SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY::PUTTUR
(AUTONOMOUS)
Department of Electronics & Communication Engineering

Induction Program (Mandatory)	3 weeks duration
Induction program for students to be offered right at the start of the first year.	• **Physical activity** • **Creative Arts** • **Universal Human Values** • **Literary** • **Proficiency Modules** • **Lectures by Eminent People** • **Visits to local Areas** • **Familiarization to Dept./Branch & Innovations**

I B. Tech. – I Semester (ECE)

S.No.	Course Code	Subject	L	T	P/Drg	C
1.	19HS0830	Algebra and Calculus	3	-	-	3
2.	19HS0801	Applied Chemistry	3	1	-	4
3.	19ME0302	Engineering Graphics	1	-	4	3
4.	19CS0501	Python Programming	3	-	-	3
5.	19HS0803	Applied Chemistry lab	-	-	3	1.5
6.	19CS0502	Python Programming Lab	-	-	3	1.5
7.	19ME0301	Workshop Practice Lab	-	-	4	2
Contact Periods / Week			10	1	14	18
			Total/Week 25			

I B. Tech. – II Semester (ECE)

S.No.	Course Code	Subject	L	T	P	C
1.	19HS0831	Differential Equations and Vector Calculus	3	1	-	4
2.	19HS0851	Semiconductor Physics	3	1	-	4
3.	19EE0239	Basic Electrical Engineering	3	-	-	3
4.	19HS0810	Communicative English	3	-	-	3
5.	19EC0401	Switching Theory and Logic Design	3	-	-	3
6.	19HS0855	Semiconductor Physics Lab	-	-	3	1.5
7.	19HS0811	Communicative English Lab	-	-	3	1.5
Non -Credit Course						
8.	19HS0817	Essence of Indian Traditional Knowledge	3	-	-	-
Contact Periods / Week			18	2	6	20
			Total/Week 26			

II B. Tech. – I Semester (ECE)

S.No.	Course Code	Subject	L	T	P	C
1.	19HS0834	Numerical Methods and Transforms	3	1	-	4
2.	19EE0242	Network Theory	3	-	-	3
3.	19EC0402	Electronic Devices and Circuits	3	-	-	3
4.	19EC0403	Signals, Systems and Random Processes	3	-	-	3
OPEN ELECTIVE – I						
5.	19CE0136	Water Technology	3	-	-	3
	19EE0238	Generation of Energy through Waste				
	19ME0349	Fundamentals of Mechanical Engineering				
	19CS0549	Linux Programming				
	19HS0813	Management Science				
6.	19EC0404	Switching Theory and Logic Design Lab	-	-	2	1
7.	19EC0405	Electronic Devices and Circuits Lab	-	-	3	1.5
8.	19EC0406	Basic Simulation Lab	-	-	3	1.5
Non -Credit Course						
9.	19HS0816	Indian Constitution	3	-	-	-
Contact Periods / Week			18	1	8	20
			Total/Week 27			

II B. Tech. – II Semester (ECE)

S.No.	Course Code	Subject	L	T	P	C
1.	19EC0407	Electronic Circuit Analysis	3	-	-	3
2.	19EC0408	Analog Communications	3	-	-	3
3.	19EC0409	Linear & Digital IC Applications	3	-	-	3
4.	19EC0410	Electromagnetic Theory and Transmission Lines	3	1	-	4
5.	**OPEN ELECTIVE – II**					
	19CE0143	Fundamentals of Urban Planning	3	-	-	3
	19EE0233	Industrial Instrumentation				
	19ME0350	Mechanical Measurements & Control Systems				
	19CS0551	Java Programming				
	19HS0814	Intellectual Property Rights				
6.	19EC0411	Electronic Circuit Analysis Lab	-	-	2	1
7.	19EC0412	Analog Communications Lab	-	-	3	1.5
8.	19EC0413	Linear & Digital IC Applications Lab	-	-	3	1.5
Non -Credit Course						
9.	19HS0805	Environmental Science	3	-	-	-
Contact Periods / Week			18	1	8	20
			Total/Week 27			

3 B.Tech. – I Semester (ECE)

S.No.	Course Code	Subject	L	T	P	C
1.	19EE0212	Control Systems	3	-	-	3
2.	19EC0414	Antennas and Wave Propagation	3	1	-	4
3.	19EC0415	Digital Communications	3	-	-	3
4.	19EC0416	Electronic Measurements and Instrumentation	3	-	-	3
Open Elective-III						
5.	19CE0129	Elements of Road Traffic Safety	3	-	-	3
	19EE0239	Solar Photovoltaic Systems				
	19ME0321	Non-Conventional Energy Resources				
	19CS0545	Software Development & Testing				
	19HS0861	Business Ethics				
6.	19EC0417	Antennas and Wave Propagation Lab (Virtual Lab)	-	-	2	1
7.	19EC0418	Digital Communications Lab	-	-	3	1.5
8.	19EC0419	Electronic Measurements Lab (Virtual Lab)	-	-	3	1.5
Non - Credit Course						
9.	19HS0859	English for Corporate Communications Skills Lab	-	-	2	-
Contact Periods / Week			15	1	10	20
			Total/Week 26			

III B. Tech. – II Semester (ECE)

S.No.	Course Code	Subject	L	T	P	C
1.	19HS0812	Managerial Economics and Financial Analysis	3	-	-	3
2.	19EC0420	Digital Signal Processing	3	1	-	4
3.	19EC0421	Microprocessors and Microcontrollers	3	-	-	3
4.	19EC0422	Microwave Theory and Techniques	3	-	-	3
Open Elective-IV						
5.	19CE0147	Project Planning and Control	3	-	-	3
	19EE0231	Neural Networks and Fuzzy Logic				
	19ME0353	Computer Aided Process Planning				
	19CS0546	Introduction to Cyber Security				
	19HS0862	Strategic Management				
6.	19EC0423	Digital Signal Processing Lab	-	-	2	1
7.	19EC0424	Microcontroller and Applications Lab	-	-	3	1.5
8.	19EC0425	Microwave Measurements Lab	-	-	3	1.5
	Non - Credit Course					
9.	19HS0858	Human Values and Professional Ethics	3	-	-	-
Contact Periods / Week			18	1	8	20
			Total/Week 27			

IV B.Tech. – I Semester (ECE)

S.No.	Course Code	Subject	L	T	P	C
1.	19HS0815	Entrepreneurship Development	3	-	-	3
2.	19EC0426	Wireless Communications	3	-	-	3
3.	19EC0427	Embedded systems and IoT	3	-	-	3
4.	**Professional Elective Course (PEC) –I**					
	19EC0433	VLSI Design	3	-	-	3
	19EC0434	Information Theory and Coding				
	19EC0435	Bio-Medical Electronics				
5.	**Professional Elective Course (PEC) –II**					
	19EC0436	Mixed Signal Design	3	-	-	3
	19EC0437	Digital Image Processing				
	19EC0438	Scientific Computing				
6.	**Professional Elective Course (PEC) –III**					
	19EC0439	High Speed Electronics	3	-	-	3
	19EC0440	Fiber Optic Communications				
	19EC0441	Adaptive Signal Processing				
7.	19EC0428	Internship (60 Hours)	-	-	-	3
8.	19EC0429	Project Phase-I	-	-	4	2
Contact Periods / Week			18	-	4	23
			Total/Week 22			

IV B.Tech. – II Semester (ECE)

S.No.	Course Code	Subject	L	T	P	C
1.	**MOOC**		3	-	-	3
2.	19EC0430	Seminar	-	-	6	3
3.	19EC0431	Comprehensive Viva Voce	-	-	-	2
4.	19EC0432	Project Phase-II	-	-	22	11
Contact Periods / Week			3	-	28	19
			Total/Week 31			

