 2	Explain the fundamentals of Design Thinking and innovation.	K2
CO 3	Apply the design thinking techniques for solving problems in various sectors.	K3
CO 4	Analyze to work in a multidisciplinary environment.	K4
CO 5	Evaluate the value of creativity.	K5

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Web Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year I Semester

ANALOG & DIGITAL IC APPLICATIONS

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	EDC & STLD	**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	understand the characteristics and applications of operational amplifiers (Op-Amps), including both ideal and practical models.
2	Understand 555 timers, 565 PLLs, and their use in waveform generation and signal processing.
3	know data converters (DACs and ADCs) and understand their working principles and specifications
4	know about combinational and sequential digital logic ICs, their functionalities, and how they are applied in real-time digital systems
5	gain knowledge of memory devices, including RAM, ROM, and their architecture and applications in digital electronics.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain Op-Amp characteristics, modes, and voltage regulators for analog circuit applications	K2
CO2	Implement active filters, waveform generators, and timer/PLL circuits using ICs (741,555,565)	K3
CO3	Apply DAC and ADC types to meet design specifications (resolution, linearity, accuracy)	K3
CO4	Apply TTL and CMOS logic ICs to implement combinational circuits	K3
CO5	Apply flip-flops, counters, and shift registers to design timing and control circuits accurately.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

UNIT–I

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, features of 741 Op-Amp, Modes of Operation-Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT-II

Op-Amp, IC-555 & IC565 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer-Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL-Block Schematic, principle and Applications.

UNIT-III

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT-IV

Combinational Logic ICs: Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, De-multiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT-V

Sequential Logic IC's and Memories: Familiarity with commonly available 74XX & CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.
Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXTB OOKS:

1. Ramakanth A.Gayakwad- Op-Amps & Linear ICs,PHI,2003.
2. Floyd and Jain- Digital Fundamentals, 8thEd., Pearson Education,2005.

REFERENCE BOOKS:

1. D.Roy Chowdhury–Linear Integrated Circuits, New Age International(p) Ltd,2ndEd.,2003.
2. John.F. Wakerly–Digital Design Principles and Practices, 3rdEd., Pearson, 2009.
3. Salivahana- Linear Integrated Circuits and Applications, TMH,2008.
4. William D. Stanley-Operational Amplifiers with Linear Integrated Circuits,4thEd.,Pearson Education India, 2009

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III Year I Semester

DIGITAL COMMUNICATIONS

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Signals and Systems	**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	Understand PCM, DPCM, DM principles, sampling, quantization, companding, multiplexing.
2	Learn digital modulation techniques and characteristics for efficient communication.
3	Understand signal reception and error probability in detection schemes.
4	Learn linear block, Hamming and BCH codes for error control.
5	Know convolution and Turbo codes with encoding and decoding methods.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain PCM, DPCM, DM principles through sampling, quantization, companding, and multiplexing under noisy conditions.	K2
CO2	Illustrate ASK, FSK, PSK, QPSK, and M-ary modulation schemes using diagrams .	K3
CO3	Apply matched filter concepts to determine error probabilities for coherent and non-coherent receivers in AWGN.	K3
CO4	Analyze linear block, Hamming, BCH codes and perform encoding, syndrome calculation, and error correction.	K4
CO5	Analyze convolution and Turbo codes by generating sequences, drawing trellis, and decoding with Viterbi algorithm.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

UNIT I

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems, Time division multiplexing, Frequency division multiplexing.

UNIT II

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III

DATA TRANSMISSION: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT IV

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH codes

UNIT V

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm, Turbo Codes.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003
3. Digital Communications- J.Das, S.K.Mullick, P.K.Chatterjee, John willy & sons, 1986.

RERFERENCES:

1. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004
3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

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III Year I Semester

ANTENNAS AND WAVE PROPAGATION

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	EMTL	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Understand the Basics of Antennas and Explore Antenna Parameters
2	Understand radiation principles, field evaluation, and performance parameters of thin wire and loop antennas, including dipoles, monopole
3	Analyze antenna arrays, radiation patterns, directivity, and design of linear, binomial, and parasitic element arrays including Yagi-Uda and folded dipoles.
4	Understand design, characteristics, and applications of broadband, UHF, microwave, horn, reflector, and microstrip antennas with relevant parameters and performance analysis.
5	Understand antenna measurements, wave propagation types, ionospheric effects, and field strength calculations in communication.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand basic radiation mechanisms, antenna parameters, radiation patterns, and performance metrics of wire antennas.	K2
CO2	Analyze radiation, field components, and performance of dipoles, monopoles, and small loop antennas.	K4
CO3	Design and compare antenna arrays including uniform, binomial, and Yagi-Uda with pattern multiplication principles.	K4
CO4	Understand design and characteristics of broadband, horn, reflector, and microstrip antennas with practical considerations.	K2
CO5	Study antenna measurement techniques and wave propagation types including sky and space wave characteristics.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2
CO2	3	2	1	-	-	-	-	-	-	-	-	2	1
CO3	3	2	1	-	-	-	-	-	-	-	-	2	2
CO4	3	2	1	-	-	-	-	-	-	-	-	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2

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COURSE CONTENT

UNIT-I: ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – Single Wire, 2-Wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Field Regions, Main Lobe and Side Lobes, Beam width, Radiation Intensity, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance, Beam Area and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT-II: THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, **Radiation Efficiency**, Beam width, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops

UNIT-III: ANTENNA ARRAYS : 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations), Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics

UNIT-IV BROADBAND ANTENNAS: Log periodic antenna, Basic principle, Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UHF AND MICROWAVE ANTENNAS:

Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; **Paraboloidal Reflectors**: – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Case grain Feeds.

Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics, illustrated Problems.

UNIT-V ANTENNA MEASUREMENTS: FRIIS Transmission Equation, Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

WAVE PROPAGATION: TYPES of propagations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance; Space Wave Propagation – Mechanism, LOS and Radio Horizon, Field strength equation, illustrated Problems.

TEXT BOOKS:

1. Antenna Theory: Analysis And Design- Constantine A. Balanis, 3rd Edition, A John Wiley & Sons, Inc., Publication
2. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
3. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCES:

1. Antennas and Wave Propagation-G.S.N. Raju, Pearson publications, 2006.
2. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
3. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988.

WEB LINKS:

https://www.antenna-theory.com/

https://nptel.ac.in/courses/108101092

https://www.youtube.com/watch?v=FNL2xGvxKcU&list=PLgwJf8NK-2e7tzLIDL4aXUbtRFY3ykmkT

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year I Semester

DIGITAL SYSTEM DESIGN THROUGH HDL

(PE-1)

Course Category	Professional Elective - I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	fundamental Verilog HDL concepts, syntax, and gate-level modeling techniques for basic digital circuit design.
2	behavioral models for combinational and sequential circuits using procedural Constructs, control statements, and generate blocks
3	dataflow and switch-level modeling constructs to design combinational and sequential circuits with timing considerations
4	finite state machines using Verilog functions, tasks, and encoding techniques, and synthesize them for hardware implementation
5	testbench creation and verification techniques to ensure functional accuracy of Verilog designs.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Implement digital circuits at the gate level using Verilog HDL primitives and delays	K3
CO2	Model sequential and combinational circuits using behavioral constructs in Verilog	K3
CO3	Analyze timing and functional behavior of circuits developed using dataflow and switch-level modeling.	K4
CO4	Analyze finite state machine designs in Verilog for functional accuracy and encoding efficiency	K4
CO5	Apply testbench techniques to verify the functionality of digital circuits	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6-Creating

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

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COURSE CONTENT

UNIT-I: Introduction to Verilog HDL and Gate Level Modelling:

Verilog as HDL, Levels of Design Description Basics of Concepts of Verilog, Data Types, System Task, Compiler directives, modules and ports. AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flipflops with Gate Primitives, Delay.

UNIT-II: Behavioural Modelling:

Introduction, structured processors, procedural assignments, timing controls, conditional statements, multi-way branching, loops, sequential and parallel blocks, generate blocks, Design of Decoders, Multiplexers, Flip-flops, Registers & Counters in Behavioral model.

UNIT-III: Modelling at Data flow Level:

Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Design of Decoders, Multiplexers, Flip-flops, Registers & Counters in dataflow model, Switch Level Modelling: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitive delays.

UNIT-IV: FSM Design:

Functions, Tasks, User-defined, Primitives: Introduction, Function, Tasks, User-Defined Primitives (UDP), FSM Design (Moore and Mealy Machines), Encoding Style: From Binary to One Hot. Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines

UNIT-V: Components Test and Verification:

Test Bench – Combinational Circuits Testing, Sequential Circuits Testing, Test Bench Techniques, Design Verification, Assertion Verification

Text Books:

1. Samir Palnitkar, "Verilog HDL A Guide to Digital and Synthesis" ,2nd Edition, Pearson Education,2006.
2. Michael, D. Ciletti, "Advanced digital design with the Verilog HDL", Pearson Education India,2005.

Reference Books:

1. Padmanabhan, Tripura Sundari -Design through Verilog HDL, Wiley, 2016
2. S. Brown, Zvonko – Vranesic, Fundamentals of Digital Logic with Verilog Design, TMH, 3rdEdision 2014.
3. J. Bhasker, A Verilog HDL Primer 2nd edition, BS Publications, 2001.