TOTAL CREDITS= 18+20+20+20+20+20+23+19= 160

NOTE: L-Lecture, T- Theory, P-Practical, C-Credit

LIST OF SUBJECTS

S.No.	Course Code	Subject
Program Core Courses		
1.	19EC0401	Switching Theory and Logic Design
2.	19EC0402	Electronic Devices and Circuits
3.	19EC0403	Signals, Systems and Random Variables
4.	19EC0404	Switching Theory and Logic Design Lab
5.	19EC0405	Electronic Devices and Circuits Lab
6.	19EC0406	Basic Simulation Lab
7.	19EC0407	Electronic Circuit Analysis
8.	19EC0408	Analog Communications
9.	19EC0409	Linear & Digital IC Applications
10.	19EC0410	Electromagnetic Theory and Transmission Lines
11.	19EC0411	Electronic Circuit Analysis Lab
12.	19EC0412	Analog Communications Lab
13.	19EC0413	Linear & Digital IC Applications Lab
14.	19EC0414	Antennas and Wave Propagation
15.	19EC0415	Digital Communications
16.	19EC0416	Electronic Measurements and Instrumentation
17.	19EC0417	Antennas and Wave Propagation Lab(Virtual Lab)
18.	19EC0418	Digital Communications Lab
19.	19EC0419	Electronic Measurements Lab (Virtual Lab)
20.	19EC0420	Digital Signal Processing
21.	19EC0421	Microprocessors and Microcontrollers
22.	19EC0422	Microwave Theory and Techniques
23.	19EC0423	Digital Signal Processing Lab
24.	19EC0424	Microcontrollers and Applications Lab
25.	19EC0425	Microwave Measurements Lab
26.	19EC0426	Wireless Communications
27.	19EC0427	Embedded systems and IoT
28.	19EC0428	Internship (60 Hours)
29.	19EC0429	Project Phase-I
30.	19EC0430	Seminar
31.	19EC0431	Comprehensive Viva Voce
32.	19EC0432	Project Phase-II
Professional Elective Courses		
33.	19EC0433	VLSI Design
34.	19EC0434	Information Theory and Coding
35.	19EC0435	Bio-Medical Electronics
36.	19EC0436	Mixed Signal Design
37.	19EC0437	Digital Image Processing
38.	19EC0438	Scientific Computing
39.	19EC0439	High Speed Electronics
40.	19EC0440	Fiber Optic Communications
41.	19EC0441	Adaptive Signal Processing

Subjects Offered To Other Branches		
42.	19EC0402	Electronic Devices and Circuits
43.	19EC0405	Electronic Devices and Circuits Lab
44.	19EC0446	Analog Electronic Circuits
45.	19EC0447	Analog Electronic Circuits Lab
46.	19EC0401	Switching Theory and Logic Design
47.	19EC0404	Switching Theory and Logic Design Lab
48.	19EC0421	Microprocessors and Microcontrollers
49.	19EC0424	Microcontroller and Applications Lab
Open Elective Courses		
50.	19EC0448	Introduction to Communication Systems
51.	19EC0449	Elements of Embedded Systems
52.	19EC0450	Introduction to IOT
53.	19EC0451	MATLAB Programming
Minor Degree Courses		
54.	19EC0403	Signals, Systems and Random Processes
55.	19EC0416	Electronic Measurements and Instrumentation
56.	19EC0435	Bio Medical Electronics
57.	19EC0437	Digital Image Processing
58.	19EC0426	Wireless Communications
59.	19EC0439	High Speed Electronics
Honor Degree Courses		
60.	19EC0452	Nano Electronics
61.	19EC0454	Radar Engineering
62.	19EC0453	Multi Carrier Communication Systems
63.	19EC0455	Advanced Digital Signal Processing
64.	19EC0456	Advanced VLSI
65.	19EC0457	Advanced Embedded Systems
66.	19EC0458	Mini Project

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I B.Tech – I Sem.

L	T	P	C
3	1	-	4

(19HS0801) APPLIED CHEMISTRY

COURSE OBJECTIVES

The objectives of this course:

1. *To familiarize engineering chemistry and its applications.*
2. *To train the students on the principles and applications of electrochemistry and polymers.*
3. *To introduce instrumental methods, molecular machines and switches.*

COURSE OUTCOMES (COs)

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

1. *Apply Nernst equation for calculating electrode and cell potentials, differentiate between pH metry, potentiometric and conductometric titrations, explain the theory of construction of battery and fuel cells, solve problems based on cell potential.*
2. *Apply Schrodinger wave equation to hydrogen and particle in a box, illustrate the molecular orbital energy level diagram of different molecular species, semiconductors and insulators discuss the magnetic behavior and colour of complexes.*
3. *Explain the different types of polymers and their applications, explain the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres, describe the mechanism of conduction in conducting polymers, discuss Buna-S and Buna-N elastomers and their applications.*
4. *Explain the different types of spectral series in electromagnetic spectrum, understand the principles of different analytical instruments, Explain the different applications of analytical instruments.*
5. *Explain the band theory of solids for conductors, semiconductors and insulators, explain supra molecular chemistry and self-assembly, demonstrate the application of Rotaxanes and Catenanes as artificial molecular machines*

UNIT - I

Electrochemistry And Applications: Electrochemical cell, Nernst equation, cell potential calculations and Numerical problems, Potentiometry - Potentiometric titrations (Redox titrations), Conductometric titrations (Acid-Base titrations), Photovoltaic cell – working and applications, Photogalvanic cells with specific examples. Electrochemical sensors, Potentiometric sensors with examples.

Primary cells – Zinc-air battery, alkali metal sulphide batteries, Secondary cells – Lead acid, and Lithium ion cells (Rechargeable). Fuel cells - Hydrogen-Oxygen, Methanol-Oxygen fuel cell – working of the cells.

UNIT - II

Structure And Bonding Models: Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, Applications to hydrogen, particle in a box and their applications for conjugated molecules, Molecular Orbital Theory – bonding in Homo and Heteronuclear diatomic molecules – Energy level diagrams of O_2 and CO etc. π- molecular orbitals of Butadiene and Benzene, Calculation of bond order, Crystal field theory
– salient features – Splitting in Octahedral and Tetrahedral, geometry, magnetic properties and colour, Band theory of solids – Band diagrams for conductors, Semiconductors and insulators, Role of doping on band structures.

UNIT - III

Polymer Chemistry: Introduction to Polymers, Functionality of monomers, Nomenclature of polymers. Chain growth and Step growth polymerization, Coordination polymerization, Co-polymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosetting, Preparation, properties and applications of – Bakelite, Nylon-6,6, Carbon fibers, Elastomers – Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – Classification, Synthesis and applications.

UNIT - IV

Instrumental Methods And Applications: Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle and applications of pH Metry, Potentiometry, Conductometry ,UV-spectroscopy, IR and AAS. Principles of Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC) - Separation of gaseous mixtures and Liquid mixtures.

UNIT - V

Advanced Engineering Materials : Concepts and terms of Supra molecular chemistry, Complementarity, Basic Lock and Key principle, examples of Supramolecules, Applications of Supra molecules (sensors, catalysts, gas storage, medical and molecular switches). Semiconducting and Super Conducting materials-Principles and some examples. Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators and applications of electrical insulating materials, Super capacitors. Nanochemistry: Introduction, classification of nanomaterials properties and applications of Fullerenes, Carbon nano tubes.

TEXT BOOKS

1. K.N.Jayaveera, G.V.Subba Reddy and C. Ramachandraiah, *Engineering Chemistry*, McGraw Hill Higher Education, 4th Edition, New Delhi,2019.
2. Jain and Jain, *A Text Book of Engineering Chemistry*, Dhanapathi Rai Publications, New Delhi,2010.

REFERENCES

1. S.S. Dhara, A Text book of Engineering Chemistry, S. Chand Publications, New Delhi, 2010.
2. K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, Engineering Chemistry,SCITECH Publications India Pvt. Limited,2015.
3. H.D. Gesser, *Applied Chemistry*, Springer International Edition,2010.

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I B.Tech – I Sem.

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3	-	-	3

(19HS0830) ALGEBRA AND CALCULUS

COURSE OBJECTIVES

The objectives of this course:

1. *This course will illuminate the students in the concepts of calculus and linear algebra.*
2. *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.*
3. *To evaluate multiple integrals in Cartesian, cylindrical and spherical geometries.*

COURSE OUTCOMES (COs)

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

1. *Develop the use of matrix algebra techniques that is needed by engineers for practical applications.*
2. *Utilize mean value theorems to real life problems..*
3. *Familiarize with functions of several variables which is useful in optimization*
4. *Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems.*
5. *Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions.*

UNIT – I

Matrices: Rank of a matrix by echelon form - Solutions of system of homogeneous and non-homogeneous linear equations - Eigen values and Eigen vectors 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 form by orthogonal transformation.

UNIT – II

Calculus and Mean Value Theorems: Rolle's Theorem - Lagrange's mean value theorem - Cauchy's mean value theorem - Taylor's and Maclaurin's theorems (without proofs).

UNIT – III

Multivariable Calculus: Partial derivatives - Total derivatives - Chain rule - Jacobians - Functional dependence - Maxima and minima of functions of two variables - Method of Lagrange multipliers.

UNIT –IV

Integral Calculus: Evaluation of definite and improper integrals (single variable)

Multiple Integration: Double integrals (Cartesian) - Change of order of integration in double integrals - Change of variables (Cartesian to polar) - Evaluation of Triple integrals (Cartesian)

UNIT – V

Special Functions: Beta and Gamma functions and their properties - Relation between Beta and Gamma functions - Evaluation of definite integrals using Beta and Gamma functions.

TEXTBOOKS

1. B. S. Grewal, *Higher Engineering Mathematics,* Khanna Publishers, 42nd Edition, 2017.
2. B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill Companies, ThirdEdition.

REFERENCES

1. T.K.V. Iyengar, *Engineering Mathematics Volume-I,* S.Chand Publication, 5thEdition, 2010.
2. T.K.V. Iyengar, *Engineering Mathematics Volume-II,* S.Chand Publication, 5th Revised Edition,2011.
3. T.K.V. Iyengar, *Engineering Mathematics Volume-III,* S.Chand Publication, 10th Revised Edition,2015.
4. E.Rukmangadachari, *Engineering mathematics, volume-I,* Pearson Publishers, 1st Edition, 2015.
5. Dr.C. Sankaraiah, *Mathematical Methods,* Unitech series, First Edition,2008.

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I B.Tech – I Sem.

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1	-	4	3

(19ME0302) ENGINEERING GRAPHICS

COURSE OBJECTIVES

The objectives of this course:

1. *Understand the importance of graphics in engineering.*
2. *To introduce the students to the "universal language of Engineers" for effective Communication through drafting.*
3. *Develop the graphical skills for communication of concepts, ideas and design of engineering products through engineering drawings.*
4. *Increase ability to take data and transform it into graphic drawings.*
5. *To familiarize the students in basic concept of conic sections, projections and development of objects.*

COURSE OUTCOMES (COs)

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

1. *Graphically construct and understand the importance of mathematical curves in engineering applications.*
2. *Able to draw the basic views related to projections of Points, Lines and Planes.*
3. *Able to draw the projections of geometrical solids and sectional view of solids.*
4. *Understand the concept of projection and acquire visualization skills, development of surfaces and interpenetrations of solids.*
5. *To draw multi view orthographic and other projections including isometric.*

UNIT –I

Introduction To Engineering Drawing: Principles of Engineering Graphics and their significance - usage of Drawing instruments – lettering - Conic sections, Cycloids and Involutes.

UNIT – II

Projections of Points: Principles of Orthographic Projections - Conventions - Projections of Points

Projections Of Straight Lines: Inclined to both the planes (Trapezoidal Method & Rotating line method) - simple problems only, Traces

Projections of Planes: Surface inclined to both reference planes

UNIT – III

Projections of Solids: Introduction – Projections of right regular solids-Prisms, Pyramids in different positions. (Inclined to one plane only)

Sections of Solids: Sectional Views of Right regular Solids - Prisms, Pyramids.

UNIT – IV

Development Of Surfaces: Development of surfaces of Right Regular Solids - Prisms, Pyramids.

Interpenetration of Solids: Cylinder to Cylinder, Prism to Prism, Cone to Cone (simple Problems Only

UNIT – V

Orthographic Projections: Principles of Orthographic projection, Conversion of objects from 3D to 2D.

Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids, Conversion of 2D to 3D.

TEXT BOOKS

1. Basant Agarwal & CM Agarwal, *Engineering Drawing & Graphics*, McGraw Hill Education, 2013.
2. N.D.Bhatt, *Engineering Drawing*, Charotar Publishers, 2011.
3. K.L.Narayana, Kannaiah, *A Text Book of Engineering Drawing*, Scitech Publishers, 2010.

REFERENCES

1. K.Venugopal, *A Text Book of Engineering Drawing and Graphic*, New Age Publishing, New Delhi, 2008.
2. P.J.Shah, *A Text Book of Engineering Graphics*, S.Chand & Company Ltd., New Delhi, 2016.
3. R.K.Dhawan, *A Text Book of Engineering Drawing*, S.Chand & Company Ltd., New Delhi,2013.

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I B.Tech – I Sem.

L	T	P	C
3	-	-	3

(19CS0501) PYTHON PROGRAMMING
(Common to CSE, CSIT and ECE)

COURSE OBJECTIVES

The objectives of this course:

1. *Introduction of Scripting Language.*
2. *Exposure to various problem solving approaches of computer science.*
3. *To introduce function-oriented programming paradigm.*
4. *Exposure to solve the problems using object oriented concepts, exceptional handling.*
5. *Exposure to solve the problems using Files, Regular Expressions and, Standard Libraries.*

COURSE OUTCOMES (COs)

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

1. *Develop Software easily right out of the box.*
2. *Solve the problems using control structures, input and output statements.*
3. *Summarize the features of lists, tuples, dictionaries, strings and files.*
4. *Experience the usage of standard libraries, objects, and modules.*
5. *To build the software for real needs.*

UNIT- I

Introduction: Algorithms -Building blocks of flow-chart design -History of Python -Python features – Applications - Programming Using the REPL(Python Shell) - Running Python Scripts – Variables – Assignment – Keywords - Input-Output - Indentation.
Data Types: Data Type – Types of data: Single Valued and Multi valued data types.
Single Valued: Numbers - Strings and methods - Booleans.

UNIT- II

Data Structures: Lists – Tuples – Sets - Dictionaries and Sequences - Indexing and slicing - Comprehensions -**Type Casting:** Conversion methods.
Operators and Expressions: Operators-Types of operators - Expressions and order of evaluations.
Control Flow: Simple if - if else- nested if - if-elif-else –looping: while and for -Jumping: break – continue - pass

UNIT - III

Functions - Defining Functions - Calling Functions - Passing Arguments - Keyword Arguments – Default Arguments - Variable-length arguments - Anonymous Functions –
Fruitful Functions(Function Returning Values) - Nested functions - Recursive functions -Scope of the Variables in a Function - Global and Local Variables.

Object Oriented Programming in Python: Classes - Class diagram – Constructor - Object- 'self variable' - Methods - Magic methods – Inheritance – Polymorphism - Method overloading - Overriding Methods.

UNIT-IV

Modules: Creating modules - Import statement - From Import statement - Name spacing
Python packages: Introduction to PIP - Installing Packages via PIP (Numpy, Pandas, MatPlotlib etc.,) - Using Python Packages.
Exception Handling: Introduction - try except block - try else – finally - Raising Exceptions - User Defined Exceptions
Introduction to Regular Expressions – Searching and Matching

UNIT- V

Functional Programming: Iterators and Generators - Maps and Filters
Files: Text files- Reading and Writing files - Command line arguments;
Brief Tour of the Standard Library - Dates and Times - Data Compression - Python Runtime Services – Mathematics - Data Management and Object Persistence
GUI Programming - Turtle Graphics

TEXT BOOKS

1. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson.
2. Reema Thareja, *Python Programming - Using Problem Solving Approach*, First Edition (English, Paper back).

REFERENCES

1. Mark Lutz, *Learning Python*, Orielly.
2. Allen Downey, *Think Python*, Green Tea Press.
3. W.Chun, *Core Python Programming*, Pearson.
4. Kenneth A. Lambert, *Introduction to Python*, Cengage.
5. Michael T. Goodrich , Roberto Tamassia, Michael H. Goldwasser, *Data Structures and Algorithms in Python*, 1st Edition , kindle Edition.