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Department of Electronics and Communication Engineering

III Year I Semester

OPTICAL COMMUNICATIONS

(PE-II)

Course Category	Professional Elective - I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Understand the basic principles and types of optical fibers.
2	Know fiber materials and how losses and dispersion affect signals.
3	Learn fiber connectors, splicing methods, and joint losses.
4	Understand the working of optical sources and detectors.
5	Know power launching methods and basics of optical system design.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain basic optical fiber concepts and types using fiber parameters.	K2
CO2	Analyze signal distortion and dispersion effects.	K4
CO3	Identify fiber connectors and splicing methods from fiber joints.	K2
CO4	Describe the operation of optical sources and detectors.	K2
CO5	Design an optical link with power and rise time budget.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

UNIT I

Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber waveguides-Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers-Cutoff wave length, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II

Fiber materials:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT III

Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing-Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT IV :

Optical sources-LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Comparison of Photo detectors, Related problems.

UNIT V

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers. Optical system design - Point-to-point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXTBOOKS:

1. Optical Fiber Communications–GerdKeiser, McGraw-HillInternationaledition,3rdEdition,2000.
2. Fiber Optic Communications– JosephC.Palais, 4thEdition, Pearson Education, 2004.

RERFERENCES:

1. Fiber Optic Communications–D.K.Mynbaev ,S.C.Gupta and Lowell L.Scheiner,PearsonEducation,2005.
2. TextBookonOpticalFiberCommunicationanditsApplications–S.C.Gupta,PHI,2005.
3. Fiber Optic Communication Systems–Govind P.Agarwal ,JohnWiley,3rdEdiition,2004.

Web Links:

1. http://www.nptel.ac.in/syllabus/117101054/
2. https://nptel.ac.in/courses/115/107/115107122/
3. https://www.coursera.org/specializations/optical-engineering
4. https://www.youtube.com/watch?v=-ap00IUJm7k

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year I Semester

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

(PE-1

Course Category	Professional Elective - I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Know the electronic measuring instruments, working principle, errors, specifications .
2	Understand the working principles of different types of CRO's, dual trace CRO, Dual beam CRO, storage oscilloscope.
3	Understand Working principles bridges and measurement of inductance, capacitance andFrequency
4	Learn about signal generators, wave analyzers and their working principle.
5	Understand Active and passive transducers and Measuring physical parameters using transducers

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify the instrument for measurements of voltage , current , power and estimate errors.	K3
CO2	Understand the operation of dual trace CRO, Dual beam CRO and storage oscilloscope.	K2
CO3	Analyze the values of R, L, C and frequency employing bridges,	K3
CO4	Acquire the knowledge on signal generators and wave analyzers	K2
CO5	Know the basic principles and working of transducers	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

UNIT I

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures, Basic PMMC Meter- construction and working, DC and AC Voltmeters- Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

UNIT II

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal deflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

UNIT III

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

UNIT IV

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

UNIT V

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, LVDT.

Intelligent Sensors: definition of intelligent instrumentation, types of instruments, Classification, Smart sensors, Cogent Sensors, Soft or Virtual sensors, Self-Adaptive Sensors, Self-Validating Sensors, Temperature Compensating Intelligent Sensors, Pressure Sensor, Indirect Sensing. (**Text Book 3**)

TEXT BOOKS

1. H. S. Kalsi, "Electronic Instrumentation", Third edition, Tata McGraw Hill, 2010.
2. A. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 6th Edition, 2010.
3. Manabendra Bhuyan, ―Intelligent Instrumentation: Principles and Applications CRC Press, 2011.

REFERENCE BOOKS

1. A.K. Sawhney, DhanpatRai& Co., "A course in Electrical and Electronic Measurements and Instrumentation", 9th Edition, 2010.
2. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year I Semester
COMPUTER ORGANIZATION AND ARCHITECTURE
(PE-1)

Course Category	Professional Elective - I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	Computer architecture, Data representation methods, and Register-level operations for efficient digital system design.
2	Basic Computer Design, Programming, and Micro Programmed Control Unit concepts for effective system implementation.
3	CPU architecture, Instruction Handling, Arithmetic Algorithms, and RISC concepts for efficient processing.
4	I/O device architecture, Interfaces, and Data transfer mechanisms for efficient communication.
5	Memory hierarchy, Advanced memory types, and Hardware mechanisms for effective memory management.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Describe computer architecture, data representation, and register-level operations using appropriate notation.	K2
CO2	Design basic computer organization and implement programs using machine and assembly language.	K3
CO3	Apply CPU organization principles and arithmetic algorithms to design and implement efficient data processing operations.	K3
CO4	Explain I/O architecture, interfaces, and data transfer techniques for efficient communication.	K2
CO5	Understand Hierarchy, Structure, and operation of various memory types and management hardware in computer systems.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

UNIT-1 :

Introduction: Digital Computers, Von Neumann computers, Basic organization of a computer, **Data Representation:** Data types, Complements, Fixed-point representation, Conversion of fractions, Floating-point representation.

Register Transfer and Micro operations: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit

UNIT-2

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic computer

Programming the Basic Computer: Introduction, Machine Language, Assembly language, The Assembler, Program Loops, Programming Arithmetic and Logic Operations

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit (**Preferably from Reference Book 2**)

UNIT-3

Central Processing Unit: Introduction, General Register Organization, Stack organization, Instruction Formats, Addressing Modes, Data transfer and Manipulation, Program Control, Reduced Instruction Set Computer

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT – 4

Input-Output organization : Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

UNIT– 5

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Text Book

1. M.Morris Mano," Computer System Architecture," Pearson Publishers, Revised Third Edition

Reference Books

1. John P Hayes, "Computer Architecture and Organization,"Mc-Graw Hill Publishers, Third Edition
2. Carl Hamacher, "Computer Organization," Tata Mc-Graw Hill Publishers, Fifth Edition

PRAGATI ENGINEERING COLLEGE

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(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year– I Semester

CONSTRUCTION PROJECT MANAGEMENT

Course Category	**Open Elective**	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	**Building materials Project management basics**	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To introduce to the student, the concept of project management including network drawing and monitoring
2.	To introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery
3.	To introduce the importance of safety in construction projects

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	**Explain** the principles of construction project management, including planning, scheduling, monitoring, and coordination using CPM and PERT techniques.	**K2**
CO2	**Apply** project evaluation methods, cost analysis, and resource optimization techniques using construction management software like Primavera.	**K3**
CO3	**Analyze** the selection, capacity, and productivity of various construction equipment for earthwork, compaction, hoisting, and concreting operations.	**K4**
CO4	**Demonstrate** the operation and application of concreting equipment, including batching plants, mixers, and finishing tools for quality construction.	**K3**
CO5	**Evaluate** construction methods, formwork practices, and safety measures, incorporating BIM concepts for effective civil engineering project execution	**K5**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes : (1 – Low, 2 - Medium, 3 – High)														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	1	-	1	2	2	1	3	2	1
CO2	3	3	2	2	3	1	-	1	2	3	1	3	2	1
CO3	3	3	2	2	2	2	-	1	2	2	1	3	3	1
CO4	3	2	3	2	2	2	-	2	2	2	1	3	3	1
CO5	3	3	3	3	3	3	2	2	3	3	2	3	3	2

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COURSE CONTENT

UNIT–I

Construction project management and its relevance – qualities of project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT-II

Project evaluation and review technique– cost analysis updating crashing for optimum cost–crashing for optimum resources–allocation of resources introduction to software's for construction management, project management using PRIMAVERA (or) equivalent

UNIT-III

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

Hoisting and earthwork equipment–hoists–cranes–tractors-bulldozers–graders–scrapers–draglines-clamshellbuckets

UNIT – IV

Concreting equipment— concrete mixers–Batching plants, mobile using plants like"Ajax"etc.mixing and placing of concrete – consolidating and finishing.

UNIT – V

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection–quality control and safety engineering. BIM for Civil Engineers (Building Information Modeling)

Text Books:

1. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder, Shapira, Tata Mc Graw hill.
2. 'Construction Project Management Theory and Practice'by Kumar Neeraj Jha (2011), Pearson.
3. 'ConstructionTechnology'bySubirK.SarkarandSubhajitSarasvati,OxfordUniversity press

References:

1. 'Construction Project Management – An Integrated Approach'by Peter Fewings,Taylor and Francis
2. 'Construction Management Emerging Trends and Technologies' by Trefor Williams , Cengage learning

Web References:

1. NPTEL :: Civil Engineering - NOC:Principles of Construction Management

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Department of Electronics and Communication Engineering

III Year I Semester

Open Elective-I

RENEWABLE ENERGY SOURCES

(Common to CE, ME, ECE, CSE, IT, CSE-CS, CSE-DS, CSE-AI, CSE-AIML)

Course Category	Open Elective Courses	**Course Code**	
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	Basic Electrical Engineering	**Internal Assessment**	**30**
		Semester End Examination	**70**
		Total Marks	**100**

COURSE OBJECTIVES	
1	To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics.
2	To understand the concept of Wind Energy Conversion & its applications.
3	To study the principles of biomass, hydel and geothermal energy.
4	To understand the principles of ocean Thermal Energy Conversion, waves and power associated with it.
5	To study the various chemical energy sources such as fuel cell and hydrogen energy along with their operation and equivalent circuit.

COURSE OUTCOMES		**Cognitive Level**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.	K4
CO2	Illustrate the components of wind energy systems.	K3
CO3	Illustrate the working of biomass, hydel plants and Geothermal plants.	K3
CO4	Demonstrate the principle of Energy production from OTEC, Tidal and Waves.	K2
CO5	Evaluate the concept and working of Fuel cells & MHD power generation.	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1	-	-	-	**1**	-	-	-	-	3	3
CO2	3	2	1	-	-	-	1	-	-	-	-	2	3
CO3	3	1	1	-	-	-	1	-	-	-	-	2	3
CO4	3	1	1	-	-	-	1	-	-	-	-	3	3
CO5	3	1	1	-	-	-	1	-	-	-	-	2	3

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COURSE CONTENT	
UNIT 1	**Solar Energy** Introduction - Renewable Sources - prospects, solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.
UNIT 2	**Wind Energy** Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.
UNIT 3	**Biomass, Hydel and Geothermal Energy** **Biomass**: Introduction - Biomass conversion technologies- Photosynthesis. Factors affecting Bio digestion. **Hydro plants**: Basic working principle – Classification of hydro systems: Large, small, micro hydel plants. **Geothermal Energy**: Introduction, Geothermal Sources – Applications - operational and Environmental problems.
UNIT 4	**Energy From oceans, Waves & Tides** **Oceans**: Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India. **Waves**: Introduction - Energy and Power from the waves - Wave Energy conversion devices. **Tides**: Basic principle of Tide Energy -Components of Tidal Energy.
UNIT 5	**Chemical Energy Sources** **Fuel Cells**: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications. **Hydrogen Energy**: Introduction - Methods of Hydrogen production - Storage and Applications. **Magneto Hydro Dynamic (MHD) Power generation**: Principle of Operation - Types.

TEXT BOOKS	
1	G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
2	John Twidell& Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.
REFERENCE BOOKS	
1	Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak,TMH, New Delhi, 3rd Edition.
2	John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.
3	Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.
4	Non-conventional energy source –B.H. Khan- TMH-2nd edition
5	Renewable Energy- Edited by Godfrey Boyle-oxford university. press,3rd edition,2013.
6	Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
7	Renewable Energy Technologies /Ramesh & Kumar /Narosa.
8	Renewable energy technologies – A practical guide for beginners – ChetongSingh Solanki, PHI
WEB RESOURCES (Suggested)	
1	https://archive.nptel.ac.in/courses/103/103/103103206
2	https://archive.nptel.ac.in/courses/103/107/103107157
3	nptel.ac.in/courses/112105050/m1l1.pdf

4	https://en.wikipedia.org/wiki/Tidal_power#Tidal_power_issues
5	http://nptel.ac.in/courses/108108078/pdf/chap2/student_slides01.pdf

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year I Semester

SUSTAINABLE ENERGY TECHNOLOGIES

Course Category	Open Elective-I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	-	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To demonstrate the importance the impact of solar radiation, solar PV modules.
2	To understand the principles of storage in PV systems.
3	To discuss solar energy storage systems and their applications.
4	To get knowledge in wind energy and bio-mass.
5	To gain insights in geothermal energy, ocean energy and fuel cells.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate solar radiation principles and the design of PV modules.	K3
CO2	Discuss battery technologies and storage methods in PV systems.	K2
CO3	Explain solar energy collection, storage methods, and applications.	K2
CO4	Describe the principles and utilization of wind and bio-mass energy systems.	K2
CO5	Analyze geothermal, ocean, and fuel cell energy technologies.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

UNIT –I

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

SOLAR PV MODULES AND PV SYSTEMS:

PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant, Installation and Maintenance, Real-time PV monitoring systems, Maximum Power Point Tracking)algorithms in PV systems.

UNIT –II

STORAGE IN PV SYSTEMS:

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT –III

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney, Solar-assisted heat pump systems**.**

UNIT – IV

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT – V

GEOTHERMAL ENERGY: Origin, Applications, Types of Geothermal Resources, Relative Merits

OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges.

FUEL CELLS: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

Text books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH.
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.
3. Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013.

Reference Books:

1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis.
2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd.
3. Renewable Energy Technologies -Ramesh & Kumar /Narosa.
4. Non-conventional Energy Source- G.D Roy/Standard Publishers.

Web References:

1. https://onlinecourses.nptel.ac.in/noc24_me144/preview
2. https://archive.nptel.ac.in/courses/115/105/115105127/
3. https://archive.nptel.ac.in/courses/121/106/121106014/

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III Year I Semester

INTRODUCTION TO CLOUD COMPUTING

(Common to CE, EEE, ME & ECE)

Course Category	**Open Elective - 1**	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To explain the evolving utility computing model called cloud computing.
2	To introduce the various levels of services offered by cloud.
3	To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
4	To emphasize the security and other challenges in cloud computing.
5	To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

COURSE OUTCOMES		
Up on successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand cloud computing fundamentals, service models, and deployment types.	K2
CO2	Understand enabling technologies including distributed systems and virtualization techniques.	K2
CO3	Demonstrate virtualization, containers, and orchestration using modern cloud tools.	K4
CO4	Analyze cloud challenges including security, scalability, and interoperability issues.	K4
CO5	Apply advanced cloud concepts like serverless, IoT, and DevOps.	K2

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	0	2	0	0	0	0	0	0
CO2	3	2	3	0	2	0	0	0	0	0	0
CO3	3	3	3	0	2	0	0	0	0	0	0
CO4	3	3	3	0	3	0	0	0	0	0	0
CO5	3	2	3	0	3	0	0	0	0	0	0

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COURSE CONTENT

UNIT -I: Introduction to Cloud Computing Fundamentals

Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google AppEngine).

UNIT-II: Cloud Enabling Technologies

Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.

UNIT-III: Virtualization and Containers

Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.

UNIT-IV: Cloud computing challenges

Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

UNIT -V: Advanced concepts in cloud computing

Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

Text Books:

1. Mastering Cloud Computing, 2nd edition, RajkumarBuyya, Christian Vecchiola, ThamaraiSelvi, ShivanandaPoojara, Satish N. Srirama, McGraw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference Books:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)

e-Resources:https://onlinecourses.nptel.ac.in/noc21_cs14/preview

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year I Semester

ANALOG AND DIGITAL IC APPLICATIONS LAB

Course Category	Professional Core	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Demonstrate The Operation Of Analog Integrated Circuits, Including Op-Amps, Timers, Oscillators, And Filters, Through Practical Circuit Implementation.
2	Develop Digital Logic Functions And Sequential Circuits Using Standard Ttl/Cmos Ics And Hdl Coding Techniques.
3	**Analyze** The Performance Of Analog And Digital Circuits By Comparing Experimental Measurements With Theoretical Expectations.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Measure the parameters of IC 741 Op-amp and realize applications such as Integrators, differentiators, filters, and waveform generators	Digital signaK3
CO2	Demonstrate timer, PLL, VCO, DAC circuits using IC 555, 565, 566, op-amps.	K3
CO3	Understand the Verilog HDL in different level of abstractions and develop Verilog model for given combinational circuit and sequential circuit	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

PRAGATI ENGINEERING COLLEGE

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COURSE CONTENT

PART-A: (Minimum **SIX** Experiments to be conducted):

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
5. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
6. Function Generator using OP AMPs.
7. IC 555 Timer – Astable & Mono-stable Operation Circuit.
8. Schmitt Trigger Circuits – using IC 741 and IC 555.
9. IC 565 – PLL Applications.
10. IC 566 – VCO Applications.
11. 4 bit DAC using OP AMP.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 etc.
8. Analog IC Tester

PART-B: (Minimum **SIX** Experiments to be conducted):

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to develop HDL(VHDL, Verilog HDL) source code, perform simulation using relevant simulator and analyze the obtained simulation results using appropriate synthesizer. Further, it is required to verify the logic with necessary hardware.

List of Experiments:

1. Realization of Logic Gates
2. 3 to 8 Decoder- 74138
3. 8*1 Multiplexer-74151 and 2*1 De-multiplexer-74155
4. 4-Bit Comparator-7485.
5. D Flip-Flop- 7474
6. Decade Counter- 7490
7. Universal shift register-74194/195
8. RAM (16*4)-74189 (read and write operations)

Equipment Required:

1.Xilinix Vivado/Equivalent Standard IDE
2. Personal computer with necessary peripherals
3.Hardware kits- Various FPGA families.

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III Year I Semester

ANALOG AND DIGITAL COMMUNICATIONS LAB

Course Category	Professional Core	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	**Understand** the principles of analog and digital modulation techniques through waveform analysis.
2	**Understand** the operation of multiplexing and companding by implementing them and assessing communication system performance.
3	**Know** the fundamentals of encoding and decoding by verifying the accuracy of transmitted and received data.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate modulation techniques(analog and digital) and verify corresponding waveforms .	K3
CO2	Implement multiplexing and companding to evaluate system performance.	K3
CO3	**Implement** linear block code,binary cyclic code,convolution encoder and decoder for a given message length and verify error correction capability.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

List of Experiments:

(Fourteen experiments to be done-**The students have to calculate the relevant parameters**)–

(a. Hardware, b. MATLAB Simulink c. MATLAB Communication toolbox)

Part-A

1. Amplitude Modulation-Modulation & Demodulation
2. AM-DSBSC-Modulation & Demodulation
3. Diode Detector
4. Pre-emphasis & De-emphasis
5. Frequency Modulation-Modulation & Demodulation
6. Verification of Sampling Theorem
7. Pulse Amplitude Modulation & Demodulation
8. PWM,PPM–Modulation & Demodulation

Part-B

1. Time division multiplexing.
2. Frequency Division Multiplexing
3. Pulse code modulation.
4. Differential pulse code modulation.
5. Delta modulation.
6. Frequency shift keying.
7. Phase shift keying.
8. Differential phase shift keying.
9. Companding
10. Source Encoder and Decoder
11. Linear Block Code-Encoder and Decoder and Binary Cyclic Code–Encoder and Decoder
12. Convolution Code–Encoder and Decoder