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I B.Tech – I Sem.	**L**	**T**	**P**	**C**
(19HS0803) APPLIED CHEMISTRY LAB	**-**	**-**	**3**	**1.5**

COURSE OBJECTIVES

The objectives of this course:

1. *Verify the fundamental concepts with experiments.*

COURSE OUTCOMES (COs)

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

1. *Determine the cell constant and conductance of solutions .*
2. *Prepare advanced polymer materials .*
3. *Estimate the Iron and Calcium incement.*
4. *Calculate the hardness of water.*
5. *Determination of conductivity of an Acid.*

List of Experiments

1. Conductometric Titration of Strong acid vs Strong base.
2. Conductometric Titration of Weak acid vs. Strong base.
3. Determination of Hardness of a Ground water sample.
4. pH metric titration of Strong acid vs. Strong base.
5. Potentiometry - Determination of Redox potentials and emfs.
6. Determination of Strength of an Acid in Pb-Acid battery.
7. Preparation of a Polymer.
8. Determination of viscosity of an oil by Redwood viscometer.
9. Determination of percentage of Iron in Cement sample by Colorimetry.
10. Estimation of Calcium in Port land Cement.
11. Adsorption of Acetic acid by Charcoal.
12. Determination of Percentage Moisture content in a Coal sample.

TEXT BOOKS

1. J. Mendham et al, *Vogel's Text book of Quantitative Chemical Analysis,* Pearson Education, Sixth Edition,2002.
2. Chandra Sekhar, G.V. Subba Reddy and Jayaveera, *Chemistry Practical – Lab Manual,* McGraw Hill Higher Education,2015.

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I B.Tech – I Sem.	**L**	**T**	**P**	**C**
(19ME0301) WORKSHOP PRACTICE LAB **PART A - ENGINEERING WORKSHOP**	**-**	**-**	**4**	**2**

COURSE OBJECTIVES

The objectives of this course:

1. *To familiarize with the basic manufacturing processes and to study the various tools and equipment*
2. *The course provides hands-on training in the trades of Carpentry, Fitting, House-wiring, and Tin Smithy.*
3. *Overview of metal cutting processes, plumbing is provided through live demonstrations.*
4. *To know the labour involved, machinery or equipment necessary, time required to fabricate.*
5. *To acquire practical skills by performing the experiments in different shops of workshop*

COURSE OUTCOMES (COs)

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

1. *Apply wood working skills in real world applications.*
2. *Build different parts with metal sheets in real world applications*
3. *Apply fitting operation in various applications*
4. *Apply different types of basic electric circuit connections*
5. *Demonstrate soldering and brazing.*

LIST OF EXPERIMENTS

Carpentry: Familiarity with different types of woods and tools used in wood working and make following joints

1. T-Bridle joint
2. Corner Dovetail joint

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

1. Tapered tray
2. Conical funnel

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

1. Step Fitting
2. V-Fit

Electrical Wiring:
Familiarity with different types of basic electrical circuits and makes the following connections

1. Parallel and series
2. Two way switch
3. Go down lighting
4. Tube light
5. Three phase motor
6. Soldering of wires

PART B - IT WORKSHOP

COURSE OBJECTIVES
To provide students with hands-on experience in

1. *Basic hardware*
2. *Productivity tools like MS Office*
3. *Basic operating system installations.*

COURSE OUTCOMES
On successful completion of this course, the student will be able to

1. *Identify the basic computer peripherals.*
2. *Gain sufficient knowledge on assembling and disassembling a PC.*
3. *Learn the installation procedure of Windows and Linux OS.*
4. *Acquire knowledge on basic networking infrastructure.*
5. *Learn productivity tools like Word, Excel and Power point.*
6. *Acquire knowledge on basics of internet and worldwide web.*

TASK 1:
Identification of the peripherals of a computer: To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices

TASK 2:
A practice on disassembling the components of a PC and assembling them.

TASK 3:

1. Basic DOS commands, Installation of MS windows.
2. Basic Linux Commands, Installation of Linux.

TASK 4:
Hardware Troubleshooting (Demonstration): Identification of a problem and fixing the solution (improper assembly or defective peripherals). Software Troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues

PRODUCTIVITY TOOLS
TASK 5:

1. **MS Word Orientation:** Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving

2. **Presentations:** Creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper linking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.
3. **Spread sheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

TASK 6:

Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

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((19CS0502) PYTHON PROGRAMMING LAB
(Common to CSE, CSIT and ECE)

COURSE OBJECTIVES
The objectives of this course:

1. *The course provides hands-on training in usage of basic concepts, control structures, data structures, object oriented programming, exceptional handling and plotting of graphical entities.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Ability to program on basic concepts, control structures.*
2. *Ability to implement data structures and their operations*
3. *Ability to work on object oriented programming*
4. *Ability to handle exceptional handling and plotting of graphical entities.*
5. *Ability to develop any real world problem*

List of Experiments:

1. Implement the following tasks
   a) Write a python program to check whether the number is positive or negative.
   b) Write a python program to find whether a given number is even or odd.
   c) Write a python program to find biggest number among three numbers.
2. Implement the following tasks
   a) Write a python program to displaying reversal of a number.
   b) Write a python program to print factorial of a number
   c) Write a python program to generate prime numbers series up to N
3. Implement following problems using python script
   a) Swapping of two numbers with and without using temporary variable.
   b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.
   c) Arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic operation through keyboard.
4. Implement the following tasks
   a) Implement the python program to generate the multiplication table.
   b) Implement Python program to find sum of natural numbers
   c) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.
5. Implement the following tasks

a) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the SIETK examination policy.

b) Given a number x, determine whether it is Armstrong number or not.

Hint: For example, 371 is an Armstrong number since 3**3 + 7**3 + 1**3 = 371. Write a program to find all Armstrong number in the range of 0 and 999.

6. Implement the following tasks
   a) Write a Python script to
   - create a list
   - access elements from a list
   - slice lists
   - change or add elements to a list
   - delete or remove elements from a list

   b) Write a Python script to read the values from a list and to display large stand smallest numbers from list.
   c) Write a Python script to compute the similarity between two lists.
7. Implement the following tasks
   a) Write a Python script to read set of values from a Tuple to perform various operations.
   b) Write a Python script to perform basic dictionary operations like insert, delete and Display.
   c) Write a Python program to count the occurrence of each word in a given sentence.
8. Implement the following tasks
   a) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.
   b) Implement Python script to display power of given numbers using function.
   c) Implement a Python program that takes a list of words and returns the length of the longest one using function.
9. Implement the following tasks
   a) Implement Python program to perform various operations on string using string libraries.
   b) Implement Python program to remove punctuations from a given string.
   c) Write a Python program to change the case of the given string (convert the string from lower case to upper case). If the entered string is “computer”, your program should output “COMPUTER” without using library functions.
10. Implement the following tasks
    a) Implement Python program to capitalize each word in a string. For example, the entered sentence “god helps only people who work hard” to be converted as “God Helps Only People Who Work Hard”
    e) Write a Python script to display file contents.
    f) Write a Python script to copy file contents from one file to another.
11. Implement the following tasks
    a) Write a Python script to combine two text files contents and print the number of lines, sentences, words, characters and file size.
    b) Write a Python commands to perform the following directory operations.
       - List Directories and Files
       - Making a New Directory
       - Renaming a Directory or a File
       - Removing Directory or File

12. Implement the following tasks
    a) Create a package named Cars and build three modules in it namely, BMW, Audi and Nissan. Illustrate the modules using class. Finally we create the init.py file. This file will be placed inside Cars directory and can be left blank or we can put the initialization code into it.
    b) Write a python script to display following shapes using turtle.

TEXT BOOKS

1. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson
2. Reema Thareja, *Python Programming - Using Problem Solving Approach*, First Edition (English, Paperback), Oxford University Press.

REFERENCES

1. Mark Lutz, *Learning Python*, Orielly.
2. Allen Downey, *Think Python*, Green Tea Press.
3. W.Chun, *Core Python Programming*, Pearson.
4. Kenneth A. Lambert, *Introduction to Python*, Cengage.
5. Michael T. Goodrich , Roberto Tamassia, Michael H. Gold wasser, *Data Structures. and Algorithms in Python*, 1t Edition , kindle Edition.