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

Equipment & Software required:

Software:

i) Computer Systems with latest specifications
ii) Connected in LAN(Optional)
iii) Operating system(Windows/Linux software)
iv) Simulations software(Simulink &MATLAB)

Equipment:

1. RPS -0 –30V
2. CRO -0–20MHz.
3. Function Generators -0–1MHz
4. Components and Breadboards
5. Multi meters and other meters

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III Year I Semester

APPLICATIONS OF LAB VIEW FOR INSTRUMENTATION & COMMUNICATIONS

Course Category	Skill Enhancement course	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-1-2-2
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	the fundamentals of graphical programming using LabVIEW and develop basic Virtual Instruments (VIs) for data visualization and control.
2	interface various sensors and perform real-time data acquisition using National Instruments (NI) DAQ systems
3	process signals using LabVIEW's built-in signal generation and filtering tools, including FFT and waveform analysis
4	communication systems such as analog and digital modulation techniques and evaluate system performance
5	instrumentation and automation applications including motor control, PID controllers, data logging, image processing, and IoT integration.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Develop and debug LabVIEW programs using front panel and block diagram interfaces for various engineering applications	K3
CO2	Acquire and analyze sensor data in real-time using NI-DAQ hardware and perform signal processing operations	K3
CO3	Implement and evaluate analog/digital communication systems using LabVIEW's simulation and visualization tools	k5
CO4	Design and deploy automation solutions such as closed-loop motor control and real-time process monitoring systems	K5
CO5	Integrate advanced applications such as image processing, wireless communication, and IoT-based remote monitoring into LabVIEW projects.	K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1	2	3	0	0	0	0	0	0	3	2
CO2	3	3	2	3	3	2	1	0	0	0	0	3	3
CO3	2	2	3	2	3	0	0	0	2	2	0	3	2

CO4	2	2	3	2	3	0	0	0	2	0	2	3	2
CO5	3	2	3	2	3	2	1	0	0	2	0	3	3

COURSE CONTENT

Unit I:

Introduction to Lab VIEW & Virtual Instrumentation: Overview of LabVIEW: Graphical programming paradigm, LabVIEW Environment: Front panel, block diagram, data flow programming, Creating simple Virtual Instruments (VIs), Debugging and troubleshooting techniques, Implementing loops, case structures, arrays, and clusters.

Unit II:

Data Acquisition & Signal Processing: Interfacing sensors (temperature, pressure, light, etc.) with LabVIEW, Real-time data acquisition using NI DAQ hardware, Signal generation: Sine, Square, Triangular waves, Fourier Transform (FFT) for frequency analysis, Filtering techniques: Low-pass, High-pass, Band-pass filters.

Unit III:

Communication System Implementation: AM and FM Modulation/Demodulation using LabVIEW, Simulation of Digital Modulation Schemes (ASK, PSK, FSK), Eye diagrams and constellation plots for digital signals, Error detection and correction: Parity, CRC, Hamming Code.

Unit IV: Instrumentation & Automation Applications:

Real-time data logging and file handling (Excel/CSV), PID Controller Design for automation and process control, Motor speed control using LabVIEW and DAQ, Signal visualization and user interface design.

Unit V: Advanced Applications:

Image Processing using LabVIEW, Wireless communication using Bluetooth & Wi-Fi in LabVIEW, IoT Integration-Cloud-based monitoring and remote data access, Project-based learning-

Textbooks & References

1. R. W. Larsen, LabVIEW for Engineers, 1st ed., Prentice Hall, 2011.
2. G. W. Johnson and R. Jennings, LabVIEW Graphical Programming, 4th ed., McGraw-Hill, 2017.
3. National Instruments, "LabVIEW Tutorials & Documentation," Available: https://www.ni.com.J. Jerome, Virtual Instrumentation Using LabVIEW, 1st ed., PHI Learning Pv

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Department of Electronics and Communication Engineering

III Year I Semester

DESIGN OF PCB & ANTENNAS LAB

Course Category	Engineering Science	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	To understand EM wave generation, perform impedance matching using Smith Chart, and calculate phase and group velocities in transmission media.
2	To understand and visualize the radiation characteristics of basic antennas and linear arrays through radiation pattern plotting.
3	To study and measure radiation patterns of various antenna types to understand their directional and performance characteristics.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the generation of electromagnetic waves, apply Smith Chart for impedance matching, and calculate phase and group velocities in transmission lines.	K3
CO2	Plot and interpret the radiation patterns of dipole, monopole, and uniform linear array antennas for analyzing directional characteristics.	K3
CO3	Measure and analyze the radiation patterns of wired, aperture, planar, reflector, and array antennas using standard techniques.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

Merits of PCB Machine:

1. CNC based for Better Accuracy and results.
2. Etching, Engraving and Drilling can be done with same Machine
3. Maintenance free machine compared to chemical method.
4. Compatible with multiple software Gerber / G code.
5. Reduction of time and Inventory.
6. Height mapping for bed level and depth sensing.
7. Surface mapping of bed
8. Power Optimized system ability to run on ups systems unlike other Machines.
9. High precision lead screw
10. 5umeter resolution, 0.001 repeatability, 2 layer with FR4
11. Scalability from a single prototype to a batch of 10-50 PCBs.

Scope of learning:

1. In house PCB proto type manufacturing process.
2. How to convert simulation results into real time Electronic boards/ Projects.
3. Designing according to project requirements.
4. Along with PCB other Multi materials support carbon fiber sheets, Drone frames, Engraved
5. Acrylic sheets. Engraving on aluminium.
6. Latest multi domain projects extension 3D printing and Additive Manufacturing.
7. Exposure to design the proto type products.

ANTENNAS LAB:

List of experiments: (Any Ten experiments using any simulation software)

1. Generation of EM-Wave
2. Impedance Matching using Smith Chart
3. Calculation of phase and group velocity calculation
4. Plot of Radiation pattern of dipole antenna
5. Plot of Radiation pattern of monopole antenna
6. Plot of Radiation pattern of Uniform Linear Array
7. Measurement of radiation pattern of all wired and aperture antennas
8. Measurement of radiation pattern of planar antennas
9. Measurement of radiation pattern of reflector antennas
10. Measurement of radiation pattern of array antennas
11. Analysis of co-polarization and cross polarization
12. Performance analysis of Yagi -Uda antenna
13. Performance analysis of Helix antenna
14. Radio wave propagation path loss calculations

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year II Semester

VLSI DESIGN

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	Enable the student to visualize MOS fabrication technologies and to understand electrical Properties of MOS, CMOS and Bi CMOS circuits.
2	Train the student to draw integrated circuit layouts and stick diagrams following Lambda based design rules and to understand basic circuit concepts.
3	Know the basic building blocks of Analog IC design
4	Study various Combinational and sequential Logic circuit design
5	Study the role of FPGA in VLSI design and usage of advanced technologies

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand MOSFET fabrication, device characteristics, and CMOS/nMOS/BiCMOS logic with layout design	K2
CO2	Analyze sheet resistance, layer capacitances, propagation delays, and scaling impacts on MOS circuits	K3
CO3	Design and bias MOS analog building blocks including amplifiers, current sources, and sinks.	K3
CO4	Implement static and dynamic CMOS combinational and sequential circuits such as adders, multiplexers, and flip-flops.	K3
CO5	Comprehend FPGA design flow, architecture, and advanced VLSI technologies like FinFET, high-k, metal gate, and TFET.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

PRAGATI ENGINEERING COLLEGE

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COURSE CONTENT

UNIT-I:

INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

UNIT-II:

BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density.

UNIT-III:

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT-IV:

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:

Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic, design of Half adder, full adder, multiplexer, decoder.**Dynamic CMOS Design:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Design examples of sequential circuits: Cross coupled NAND and NOR flipflops, D flipflop, SR JK flip flop, SR Master Slave flip flop.

UNIT-V:

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.

INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell
2. And Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
3. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
4. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2nd edition,2016.

REFERENCES:

1. "Introduction to VLSI Circuits and Systems", John P. Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, ColingeJP, Editor New York, Springer,2008.

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year II Semester

MICROPROCESSOR AND MICROCONTROLLERS

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	the architecture and operation modes of microprocessors and microcontrollers.
2	skills in writing assembly language programs for 8086 microprocessor.
3	interfacing of memory and peripherals with microprocessors.
4	knowledge of 8051 microcontroller programming and interfacing techniques.
5	ARM Cortex-M3 architecture and application programming.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain 8086 architecture and modes using diagrams to differentiate from other processor types.	K2
CO2	Develop 8086 assembly programs using instructions and addressing modes to solve given problems.	K3
CO3	implement memory and peripheral interfacing with 8086 to achieve required functions	K3
CO4	Demonstrate 8051 programming and device interfacing to meet given specifications	K2
CO5	Apply ARM Cortex-M3 features to write and verify programs for specific applications	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

Unit -I

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, History and classifications of Microprocessor and Microcontroller.

8086 Architecture: register organization, internal architecture of 8086, pin description of 8086, minimum mode and maximum mode of 8086 operation and timing diagrams.

Unit -II

8086 Programming: instruction set, addressing modes, assembler directives, programming with an assembler, writing simple programs with an assembler, stack and stack structure, interrupts and interrupt service routines 8086 system,

Unit -III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

Unit -IV

Intel 8051 MICROCONTROLLER and Interfacing

Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

Unit -V

ARM Architectures and Processors:

Introduction to CISC and RISC architectures, ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, Instruction set summary, System address map, write buffer, bit-banding. Programmers Model – Modes of operation and execution, stack pointer, exceptions and interrupt handling.

ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller– functional description and NVIC programmers' model.

TEXTBOOKS:

1. Advanced microprocessors and peripherals by K. M. Bhurchandi, A. K. Ray 3e
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2-Edition,2011.
3. TheDefinitiveGuidetoARMCortex-M3andCortex-M4ProcessorsbyJosephYiu.,Newnes Third edition.

REFERENCEBOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm EducationMedia,2017.
2. Cortex-M3 Technical Reference Manual

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Department of Electronics and Communication Engineering

III Year II Semester

DIGITAL SIGNAL PROCESSING

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Understand signal and system fundamentals in time and frequency domains for discrete-time analysis.
2	Know systems using z-transform and discrete Fourier transform for signal processing applications.
3	Understand efficient algorithms like FFT for spectral analysis of discrete-time signals.
4	Design digital FIR and IIR filters for signal processing needs.
5	Understand DSP architectures and features for real-time digital signal processing applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply signal and frequency analysis concepts to evaluate discrete-time LTI system behavior.	K3
CO2	Apply z-transform and DFT methods to analyze discrete-time systems and signals .	K3
CO3	Implement FIR and IIR systems using FFT algorithms for efficient computation	K3
CO4	Analyze FIR and IIR filter design techniques to meet frequency-selective specifications.	K4
CO5	Explain TMS320C5X DSP architecture and instructions in relation to signal processing applications.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

UNIT-1:Introduction: Signals, Systems, and Signal Processing, Classification of Signals, The Concept of Frequency in Continuous Time and Discrete Time Signals

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time Systems, Correlation of Discrete Time Signals.

Frequency Analysis of Signals: Frequency Analysis of Continuous Time Signals, Frequency Analysis of Discrete Time Signals, Frequency Domain and Time Domain Signal Properties, Properties of the Fourier Transform for Discrete Time Signals. Frequency Domain Analysis of LTI Systems: Frequency domain characteristics of LTI systems, Frequency response of LTI systems

UNIT-2:The z-Transform and Its Applications to the Analysis of LTI Systems: The z-Transform, Properties, Rational z Transforms, Inversion of the z-Transform, Analysis of Linear Time Invariant Systems in the z-Domain, The One sided z-Transform. (**Review only for entirez – Transform topic**).

The Discrete Fourier Transform: Its Properties and Applications: Frequency Domain Sampling: The Discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods Based on the DFT, Frequency Analysis of Signals Using DFT

UNIT-3:Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms.

Implementation of Discrete Time Systems: Structures for the Realization of Discrete Time Systems, **Structures for FIR Systems**: Direct Form Structure, Cascade Form Structures, Frequency Sampling Structures.

Structures for IIR Systems: Discrete Form Structures, Signal Flow Graphs and Transposed Structures, Cascade Form Structures, Parallel Form Structures

UNIT-4:Design of Digital Filters: General Considerations: Causality and Its Implications, Characteristics of Practical Frequency Selective Filters.

Design of FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear Phase FIR Filters Using Windows, Design of Linear Phase FIR Filters by the Frequency Sampling Method.

Design of IIR Filters From Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation.

Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain

UNIT-5:Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Auxiliary Register Compare Register, Block Move Address Register, Block Repeat Registers, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.TMS320C5X Assembly Language Instructions

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.Manolakis, 4th Edition, Pearson Education, 2007.

2. Digital Signal Processors – Architecture, Programming and Applications,,B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002

Reference Books:

1. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, 3rd Edition, Pearson, 2014.

2. Digital Signal Processing-P. Ramesh Babu, 5th Edition, SCITECHPublishers

Web Links:

1. www.nptelvideos.in/2012/12/digital signal processing.html
2. https://online.stanford.edu/courses/ee264-digital-signal-processing

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Department of Electronics and Communication Engineering

III Year II Semester

ANALOG IC DESIGN

(PE-II)

Course Category	Professional Elective–II	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	MOS transistor models and passive components for large-signal, small-signal, and sub-threshold behavior
2	CMOS sub-circuits such as switches, current mirrors, and reference circuits for biasing and performance
3	CMOS amplifier and op-amp architectures to meet design specifications.
4	comparator types and parameters to improve speed, offset, and power
5	oscillator and PLL concepts to design stable frequency and phase circuits.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain MOS transistor models and passive components to classify large-signal, small-signal, and sub-threshold behavior	2
CO2	Analyze MOS sub-circuits such as switches, current mirrors, and reference circuits to determine performance parameters	4
CO3	Design CMOS amplifiers and op-amps to meet specified gain, bandwidth, and PSRR requirements	3
CO4	Evaluate open-loop and discrete-time comparators to verify offset, speed, and power performance	4
CO5	Apply oscillator and PLL design principles to create and verify circuits for given frequency and phase requirements.	3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

UNIT -I: MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II: Analog CMOS Sub-Circuits:MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference**.**

UNIT -III: CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures. CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power-Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -IV: Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

UNIT -V: Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators. Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- BehzadRazavi, TMH Edition, Second Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition,2010.

REFERENCES:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition,2010.

2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn,201

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Department of Electronics and Communication Engineering

III Year II Semester

BIO-MEDICAL INSTRUMENTATION

(PE-1)

Course Category	Professional Elective–III	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn: To	
1	Know bio electrodes, bio amplifier, and measurement of physiological parameters.
2	Understand the **Cardiovascular Syste**.
3	Learn the function of Respiratory System
4	Study Bio telemetry and Instrumentation.
5	Understand the radio isotopes and x-rays

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify the concept of biomedical instrumentation.	K2
CO2	Acquire knowledge about the physiology of the heart,	K2
CO3	Know the lung, bloodcirculation and respiration system.	K2
CO4	Understand the bio telemetry system in palatable units	K2
CO5	Know the basics of shock Hazards, emergency systems, radio isotopes and x-rays.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

UNIT – 1:Introduction: Factors to be considered in the design of medical instrumentation systems, Basic objectives of medical instrumentation system, Physiological systems of human body, Sources of Bioelectric potentials: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, Introduction to bio-medical signals.

UNIT – 2: The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmo graphy, Measurement of Heart Sounds, Event detection, PQRS & T-Waves inECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT – 3: Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT – 4: Bio telemetry and Instrumentation for the Clinical Laboratory, Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT – 5: X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic Resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.

Text Books:

1. Biomedical Instrumentation and Measurements C.Cromwell,F.J.Weibell,E.A.Pfeiffer – Pearson education.
2. Biomedical Signal Analysis – Rangaraj, M. Rangayya – Wiley Inter Science – JohnWilley & Sons Inc.

Reference Books:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, TMH.
2. Introduction to Bio-Medical Engineering – Domach, Pearson.
3. Introduction to Bio-Medical Equipment Technology – Cart, Pearson

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Department of Electronics and Communication Engineering

III Year II Semester

SMART AND WIRELESS INSTRUMENTATION

(PE-II)

Course Category	Professional Elective–II	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Understand smart instrumentation principles, automation systems, and sensor classifications
2	Learn architecture and functioning of wireless sensor network nodes and components.
3	Understand wireless digital communication fundamentals and modulation techniques.
4	Know energy harvesting methods and power management in WSNs
5	Apply WSN technologies to real-world applications in monitoring, control, and healthcare

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain smart instrumentation, sensors, and WSN basics under given design constraints.	k2
CO2	Apply knowledge of WSN node subsystems and hardware platforms to select designs for applications	k3
CO3	Apply the Fundamentals of Wireless Digital Communication for efficient WSN data transfer.	k3
CO4	Apply WSN communication using Zigbee with energy harvesting for reliable operation	k3
CO5	Explain WSN solutions for monitoring, control, and healthcare based on set criteria	k2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6-Creating

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

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COURSE CONTENT

UNIT – 1: Introduction:
Smart Instrumentation(Materials, automation systems, ensign and Sensors, Sensor Classifications, Wireless Sensor Networks, History of Wireless Sensor networks (WSN), Communication in a WSN, important design constraints of a WSN like Energy, Self Management, Wireless Networking, Decentralized Management, Design Constraints, Security etc

UNIT – 2: Node architecture: The sensing subsystem, Analog to Digital converter, the processor subsystem, architectural overview, microcontroller, digital signal processor, application specific integrated circuit, field programmable gate array (FPGA), comparison, communication interfaces, serial peripheral interface, inter integrated circuit, the IMote node architecture, The XYZ node architecture, the Hog throb node architecture.

UNIT – 3: Fundamentals of Wireless Digital Communication: Basic components, source encoding, the efficiency of a source encoder, pulse code modulation and delta modulation, channel encoding, types of channels, information transmission over a channel, error recognition and correction, modulation, modulation types, quadratic amplitude modulation, signal propagation.

UNIT – 4: Frequency of Wireless Communication: Development of Wireless Sensor Network based on Microcontroller and communication device-Zigbee Communication device. Power sources- Energy Harvesting Solar and Lead acid batteries-RF Energy /Harvesting-Energy Harvesting from vibration Thermal Energy Harvesting-Energy Management Techniques Calculation for Battery Selection.

UNIT – 5: Applications:
Structural health monitoring - sensing seismic events, single damage detection using natural frequencies, multiple damage detection using natural frequencies, multiple damage detection using mode shapes, coherence, piezoelectric effect, traffic control, health care - available sensors, pipeline monitoring, precision agriculture, active volcano, underground mining.