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(19HS0810) COMMUNICATIVE ENGLISH

COURSE OBJECTIVES
The Objectives of this course:

1. *To facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.*
2. *To focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.*
3. *To help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.*
4. *To impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information.*
5. *To provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *To understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information.*
2. *To employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information.*
3. *To Participate in informal discussions and speak clearly on a specific topic or in general.*
4. *To Comprehend, discuss and respond to academic texts and use appropriate language for description and interpretation in writing*
5. *To form sentences using proper grammatical structures and correct word forms.*

UNIT – I
Part-1

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Writing:** Beginnings and endings of paragraphs - introducing the topic, Letter writing. **Grammar and Vocabulary:** Parts of speech; singular and plural; Basic sentence structures; simple question form - wh-questions; word order in sentences and Content words

Part-2

Half a Rupee Worth by R K Narayan from Engage with English.

UNIT – II

Part-1

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing: M**echanics of writing - punctuations **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions and function words

Part-2

The Thakur's Well by Premchand from Paths to Skills in English.

UNIT – III

Part-1

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing Report Writing. **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes and word forms

Part-2

I am not that Woman by Kishwar Naheed from Engage with English.

UNIT – IV

Part-1

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** conversational English in academic contexts (formal and informal). **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Information transfer **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of synonyms and antonyms.

Part-2

What is my name? By Sathyavathi from Paths to Skills in English.

UNIT – V

Part-1

Listening: Identifying key terms. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement).

Part-2

The Power of Prayer by A P J Abdul Kalam from Paths to Skills in English.

TEXTBOOKS

1. Board of Editors, *Engage with English*, Orient Blackswan, First Edition, 2016.
2. Prof. G.M. Sundaravalli & A.S.Kamalakar, *Paths to Skills in English* Orient Blackswan, First Edition, 2015.

REFERENCES

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT, 2nd Edition,2018.
3. Hewings, Martin, *Cambridge Academic English (B2)*, CUP,2012.
4. Eric H.Glendinning &Beverly Holmström *Study Reading: A Course in Reading Skills for Academic Purposes* Cambridge University Press, 2 edition, 14 October 2004.

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(19HS0831) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

COURSE OBJECTIVES

The objectives of this course:

1. *To enlighten the learners in the concept of differential equations and multivariable calculus.*
2. *To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.*
3. *To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.*

COURSE OUTCOMES (COs)

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

1. *Solve the differential equations related to various engineering fields.*
2. *Identify solution methods for partial differential equations that model physical processes.*
3. *Interpret the physical meaning of different operators such as gradient, curl and Divergence.*
4. *Estimate the work done against a field, circulation using vector calculus.*
5. *Students will become familiar with applications of surface and volume integrals.*

UNIT – I

First and Higher Order Ordinary Differential Equation: Exact - Linear and Bernoulli's equations - Second order linear differential equations with constant coefficients with R.H.S term of the types e^{ax} , sinax, cosax, polynomials in x^n ,e^{ax} V(x).

UNIT – II

Equations Reducible to Linear Differential Equations: Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous linear equations with constant coefficients - Applications to L-C-R Circuit problems.

UNIT – III

Partial Differential Equations: Formation of P.D.E by eliminating arbitrary constants and functions.

Solutions of P.D.E: Equations solvable by direct integration - Linear and non-linear equations of first order - Method of separation of variables.

UNIT – IV

Vector Differentiation: Scalar and vector point functions - Vector operator del - Del applies to scalar point functions – Gradient - Del applied to vector point functions - Divergence and Curl - Vector identities.

UNIT – V

Vector Integration: Line integral – Circulation - Work done - Surface and volume integrals. **Integral Theorems:** Green's theorem in the plane (without proof) – Stoke's theorem (without proof) – Divergence theorem (without proof) – applications of these theorems.

TEXTBOOKS

1. Dr. Shahnaz Bathul, *Engineering Mathematics*, Overseas Publishers PV.L.T, Fourth Edition,2008.
2. T.K.V. Iyengar, *Engineering Mathematics Volume-I*, S.Chand Publication, 5th Edition, 2010

REFERENCES

1. E.Rukmangadachari & E.Keshava Reddy, *Engineering mathematics, volume-I*, Pearson Publishers, 1st edition, 2015.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 42nd Edition, 2017.
3. Peter V.Oneil, *Advanced Engineering Mathematics*, Thomson Books, 5th Edition, 2003.
4. Dr. A Anjauyulu, *Engineering Mathematics-I*, Deepthi Publications.
5. Erwin Kreyszig. *Advanced Engineering Mathematics*, John Wiley Publications,8th Edition,2000.

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(19HS0851) SEMICONDUCTOR PHYSICS

COURSE OBJECTIVES

The objectives of this course:

1. *Basic concepts of free electron theory and energy bands in solids.*
2. *Key points, formation and importance of semiconductors.*
3. *To understand the dual nature of Matter and propagation of Electromagnetic waves.*
4. *To recognize the basic concepts related properties of Lasers and Optical Fibers.*
5. *To understand the fundamentals Nano Science &Technology.*

COURSE OUTCOMES (COs)

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

1. *Explain concepts of free electron theory and energy bands in solids.*
2. *Identify the applications of semiconductors in electronic devices.*
3. *Explain the applications of magnetic materials.*
4. *Evaluate the Maxwell equations and asses the EM wave propagation in non-conducting medium.*
5. *Apply the basic properties of nanomaterials in various engineering branches.*

UNIT – I

Electron Theory of Metals: Classical free electron theory-postulates- drawbacks- Quantum free electron theory. – Fermi Dirac distribution–Effective mass of electron- sources of electrical resistance- Energy bands in solids, types of electronic materials: metals, semiconductors and insulators.

UNIT – II

Semiconductors: Intrinsic semiconductors- Carrier concentration, Fermi level, electrical conductivity-energy band gap. Extrinsic semiconductors –Life time of charge carriers- Carrier generation and recombination - diffusion and drift –Einstein's Relation-Hall Effect- Applications – theory of p -n junction – Construction and working of LED and SolarCell,

UNIT –III

Principles of Quantum Mechanics & Electromagnetic Theory Principles of Quantum Mechanics : Wave nature of Particles – Matter waves- Properties - De Broglie hypothesis - Time-dependent and time - independent Schrodinger equation for wave function –physical significance of wave function - Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box.

Electromagnetic Theory: Divergence and Curl of Electric and Magnetic Fields- Gauss' theorem for divergence and Stokes' theorem for curl- Maxwell's Equations (Quantitative)- Electromagnetic wave propagation (Non-conducting medium).

UNIT – IV

Lasers and Fiber Optics

LASERS: Introduction - Characteristics of Laser - Spontaneous and Stimulated emission of radiation - Einstein's coefficients - Population inversion - Pumping Mechanisms - He-Ne laser, Nd-YAG laser - Applications of laser.

Fiber Optics: Introduction to Optical Fibers-Total Internal Reflection-Construction of optical fibers, Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile & modes –Propagation of electromagnetic wave through optical fiber-Block Diagram of Fiber optic Communication system -Applications.

UNIT-V

Physics of Nanomaterials: Introduction, Nanoscience and Nanotechnology – Surface area to volume ratio and Quantum confinement- Classifications of Nanomaterials – Advantages of nanotechnology, Synthesis of nanomaterials- Top Down Process- Ball Milling; Bottom Up Process: Sol-Gel method– Applications.

TEXTBOOKS

1. B.E.A. Saleh and M.C. Tech, "*Fundamentals of Photonics*", John Wiley & Sons, 2nd edition,2012.
2. K.Thyagarajan ,"*Engineering Physics*", Mc Graw Hill Education Private Ltd, New Delhi, 2nd edition, 2019.