Text Books:

1. Fundamentals of wireless sensor networks : theory and practice - WaltenegusDargie, Christian Poellabauer, A John Wiley and Sons, Ltd., Publication.
2. Smart Sensors, Measurement and Instrumentation ,Subhas Chandra Mukhopadhyay, Springer Heidelberg, New York, Dordrecht London, 2013.
3. Wireless Sensors and Instruments: Networks, Design and Applications, HalitEren, CRC Press, Taylor and Francis Group, 2006.

Reference Books:

1. UvaisQidwai, Smart Instrumentation: A data flow approach to Interfacing“, Chapman & Hall; 1st Edn, December 2013.
2. Wireless Sensor Networks: Architectures and Protocols, Edgar H. Callaway Jr. and Ed gar H. Callaway.

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Department of Electronics and Communication Engineering

III Year II Semester
Machine Learning
(Only for Electronics Communication Engineering)

Course Category	Machine Learning	**Course Code**	
Course Type	Professional Elective–II	**L-T-P-C**	3-0-0-3
Prerequisites	Artificial Intelligence	**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The learning objectives of this course are:	
1	Define Machine Learning and its different types and understand their applications.
2	Explain the various techniques involved in pre-processing of data for Data Analysis.
3	Apply various supervised learning algorithms including decision trees and k-nearest neighbours (k-NN) etc.
4	Implement unsupervised learning techniques, viz., K-means clustering etc.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the fundamental concepts of Machine Learning	K2
CO2	**Analyze and apply data preprocessing techniques**	K3
CO3	Implement supervised Learning algorithms	K3
CO4	Apply unsupervised Learning techniques	K4
CO5	Evaluate Machine Learning models	K4

K1-Remembering,K2-Understanding, K3-Applying, K4-Analyzing,K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	0	1	0	0	0	0	0	0	0	0	1	0
CO2	3	3	2	1	2	0	0	0	0	0	2	0	2	1	0
CO3	2	3	3	1	3	0	0	0	0	0	2	0	2	1	0
CO4	2	2	3	1	3	0	0	0	0	0	2	0	2	1	0
CO5	2	3	0	3	3	0	0	0	0	0	1	0	1	1	0

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COURSE CONTENT

UNIT-I: Introduction to Machine Learning:

What is Machine Learning?, Traditional programming approach vs Machine Learning approach, History and Evolution of Machine Learning, Learning by Rote vs Learning by Induction, **Paradigms for ML** – Supervised ML, Unsupervised ML, Reinforcement ML, **Datatypes in ML** – Quantitative data (Continuous, Discrete), Qualitative data (Structured, Semi structured, Unstructured), Nominal data, Ordinal data, Interval data, Ratio data, Stages involved in Machine Learning, Main challenges of ML, Applications of Machine Learning, **IDE's for ML Programming** – Jupyter Notebook, Spyder, PyCharm, Google Colab, R Studio, VS Code, **Basic packages to deal with ML** – Numpy, Scipy, Pandas, Scikit-learn, Matplotlib, Seaborn, **Programming Languages for Machine Learning** – Python, Java, R, JavaScript, C++

UNIT – II: Explorative Data Analysis (EDA):

What is EDA? Why EDA is important?, **Types of EDA** – Univariate Analysis, Bivariate Analysis, Multivariate Analysis, **Data Cleaning** – Data Acquisition, Analyzing the data, Dealing with duplicate data, Dealing with missing values, Dealing with outliers **Scaling and Transformations** – Feature Scaling and Transformation, Univariate nonlinear Transformations, **Dimensionality Reduction** – Principal Component Analysis (PCA), **Feature Engineering** – Handling Categorical attributes (One-Hot-Encoding), **Feature Expansion** – Interactions and Polynomials, **Automatic Feature Selection** – Univariate Statistics, Model-Based Feature Selection, Iterative Feature Selection

UNIT–III: Supervised Machine Learning:

What is Supervised Machine Learning?, General architecture of Supervised ML, **Types of Supervised ML** – Classification and Regression, **Different Classification Algorithms** – K-Nearest Neighbor (KNN) Classifier, Linear Models, Logistic Regression, Naive Bayes Classifiers, Decision Tree Classifier, **Ensemble learning and Decision Trees** – Voting, Bagging and pasting, Random Forests, AdaBoost, Gradient Boosting, Stacking, Support Vector Classifier (SVC)/Neural Networks, **Different Regression Algorithms** – K-Neighbors Regressor, Linear Regression, Ridge Regression, Lasso Regression, Polynomial Regression, Support Vector Regressor (SVR), Decision Tree Regressor, Random Forest Regressor

UNIT–IV: Unsupervised Machine Learning

What is Unsupervised Machine Learning?, General architecture of Unsupervised Machine Learning, Challenges in Unsupervised ML, **Clustering** – Introduction to Clustering, Soft clustering vs Hard Clustering, K-Means Clustering algorithm, Centroid-based clustering algorithm, Divisive Clustering and Agglomerative Clustering, DBSCAN

UNIT V - Model Evaluation metrics, Fine tuning the model and Visualizations Evaluation Metrics for Classification –Confusion Matrices, Accuracy, Precision, Recall, F1-Score, Precision-recall curves, ROC (Receiver Operating Characteristics) curves, Confusion Matrix **Evaluation Metrics for Regression** – R^2, Mean Squared Error (MSE), Mean Absolute Error (MAE), Root Mean Squared Error (RMSE) **Evaluation Metrics for Clustering** – Adjusted Random Index (ARI), Normalized Mutual Information (NMI) **Cross Validation** – Cross-Validation in scikit-learn, benefits of cross-validation, stratified k-fold cross validation **Grid Search** – Simple Grid search, Grid search with cross validation, Randomized search **Visualization** – Univariate Analysis (Bar plot, Box plot, Count plot, Density plot, Histogram, Pieplot), Bivariate Analysis (Pair plot, Scatter plot, Bar plot, Stacked barplot, Multivariate Analysis (Heat Maps))

Text Books:

1. "Introduction to Machine Learning with Python", Andreas C. Muller & Sarah Guido, O'Reilly Publications
2. "Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow", Aurelien Geron, O'Reilly Publications
3. "Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana

Reference Books:

1. "Introduction to Machine Learning with Python: A Guide for Data Scientists" by Andreas C. Müller and Sarah Guido
2. Pattern Recognition and Machine Learning: Christopher M. Bishop, Springer Publications

Online Learning Resources/Virtual Labs:

1. https://onlinecourses.nptel.ac.in/noc22_cs32/
2. https://www.clc.hcmus.edu.vn/wp-content/uploads/2017/11/Hands_On_Machine_Learning_with_Scikit_Learn_and_TensorFlow. pdf

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year II Semester

SATELLITE COMMUNICATION

(PE-III)

Course Category	Professional Elective–II	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
The student will learn:	
1	To introduce the principles of satellite communications and orbital mechanics.
2	To explain the concepts, applications, and subsystems of satellite communications.
3	To develop the ability to derive and apply satellite link design parameters like the G/T ratio.
4	To describe multiple access techniques and earth station architecture.
5	To provide an understanding of GPS concepts and its system architecture.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Gain the ability to understand, analyze, and apply the principles of satellite communications and orbital mechanics in real-world applications.	K3
CO2	Understand the concepts, applications and subsystems of Satellite communications.	K2
CO3	Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.	K4
CO4	Understand the various types of multiple access techniques and architecture of earth station design.	K2
CO5	Understand the concepts of GPS and its architecture.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

UNIT I

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications. **ORBITAL MECHANICS AND LAUNCHERS:** Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II

SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring system, power systems, communication subsystems, Satellite antennas, Equipment reliability and Space qualification.

UNIT III

SATELLITE LINK DESIGN: Basic transmission theory, link equation, C/N ratio, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT IV

MULTIPLE ACCESS: Frequency division multiple access (FDMA): Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA); Frame structure, Examples. Code Division Multiple access (CDMA): Spread spectrum transmission and reception.

EARTH STATION TECHNOLOGY: Introduction, basic architecture, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

UNIT V

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs**GLOBAL NAVIGATION SATELLITE SYSTEM(GNSS):** Introduction, various GNSS: GPS, GLONASS, GALILEO, BeiDou, QZSS, IRNSS. GPS-location principle, GPS navigation message, GPS receiver operation, differential GPS; IRNSS-introduction, IRNSS satellites, IRNSS constellation, IRNSS configuration, IRNSS services, navigation data, applications of IRNSS; multi GNSS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 3RD Edition, 2020.

2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCES:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year II Semester
MICROWAVE ENGINEERING
(PE-III)

Course Category	Professional Elective–III	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	waveguide and microstrip line theory, modes, characteristics, and power transmission at microwave frequencies
2	limitations of conventional tubes and study working principles of O-type and reflex klystron microwave tubes.
3	slow-wave structures, traveling wave tube operation, and principles of magnetrons including PI-mode operation.
4	waveguide components, scattering parameters, coupling mechanisms, and ferrite devices for microwave circuit applications.
5	microwave semiconductor devices and perform measurements using microwave bench setup for power, frequency, and impedance.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	**Describe** the propagation of microwave signals through rectangular waveguides and microstrip lines, including modes and power transmission.	K2
CO2	**Analyze** the working of microwave tubes such as klystrons and reflex klystrons and compute their performance metrics.	K4
CO3	**Explain** the operation of helix-type Traveling Wave Tubes (TWTs) and M-type magnetrons with focus on their amplification and oscillation mechanisms.	K2
CO4	**Apply** S-matrix techniques to examine waveguide components and **construct** simple microwave circuits using directional couplers and tees.	K3
CO5	**Apply** the knowledge of solid-state microwave devices and **perform** standard microwave measurements using a microwave bench setup.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

UNIT-I : MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide. Related Problems. MICROSTRIP LINES– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor

UNIT II : MICROWAVE TUBES : Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning. Applications.

UNIT-III: HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Nature of the four Propagation Constants, Gain Considerations(qualitative treatment).**M-type Tubes** Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT-IV : WAVEGUIDE COMPONENTS AND APPLICATIONS : Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types, Scattering Matrix– Significance, Formulation and Properties, S-Matrix Calculations for – 2,3,4 port Junctions: E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types,S-Matrix Calculations Ferrite Components– Faraday Rotation, Gyrator, Isolator, Circulator, Related Problems.

UNIT-V: MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q- factor, Phase shift, VSWR, Impedance Measurement

TEXT BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering- Annapurna Das and Sisir K.Das, Mc Graw Hill Education, 3rd Edition.

REFERENCES:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave Engineering – G S N Raju , I K International
3. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year II Semester

EMBEDDED SYSTEMS

(PE-III)

Course Category	Professional Elective–III	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basic knowledge of Digital Electronics, Microprocessors, and C Programming	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	To understand the basics of embedded systems, their history, classifications, and applications.
2	To learn the hardware components used in embedded system design.
3	To understand firmware design and development approaches.
4	To get familiar with Real-Time Operating Systems and their role in embedded applications.
5	To understand the process of embedded system development, implementation, and testing.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the fundamentals, classifications, and characteristics of embedded systems.	K2
CO2	Identify and describe hardware components used in embedded system design	K2
CO3	Develop embedded firmware using appropriate languages and tools	K3
CO4	Analyze and apply RTOS concepts for task scheduling and communication	K4
CO5	Implement and test embedded systems using development tools and debugging techniques.	K5,K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

Unit-I:

Introduction: Embedded System-Definition, History, Classification, application areas and purpose of embedded systems, The typical embedded system-Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of an Embedded systems, Application-specific and Domain-Specific examples of an embedded system, Main processing elements of embedded system, hardware and software partitions.

Unit-II:

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watch dog timer, Real time clock.

Unit-III:

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

Unit-IV:

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, How to choose an RTOS. Electronics and Communication Engineering

Hardware Software Co-Design: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hard ware and Firm ware, ICE.

Unit-V:

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Dissembler/De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Embedded System Implementation And Testing: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on hostmachine, Simulators, Laboratory Tools. Test and evolution of an embedded systems (Build in selftest etc).

Case study-typical embedded system design flow with an example.

Text Books:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications,2005
2. Embedded System Design, Frank Vahid,Tony Givargis, John Wiley Publications.

References:

Embedding system building blocks By Labrosse,CMP publishers.

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Department of Electronics and Communication Engineering

III Year – II Semester

Artificial Intelligence

(Only for ECE)

Course Category	**Professional Elective**	**Course Code**	
Course Type	**Theory**	**L-T-P-C**	**3-0-0-3**
Prerequisites		**Continuous Internal Assessment**	**30**
		Semester End Examination	**70**
		Total Marks	**100**

Course Objectives:	
1	To introduce the fundamental concepts of computational intelligence and machine learning.
2	To develop the ability to apply machine learning techniques for solving real-time problems in various domains.
3	To provide knowledge of neural networks and their applications in machine learning.
4	To equip students with the skills to apply principles and algorithms for model evaluation.
5	To enable students to implement algorithms for solving practical, real-world problems.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the concepts of computational intelligence like machine learning	**K2**
CO2	Ability to get the skill to apply machine learning techniques to address the real time Problems in different areas	**K3**
CO3	Understand the Neural Networks and its usage in machine learning application.	**K2**
CO4	Apply principles and algorithms evaluate models generated from data	**K5**
CO5	Apply the algorithms to a real world problems	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes : (1 – Low, 2 - Medium, 3 – High)														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	1	0	0	0	0	0	0	3	2	1
CO2	3	3	3	2	2	0	0	0	0	0	0	3	3	2
CO3	3	2	2	1	2	0	0	0	0	0	0	3	2	2
CO4	3	3	3	3	2	0	0	0	0	0	0	3	3	2
CO5	3	3	3	3	3	0	0	0	0	0	0	3	3	3

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Department of Electronics and Communication Engineering

COURSE CONTENT:

UNIT-I -What is AI (Artificial Intelligence)? : The AI Problems, The Underlying Assumption, What are AI Techniques, The Level Of The Model, Criteria For Success, Some General References, One Final Word Problems, State Space Search & Heuristic Search Techniques: Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System, Characteristics And Issues In The Design Of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

UNIT-II - Knowledge Representation Issues: Representations And Mappings, Approaches To Knowledge Representation. Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing Knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.

UNIT-III -Symbolic Reasoning Under Uncertainty: Introduction To No monotonic Reasoning, Logics For Non-monotonic Reasoning. Statistical Reasoning: Probability And Bays' Theorem, Factors And Rule-Base Systems, Bayesian Networks, Dempster Shafer Theory

UNIT – IV -Fuzzy Logic. Weak Slot-and-Filler Structures: Semantic Nets, Frames. Strong Slot-and-Filler Structures: Conceptual Dependency, Scripts, CYC

UNIT – V - Game Playing: Overview, And Example Domain: Overview, Mini Max, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. Understanding: What is understanding? What makes it hard? As constraint satisfaction

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI

Text Books:

1. Elaine Rich and Kevin Knight "Artificial Intelligence", 2nd Edition, Tata Mcgraw-Hill, 2005.
2. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2009.

Reference Books:

1. Artificial Intelligence, Ritch & Knight, TMH
2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
3. Logic & Prolog Programming, Saroj Kaushik, New Age International
4. Expert Systems, Giarranto, VIKAS

Web Resources:

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year II Semester
Disaster Management

Course Category	Engineering Science	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

Course Objectives:	
1.	Develop an understanding of why and how the modern disaster manager is involved with pre- disaster and post-disaster activities
2.	Describe the three planning strategies useful in mitigation.
3.	Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
4.	Describe public awareness and economic incentive possibilities.
5.	Understand the tools of post-disaster management.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Affirm the usefulness of integrating management principles in disaster mitigation work	**K3**
CO2	Distinguish between the different approaches needed to manage pre- during and post- disaster periods	**K2**
CO3	Understanding the functioning of national disaster management authority	**K2**
CO4	Explain the process of risk management	**K3**
CO5	Relate to risk transfer	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes :
(1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

UNIT-I : Natural Hazards and Disaster Management: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.

UNIT-II: Man Made Disaster and Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism - threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.

UNIT-III: Risk and Vulnerability: Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses.

UNIT-IV: Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges-mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS.

UNIT-V: Multi-sectional Issues, Education and Community Preparedness: Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction- Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action.

TEXT BOOKS:

1. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S.Vaidyanathan: CBS Publishers& Distributors Pvt. Ltd.
2. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications
3. ‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
4. ‘Disaster Management – Future Challenges and Opportunities’ by Jagbir Singh (2007), I K International Publishing House Pvt.Ltd.

REFERENCE BOOKS:

1. ‘Disaster Management’ edited by H K Gupta (2003), Universities press.
2. ‘Disaster Management – Global Challenges and Local Solutions’ by Rajib shah & R R Krishnamurthy (2009), Universities press.R. Nishith, Singh AK

WEBREFERENCE:

1) https://archive.nptel.ac.in/courses/124/107/124107010/

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year II Semester

Fundamentals of Electric Vehicles

(Common to CE, ME, ECE, CSE, IT, CSE-CS, CSE-DS, CSE-AI, CSE-AIML)

Course Category	Open Elective Courses	**Course Code**	
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	Basic knowledge in Physics, Chemistry and Basics of Electrical and Electronics.	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
2	To understand various power converters used in electric vehicles.
3	To be familiar all the different types of motors suitable for electric vehicles.
4	To know various architecture of hybrid electric vehicles.
5	To have knowledge on latest developments in batteries and other storage systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the use and advantages of different types of electric vehicles.	K2
CO2	Use suitable power converters for EV application.	K2
CO3	Select suitable electric motor for EV power train.	K3
CO4	Design HEV configuration for a specific application.	K3
CO5	Analyse various storage systems and battery management system for EVs.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1	-	-	-	-	2	2	-	-	-	2	1	1
CO2	2	3	-	-	-	1	1	-	-	-	-	2	2
CO3	-	3	-	-	-	1	-	-	-	2	2	1	2
CO4	3	2	-	-	-	2	1	-	-	2	-	1	2
CO5	2	-	-	-	-	2	-	-	-	-	2	2	2

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Department of Electronics and Communication Engineering

COURSE CONTENT

UNIT 1

Fundamentals of vehicles: Vehicle model – Calculation road load and tractive force – Components of conventional vehicles – Drawbacks of conventional vehicles – Need for electric vehicles– Advantages and applications of Electric Vehicles – History of Electric Vehicles – EV Market in India and outside India – Types of Electric Vehicles.

UNIT 2

Components of Electric Vehicles

Main components of Electric Vehicles – Electric Traction Motor and Controller – Power Converters – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.

UNIT 3

Motors for Electric Vehicles

Characteristics of traction drive – requirements of electric machines for EVs – Comparison of Different motors for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only).

UNIT 4

Hybrid Electric Vehicles

Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs – Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples – Merits and Demerits.

UNIT 5

Energy Sources for Electric Vehicles

Batteries– Types of Batteries – Lithium-ion – Nickel-metal hydride – Lead-acid – Comparison of Batteries – Battery Charging – Fast Charging –Battery Management System – Ultra capacitors – Flywheels – Compressed air energy storage (CAES)– Fuel Cell – it's working.