REFERENCES

1. J. Singh, "*Semiconductor optoelectronics* : *Physics and Technology*", McGraw-Hill Inc.2nd 1995.
2. S.M. Sze, "*Semiconductor Devices: Physics and Technology*", Wiley, 2rd edition, 2015.
3. P. Bhattacharya, "*Semiconductor Optoelectronic devices*", Prentice Hall of India, 2nd edition,1997.
4. R. Fitzpdricle , "*Maxwell's equations and the principles of Electromagnetism*", Infinity Science Press, 1sted.2010.
5. John David Jackson , "*Classical Electrodynamics*", Wiley 3rd edition2007

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(19EE0239) BASIC ELECTRICAL ENGINEERING

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the nature of different circuit elements, fundamental laws and network Theorems.*
2. *To understand the operation of dc machines and single phase transformers.*
3. *To understand and solve network Theorems.*

COURSE OUTCOMES
On successful completion of this course, the student will be able to

1. *Determine the equivalent impedance of given network by using network reduction techniques.*
2. *Determine the current through any element and voltage across any element*
3. *Apply the network theorems suitably.*
4. *Analyze the operating principles of electrical machines.*
5. *Analyze the operating principles of transformer.*

UNIT – I
DC Circuits: Electrical circuit elements (R,LandC), voltage and current sources - Ohm's law, Kirchhoff's laws - analysis of circuits with dc excitation (series, parallel and series-parallel) - Superposition, Thevenin's, Norton's and Maximum Power transfer Theorems.

UNIT – II
AC Circuits: Representation of sinusoidal waveforms, peak,average and rms values, form factor phasor representation - real power, reactive power, apparent power, power factor - Analysis of single-phase ac circuits consisting of R, L, C, RL ,RC, RLC combinations (series and parallel), Resonance - Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT – III
DC Machines: Construction details of DC Machine, principle of DC generator, EMF equation - Types of generators, OCC of DC generator - Operation of DC motor, back emf, torque equation, Types of DC motors, speed control methods.

UNIT – IV
AC Machines: Construction and working principle of transformer, OC and SC tests, losses in transformers, Regulation and efficiency, Auto-transformer. Construction & working principle of 3–phase alternators, Regulation of alternator by Synchronous Impedance method & working principle of Induction motors.

UNIT – V

Domestic Wiring: Types of Wiring, Earthing – necessity of Earthing, methods of Earthing– plate earthing & pipe earthing, Protective devices-fuses & circuit breakers.

TEXT BOOKS

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata Mc GrawHill,2010.
2. A.Chakrabarthi, M.L.Soni, P.V.Gupta, U.S.Bhatnagar, *A Text book of Power System Engineering*, DhanpatRai & Sons–2010

REFERENCES

1. L. S. Bobrow, *Fundamentals of Electrical Engineering*, Oxford University Press, 2011.
2. E. Hughes, *Electrical and Electronics Technology*, Pearson, 2010.
3. M.S.Naidu, S. Kamakshaiah "*Basielectrical Engineering*" TMH, 2011.

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(19EC0401) SWITCHING THEORY AND LOGIC DESIGN

COURSE OBJECTIVES

The Objective of this course:

1. *Familiarize the student with fundamental principles of digital design.*
2. *Acquire the skills to manipulate and examine Boolean algebraic expressions, logical operations, Boolean functions and their simplifications.*
3. *Acquaint with classical hardware design and software implementation for both combinational and sequential logic circuits.*

COURSE OUTCOMES (COs)

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

1. *Able to define different Number systems, Binary Codes and perform Number base conversions.*
2. *Able to simplify the Boolean functions, design and implement using Logic gates.*
3. *Understand the methods for gate-level minimization techniques.*
4. *Design and implement Sequential and Combinational circuits.*
5. *Apply the state reduction methods in design of FSMs.*
6. *Understand and design memory systems like RAM, ROM, PLA, PAL.*

UNIT – I

Binary Systems: Digital Systems – Binary Numbers – Octal and Hexadecimal Numbers, Number Base Conversions– Complements– Signed Binary Numbers–Binary Codes.

Boolean Algebra And Logic Gates: Basic Definitions, Axiomatic Definition of Boolean Algebra – Basic Properties of Boolean Algebra – Boolean Functions, Canonical and Standard Forms – Other Logic Operations – Digital Logic Gates – Integrated circuits.

UNIT – II

Gate – Level Minimization: The Map Method, Four Variable K-Map, Five VariableK-Map – Product of Sums Simplification – Don‘t–Care Conditions – NAND and NOR implementation, Other Two Level Implementations, EX-OR Function – Tabular Minimization method.

UNIT – III

Combinational Logic: Combinational Circuits – Analysis Procedure – Design Procedure – Binary Adder–Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – De-Multiplexers.

UNIT – IV

Synchronous Sequential Logic: Sequential Circuits – Latches, Flip Flops – Analysis of Clocked Sequential Circuits – Registers, Shift Registers, Ripple counters, Synchronous counters, Ring Counter and Johnson Counter.

UNIT – V

Finite State Machines And Programmable Memories: Introduction to FSM – Mealy and Moore models – State Reduction and State Assignment **–** Design procedure – Random access memory, memory decoding – Error Detection and Correction – Read–only Memory – Programmable Logic Array – Programmable Array Logic.

TEXT BOOKS

1. Morris Mano, *Digital Design*, PHI, 3rd Edition, 2006.
2. Zvi Kohavi, *Switching & Finite Automata theory*, TMH, 2ndEdition.
3. A.Anandkumar, *Switching Theory and Logic Design*, PHI,2008.

REFERENCES

1. Fletcher, *An Engineering Approach to Digital Design*,PHI.
2. Charles H. Roth, *Fundamentals of Logic Design*, Thomson Publications, 5th Edition, 2004.
3. John M. Yarbrough, *Digital Logic Applications and Design*, Thomson Publications, 2006.

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(19HS0811) COMMUNICATIVE ENGLISH LAB

COURSE OBJECTIVES

The Objective of this course:

1. Students will be exposed to a variety of self instructional, learner friendly modes of language learning.
2. Students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
3. Students will learn better pronunciation through stress, intonation and rhythm.
4. Students will be trained to use language effectively to face interviews, group discussions, public speaking.
5. Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.

COURSE OUTCOMES

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

1. Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills.
2. Apply communication skills through various language learning activities.
3. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
4. Evaluate and exhibit acceptable etiquette essential in social and professional Settings.
5.Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

UNIT – I

Part-1

Introduction to Phonetics

Part-2

Word Stress- Intonation

UNIT – II

Part-1

JAM - Oral Presentation

Part-2

Describing objects/places/persons- Minutes of Meeting

UNIT – III
Part-1
Situational dialogues – Greeting and Introduction - Telephonic Conversations
Part-2
Book Review-Report Writing

UNIT – IV
Part-1
Non-verbal Communication – Dumb Charade
Part-2
Debate/Group Discussion- Movie Review- Reading Comprehension.

UNIT – V
Part-1
Information Transfer
Part-2
Job Application and Resume Writing - Interview Skills

Suggested Software:
Walden InfoTech Software

REFERENCES

1. T. Balasubramanian *A Textbook of English Phonetics for Indian Students* Mcmillian second edition,2012.
2. DhamijaSethi *A Course in Phonetics and spoken English* Prentice-hall of India Pvt. Ltd, 2000.
3. Krishna Mohan & NP Singh *Speaking English Effectively,* Mcmillian, second Edition, 2011.
4. E.Sureshkumar & P.Sreehari *A Hand Book of English Laboratories* Foundation books, 2011.
5. M Ashraf Rizvi *Effective Technical Communication* McGraw Hill Education, Second edition ,27 July 2017.

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(19HS0855) SEMICONDUCTORS PHYSICS LAB

COURSEOBJECTIVES
The Objective of this course:

1. *To explore the application of Interference and Diffraction by doing concerned experiments.*
2. *Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.*
3. *To understand the concept of energy gap, B-H curve and resonance phenomena in LCR circuits.*
4. *Develop an ability to apply the knowledge of physics experiments in the later studies.*

COURSE OUTCOMES
On successful completion of this course, the student will be **a**ble to

1. *Operate various optical instruments.*
2. *Estimate wavelength of laser and particles size using laser.*
3. *Plot the intensity of the magnetic field of induction along the axis of circular coil carrying current with distance.*
4. *Evaluate the acceptance angle of an optical fiber and numerical aperture.*
5. *Determine energy loss by B-H curve.*

Suggested list of experiments from the following: (Perform any TEN experiments from the following)

1. Determination of wavelengths of various colors of Mercury vapor lamp using Diffraction Grating – Normal Incidence method.
2. Determination of Dispersive power of prism.
3. Rigidity Modulus – Torsional Pendulum
4. Determination of thickness of thin object by wedge method.
5. Determination of radius of curvature of Plano convex lens – Newton'sRings.
6. Determination of wavelength of a given laser source by using diffraction grating.
7. Determination of particle size (Lycopodium particles deposited on glass plates) using Laser source.
8. Determination of energy gap of a semi conductor using p – n junction diode.

9. B- Hcurve.
10. Magnetic field along the axis of current carrying coil – Stewart & Gee's Method.
11. Determination of frequency of tuning fork - Melde's Apparatus.
12. Determination of Spring constant – Coupled Oscillator.
13. Determination of di electric constant of dielectric material using charging and discharging ofcapacitor.
14. Determination of Numerical Aperture of an Optical fiber.
15. Measurement of resistance with varying temperature–Thermistor.

REFERENCES

1. S. Balasubramanian, M.N. Srinivasan "*A Text book of Practical Physics*", S ChandPublishers,2017
2. http://vlab.amrita.edu/index.php -Virtual Labs, AmritaUniversity

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY :: PUTTUR (AUTONOMOUS)

I B.Tech- II Sem.

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(19HS0817) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

COURSE OBJECTIVES

The objectives of this course:

1. *To impart basic principles of thought process, reasoning and inference.*
2. *To connect society and nature through sustainability.*
3. *To know Holistic life style of yogic science and wisdom capsules in Sanskrit literature.*
4. *To introduce Indian knowledge system and Indian perspective of modern scientific world- view*
5. *To learn the basic principles of Yoga and holistic health care system.*

COURSE OUTCOMES (COs)

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

1. *To connect up the basic principles of thought process.*
2. *To understand Holistic life style of yogic science and wisdom capsules in Sanskrit literature.*
3. *To analyze the society and nature through sustainability.*
4. *To explain Indian knowledge system and Indian perspective of modern science.*
5. *To use the basic principles of Yoga and holistic health care system.*

UNIT – I

Basic structure of Indian Knowledge System: 4 ved- 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi.,)

UNIT – II

6 Vedanga (Shisha, Kalppa, Nirukha, VYkaran, Jyothish & Chand)-4 Upanga (Dharma Shastra, Meemamsa, Purana & Tharka Shastra)

UNIT – III

Modern Science and Indian Knowledge System-Yoga and Holistic Health care

UNIT – IV

Philosophical Tradition (Nyaya, ,Sankhya, Yog, Jain & Boudha)-Indian Linguistic Tradition –(Phonology, morphology, syntax and semantics)

UNIT – V

Indian Artistic Tradition - Chitra kala,Vasthu kala, Sangeetha, Nruthya Sahithya -Case studies

TEXT BOOKS

1. V. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition,2014
2. S.C. Chaterjee & D.M. Datta, *An Introduction to Indian Philosophy*, University of Calcutta,1984

REFERENCES

1. VN Jha (Eng. Trans.), *Tarkasangraha of Annam Bhatta*, International Chinmay Foundation, Velliarnad,Arnakulam
2. *Yoga Sutra of Patanjali*, Ramakrishna Mission, Kolkata GN Jha (Eng. Trans.), Ed. RN Jha, *Yoga-darshanam with Vyasa Bhashya*, Vidyanidhi Prakashan, Delhi2016
3. RN Jha, *Science of Consciousness Psychotherapy and Yoga Practices*, Vidyanidh Prakashan, Delhi 2016
4. Krishna Chaitanya, *Arts of India*, Abhinav Publications,1987.

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II B.Tech. – I Sem.

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(19HS0834) NUMERICAL METHODS AND TRANSFORMS

COURSE OBJECTIVES
The objectives of this course:

1. *To introduce the tools of differentiation and integration of functions of numerical methods that is used in various techniques dealing engineering problems.*
2. *To acquaint the student with mathematical tools needed in evaluating Transform techniques.*
3. *To acquaint the student with mathematical tools needed in evaluating Fourier series.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *To develop the mathematical skills of the students in the areas of numerical methods.*
2. *Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.*
3. *Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.*
4. *Calculate the Laplace transform of standard functions both from the definition and by using tables.*
5. *Students will be able to comprehend basic systems properties and signals.*
6. *Students will be able to apply Fourier analysis to periodic and aperiodic signals*

UNIT - I
Numerical solution of Algebraic and Transcendental equations: The Bisection method, Newton-Raphson method and Regula-Falsi method.
Interpolation: Finite differences-Newton's forward and backward difference formulae.

UNIT - II
Numerical solution of Ordinary differential equations: Taylor's series, Euler and Runge-Kutta method of fourth order for solving first and second order ordinary differential equations.

Numerical integration:
Trapezoidal rule and Simpson's 1/3rd and 3/8rules.

UNIT - III
Laplace Transforms: Laplace transforms of standard functions-Properties of Laplace Transform-Inverse transforms-Transforms of derivatives and integrals-Use of partial fractions to find Inverse Laplace transforms-Convolution theorem-Evaluation of integrals by Laplace transforms. Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT - IV
Fourier Series: Determination of Fourier coefficients- Fourier series- Even and odd functions, Fourier Series in an arbitrary interval, Periodic function, Half range sine and cosine series.

UNIT-V

Fourier transforms: Finite and Infinite Fourier transforms and Inverse transforms-Fourier sine and cosine transforms-Properties of Fourier transforms.

TEXT BOOKS

1. Grewal B.S, *Higher Engineering Mathematics*, 44th edition, Khanna Publishers, 2017.
2. Ramana B. V, *Higher Engineering Mathematics*, Mc Graw Hill Education, 2010.

REFERENCES

1. Iyengar T.K.V, Krishna Gandhi B, Ranganatham S & Prasad M.V.S.S.N, *Engineering Mathematics*, Volume-I,II&III, 12th Edition, S.Chand publication, 2014.
2. Rukmangadachari. E & Keshava Reddy E, *Engineering Mathematics*, Volume-I, II&III, Pearson Publishers, 2010.
3. Garg Nishu Gupta R.L, *Engineering Mathematics*, Volumes-I &II, Pearson Education, 2014.
4. Bali N, Goyal M & Watkins C, *Advanced Engineering Mathematics*, Infinity Science Press, 2007.

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(19EE0242) NETWORK THEORY

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the nature of different circuit elements, fundamental laws and network Theorems.*
2. *To analyze transients in Electrical systems.*
3. *To evaluate Network parameters of given Electrical network.*
4. *To understand about phasor concepts of single phase and Magnetic circuits.*
5. *To understand the concepts of Resonance and Fourier transforms.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand basics electrical circuits with nodal and mesh analysis.*
2. *Solve the given circuit with various theorems and methods.*
3. *Determine the transient response of R-L, R-C, R-L-C circuits for d.c and a.c excitations.*
4. *Apply Fourier transforms to electrical circuits excited by non-sinusoidal sources.*
5. *Learn the various parameters and their interrelationship, able to solve numerical with series, cascade, and parallel connection using two port parameters.*
6. *Design different types of filters.*

UNIT-I
Circuit Analysis Techniques: Loop and Nodal Methods of Analysis of Networks with Dependent Voltage and Current Sources, super node and super mesh for DC excitation, Network theorems: Reciprocity, Compensation, Tallegen's, and millman’s theorem as applied to DC circuits.

UNIT- II
Resonance and Filters:
Resonance: Series and Parallel resonance, Concept of Bandwidth and Q Factor.
Filters: Introduction, the Neper & decibel, The constant – k low pass filter, the constant – k high pass filter, band Pass Filters, band reject filters - illustrated problems.

UNIT- III

Transient Analysis:

DC Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for DC Excitation- Initial Conditions-Solution Method Using Differential Equation and Laplace Transforms.

AC Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms.

UNIT- IV

Two Port Networks: Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations. Concept of Transformed Network, Two Port Network Parameters Using Transformed Variables.

UNIT- V

Fourier Transforms: Trigonometric and exponential Fourier series, Line spectra and phase spectra, symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, Fourier transform and properties of the Fourier transform.