TEXT BOOKS

1. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.
2. Tom Denton, Hayley Pells - Electric and hybrid vehicles, Third Edition, 2024

REFERENCE BOOKS

1. Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.
2. Chau - Kwok Tong. Electric vehicle machines and drives: design – analysis and application. John Wiley & Sons - 2015.
3. Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015.

WEB RESOURCES (Suggested)

1. https://www.edx.org/learn/electric-cars

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Electronics and Communication Engineering

III Year II Semester
ADDITIVE MANUFACTURING

Course Category	Open Elective -II	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Manufacturing Processes	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To understand the principles of prototyping, classification of Rapid Prototyping processes and liquid-based Rapid Prototyping systems
2	To understand and apply different types of solid-based Rapid Prototyping systems.
3	To understand and apply different types of powder-based Rapid Prototyping systems.
4	To understand and apply various rapid tooling techniques
5	To understand different types of data formats and to explore the applications of Additive Manufacturing processes in various fields.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the principles, classification, and operation of liquid-based Rapid Prototyping systems.	K2
CO2	Describe various solid-based Rapid Prototyping systems.	K2
CO3	Analyze different powder-based Rapid Prototyping systems.	K4
CO4	Apply direct and indirect rapid tooling techniques.	K3
CO5	Interpret Rapid Prototyping data formats and applications of Additive Manufacturing.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

UNIT –I

INTRODUCTION: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

LIQUID-BASED RAPID PROTOTYPING SYSTEMS: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages, case studies. Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT –II

SOLID-BASED RAPID PROTOTYPING SYSTEMS: Laminated object manufacturing (LOM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modeling (FDM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT –III

POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Three-dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT – IV

RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting process. Direct rapid tooling: Direct AIM, LOM Tools, and Direct Metal Tooling using 3DP

UNIT – V

RAPID PROTOTYPING DATA FORMATS: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file Repairs: Generic Solution, other Translators, and Newly Proposed Formats.

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, RP medical and bioengineering applications: customized implants and prosthesis, forensic sciences.

Textbooks:

1. Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications
2. Gebhardt A., “Rapid prototyping”, Hanser Gardener Publications, 2003

Reference Books:

1. Liou L.W. and Liou F.W., “Rapid Prototyping and Engineering applications: A tool box for prototype development”, CRC Press, 2007.
2. Rapid Manufacturing / D.T. Pham and S.S. Dimov/Springer
3. Rapid Prototyping & Manufacturing / Paul F.Jacobs/ASME Press

Web References:

1. https://www.ijeast.com/papers/254-260,Tesma505,IJEAST.pdf
2. https://theswissbay.ch/pdf/Books/Survival/Workshop/Rapid%20Tooling%20Technologies%20%26%20Industrial%20Applications.pdf
3. https://www.scribd.com/document/410103053/Patri-K-Venuvinod-Weiyin-Ma-auth-Rapid-Prototyping-Laser-based-and-Other-Technologies-Springer-US-2004-pdf
4. https://onlinecourses.nptel.ac.in/noc25_me151/preview

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year II Semester

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Common to CE, EEE, ME & ECE)

Course Category	**Open Elective - II**	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES	
The learning objectives of this course are to:	
1	Identify Java language components and how they work together in applications
2	Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3	Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4	Understand how to design applications with threads in Java
5	understand how to use Java APIs for program development

COURSEOUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the fundamentals of Java to solve problems	K3
CO2	Differentiate the application of decision and iteration control structures	K2
CO3	Implement classes and method overloading concepts	K3
CO4	Apply the concepts of inheritance and packages	K3
CO5	Implement Java programs using exceptions and multithreading	K3

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	3	0	3	0	0	0	0	0	0
CO2	3	3	3	0	3	0	0	0	0	0	0
CO3	3	3	3	0	3	0	0	0	0	0	0
CO4	3	3	3	0	3	0	0	0	0	0	0
CO5	3	3	3	0	3	0	0	0	0	0	0

COURSE CONTENT

UNIT I

Object Oriented Programming: Basic concepts, Principles,

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators,

Boolean Logical Operators, Bitwise Logical Operators.

Control Statements:Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads. **Java Database Connectivity:** Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface **Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3) JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

1) The complete Reference Java, 11thedition, Herbert Schildt,TMH
2) Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7_shared/overview

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year II Semester

ENTREPRENEURSHIP AND VENTURE CREATION

III YEAR II SEMESTER (Common to CE, EEE, ME, ECE)

Course Category	Open Elective	**Credits**	3
Course Type	Theory	**L-T-P-C**	3 -0 -0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**BTL**
Upon successful completion of the course, the student will be able to		
CO 1	Classify entrepreneurial and intrapreneurial concepts, attributes, and mindset to identify personal entrepreneurial potential using classroom discussions and case studies.	K2
CO 2	Apply design thinking principles to identify and validate problems and customer segments to achieve accurate problem–customer fit through field research and simulated venture activities.	K3
CO 3	Analyze solution designs and feasibility prototypes to determine their effectiveness in achieving proof-of-concept validation under iterative testing conditions.	K4
CO 4	Analyze business and revenue models along with financial plans to evaluate their potential for sustainability and profitability under simulated business planning scenarios.	K4
CO 5	Analyze investor pitch content to assess its effectiveness in communicating venture scale potential under simulated pitching conditions.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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COURSE CONTENT

Unit – I Entrepreneurship Fundamentals & Context: Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skillsets, attributes and networks while on campus.

Unit – II Problem & Customer Identification: Understanding and analysing the macro-Problem and Industry perspective, technological, socio economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analysing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity.

Unit – III Solution design, Prototyping & Opportunity Assessment and Sizing: Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype. Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity.

Unit – IV Business & Financial Model, Go-to-Market Plan: Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach. **Business planning:** components of Business plan- Sales plan, People plan and financial plan. **Financial Planning:** Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.
Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options.

Unit – V Scale Outlook and Venture Pitch readiness: Understand and identify potential and aspiration for scale vis a vis your venture idea.
Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Textbooks:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business

Reference Books :

1. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.
2. Simon Sinek (2011) Start with Why, Penguin Books limited
3. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
4. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd

Web References:

Learning resource- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year II Semester

VLSI DESIGN LAB

Course Category	Professional Core	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Understand CMOS logic design and simulation using industry-standard EDA tools.
2	Design and analyze digital circuits like gates, adders, and latches.
3	Implement and simulate memory and analog circuits in CMOS technology.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design CMOS logic circuits and verify functionality using EDA tools	K3
CO2	Implement and simulate memory and sequential circuits using CMOS layouts.	K3
CO3	Analyze CMOS analog circuits through schematic, layout, and simulation results..	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

Laboratory Objective

The objective of this laboratory course is to enable students to design, simulate, and implement CMOS-based digital and analog circuits using industry-standard Electronic Design Automation (EDA) tools. Students are expected to develop a comprehensive understanding of schematic capture, layout design, and verification methodologies as per current CMOS technology standards.

List of Experiments:

Students shall design the schematic diagrams using CMOS logic, generate corresponding layout diagrams, and perform simulation and analysis using the latest CMOS process technology with the aid of **professional-grade EDA tools (Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools)**.

The following experiments shall be carried out:

1. Design and implementation of an inverter
2. Design and implementation of universal gates
3. Design and implementation of full adder
4. Design and implementation of full Subtractor
5. Design and implementation of RS-latch
6. Design and implementation of D-latch
7. Design and implementation asynchronous counter
8. Design and Implementation of static RAM cell
9. Design and Implementation of differential amplifier
10. Design and Implementation of ring oscillator

Equipment Required:

1. Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools
    1. 2. Personal computer with necessary peripherals.

PRAGATI ENGINEERING COLLEGE

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Department of Electronics and Communication Engineering

III Year II Semester

MICROPROCESSOR AND MICROCONTROLLERS LAB

Course Category	Professional Core	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	assembly language programming for 8086, 8051, and ARM Cortex-M3 to perform arithmetic, logical, and control operations
2	skills in interfacing microprocessors and microcontrollers with peripheral devices to meet specific application requirements.
3	practical experience in debugging, testing, and validating embedded system designs using simulation tools and hardware kits.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Implement assembly programs for 8086, 8051, and ARM Cortex-M3 using given instruction sets and addressing modes to solve arithmetic and logical problems.	K3
CO2	Demonstrate interfacing techniques for peripherals such as ADC, DAC, stepper motor, displays, sensors, and communication modules to achieve specified functions.	K3
CO3	Verify the functionality of programmed and interfaced systems through simulation or hardware testing to ensure they meet given specifications	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

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Department of Electronics and Communication Engineering

COURSE CONTENT

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed) 8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition and subtraction of n-BCD numbers.
   b. Multiplication and Division operations.
   c. Addition of an array of numbers with overflow detection.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. Interfacing ADC to8086
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.
7. Interfacing Seven-Segment display to 8086
8. Keyboard interface with 8086

PART-B: (Minimum of 5 Experiments has to be performed) 8051 Assembly Language Programming and Interfacing

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average of n-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051
6. Interfacing LCD to8051.
7. Interfacing temperature sensor (LM 35) with 8051
8. Stepper motor control with 8051

PART-C (Minimum of 2 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.
4. PWM signal generation
5. Analog signal measurement (ADC)
6. Interfacing with serial communication (UART)

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module, DAC module
6. Stepper motor module
7. Key board module
8. LED, 7-SegemtUnits, LCD display modules
9. Temperature sensor module
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.
13. ARM CORTEX M3
14. KEIL MDKARM, Digital Multi-meters