TEXT BOOKS

1. Van Valkenburg, *Network analysis*, Prentice hall of India, 2000.
2. Sudhakar, A. Shyammohan, S.P, *Circuits and Networks*, Tata McGraw-Hill New Delhi, 1994.

REFERENCES

1. A William Hayt , *Engineering Circuit Analysis*, 8th Edition, McGraw-Hill Education.
2. C.L.Wadhwa, *Electric circuit analysis*, new age international.
3. Valkenberg V., *Network Synthesis.*
4. Kuo F. F., "Network Analysis and Synthesis", 2nd Ed., Wiley India., 2008.

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(19EC0402) ELECTRONIC DEVICES AND CIRCUITS

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the characteristics and applications of P-N junction diode, special purpose devices in electronic circuits.*
2. *To familiarize working principle of BJT, JFET and MOSFET and to design single stage amplifier circuits using low frequency model.*
3. *To analyze and design various electronic devices and circuits using PN Junction diode, BJT, JFET and MOSFET.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Demonstrate the characteristics of PN Junction Diode, Rectifiers, Filters, BJT, JFET, MOSFET and special purpose electronic devices.*
2. *Analyze numerical and analytical problems in Rectifiers, Filters, Transistor biasing circuits and Transistor amplifiers.*
3. *Design and develop electronic circuits such as Rectifiers with and without filters, Transistor biasing circuits and Transistor amplifiers.*
4. *Solve engineering problems and arrive at solutions relating to electronic devices and circuits.*
5. *Identify a suitable semiconductor device and transistor for any given specification.*
6. *Select suitable technique for transistor modelling.*

UNIT – I
P-N Junction Diode: Open circuited PN Junction, Forward and Reverse Bias of PN Junction, Current Components in a PN diode, Volt - Ampere Characteristic, Temperature dependence of the V-I characteristics, Diode Resistances, Diode Capacitances, Breakdown Mechanisms, Zener Diode - Zener Diode as Voltage Regulator, Diode Clippers and Clampers.

UNIT – II
Rectifiers: Definition and Types, Half wave Rectifier, Full wave Rectifier and Bridge Rectifier, Comparison of Rectifiers, Filter - Definition and Types, Inductor Filter, Capacitor Filter, L-section Filter, CLC or π - section Filter, Comparison of various types of filters.
Special Purpose Devices: Varactor Diode, Tunnel Diode, Uni Junction Transistor, SCR, Solar Cell, LCD, LED.

UNIT – III

Transistor Characteristics: BJT: BJT - Construction, Operation, Transistor Current Components, Transistor as an Amplifier, Transistor Characteristics - CB, CE and CC.
FET: Types, JFET - Construction, Working, Characteristics, MOSFET - types, Construction, Working, Characteristics, Comparison between JFET and MOSFET.

UNIT – IV

Transistor Biasing and Thermal Stabilisation: Need for Transistor biasing, Operating point, Load line analysis, Biasing methods - Fixed bias, Collector to Base bias, Self-bias, stability factors, Bias compensation, Thermal Runaway, Thermal stability.

UNIT – V

Small Signal Low Frequency Transistor Amplifier Analysis: Frequency Response of Amplifier, Transistor hybrid model, Generalized analysis of Transistor amplifier using h-parameter model, Simplified Hybrid Model - Analysis of CE, CB and CC amplifiers using Approximate Model, Analysis of CE amplifier with emitter resistance using simplified hybrid model.
FET Amplifier Analysis: Small Signal Model, Analysis of CS and CD Amplifiers at Low frequencies.

TEXT BOOKS

1. J.Millman, C.Halkias, *Electronic Devices and Circuits,* Tata Mc-Graw Hill, 4th Edition, 2010.
2. S.Salivahanan, N.Suresh Kumar, *Electronic Devices and Circuits,* McGraw Hill Education (India) Private Limited, 3rd Edition, 2012.

REFERENCES

1. Jacob Millman, C.Halkies, C.D.Parikh, *Integrated Electronics,* Tata Mc-Graw Hill, 2nd Edition, 2009.
2. Sedra and Smith, *Micro Electronic Circuits,* Oxford University Press, 4th Edition, 2002.
3. Robert Boylested and Louis Nashelsky, *Electron Devices and Circuit Theory,* Pearson Prentice Hall, 10th Edition, July 2008.

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(19EC0403) SIGNALS, SYSTEMS AND RANDOM PROCESSES

COURSE OBJECTIVES
The Objective of this course:

1. *Study about signals and systems.*
2. *Do the analysis of signals & systems using time domain & frequency domain methods.*
3. *Understand the stability of systems through the concept of ROC.*
4. *Understand the concept of convolution.*
5. *Understand and analyze the concept of Laplace Transform and ROC.*

COURSE OUTCOMES (COs)
At the end of this course students will demonstrate the ability to

1. *Analyze different types of signals.*
2. *Represent continuous systems in time and frequency domain using different transforms.*
3. *Investigate the system stability.*
4. *Understand the concept of convolution of signals.*
5. *Understand and Analyze the Laplace Transform and ROC.*
6. *A student will able to determine the temporal and spectral characteristics of randomsignal response of a given linear system.*

UNIT-I
Introduction to Signals and Systems: Signal, Elementary Signals, Classification of signals - Continuous and Discrete time signals-Energy and Power signals-Periodic and Aperiodic Signals-Deterministic and Random Signals,Operations on signals,System-Classification of Systems-Linear and Non-linear Systems, Time Variant and Time Invariant Systems, Static and Dynamic Systems, Causal and Non-causal Systems, Stable and Unstable Systems.

UNIT-II
Fourier Series: Representation of Fourier series, Properties of Fourier series, Dirichlet‘s conditions, Trigonometric Fourier Series and Exponential Fourier Series.
Fourier Transform: Deriving Fourier Transform from Fourier series, Fourier Transform of standard signals, Magnitude and Phase response, Properties of Fourier Transform, Fourier Transform of Periodic signals.

UNIT-III

Signal Transmission through Linear Systems: Linear system, Impulse response, Step response, Response of a Linear system, Linear Time-Invariant (LTI) system, Linear Time Variant (LTV) system, Linear Shift-Invariant (LSI) systems, LTI System properties, Transfer function of a LTI system, Filter characteristics of Linear systems.

Convolution of Signals: Concept of Convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT-IV

Laplace Transforms: Laplace transform (LT)-Region of convergence, Constraints on ROC for various classes of signals, poles and zeros of system, Laplace domain analysis, solution to differential equations, Properties of LT, relation between LT and FT of a signal.

Introduction to Probability: Probability Definitions, Sample Spaces, Events, Joint Probability, Conditional Probability, Definition of a Random Variable, Distribution and Density functions, Properties,

UNIT-V

Random Processes: The Random Process Concept, Classification of Processes, Distribution and Density Functions, concept of Stationary and Statistical Independence. First-Order Stationary Processes, Second- Order, (N-Order) Stationary, Time Averages, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties. The Power Spectrum: Properties, Properties, Energy density spectrum.

TEXT BOOKS

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, *Signals and Systems*, PHI, 2nd Edition.
2. Peyton Z. Peebles, *Probability Random Variables & Random Signal Principles*, TMH, 4th Edition,

REFERENCES

1. A. Anand Kumar, *Signals and Systems*, PHI
2. B. P. Lathi, *Linear Systems and Signals*, Oxford University press, 2nd Edition, 2008.
3. Michel J. Robert, *Fundamentals of Signals and Systems*, MGH International Edition, 2008.
4. Y.Mallikarjuna Reddy, *Probability Theory & Stochastic Processes*, University Press, 4th edition,.
5. Athanasios Papoulis and Unnikrishna Pillai, *Probability, Random Variables and Stochastic Processes*, PHI, 4th Edition, 2002.
6. R.P. Singh and S.D. Sapre, *Communication Systems Analog & Digital*, TMH, 1995.

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(19CE0136) WATER TECHNOLOGY

COURSE OBJECTIVES
The objectives of this course:

1. *To develop a student's skill in evaluating the performance of water treatment plants*
2. *Communicate the importance of conserving water*
3. *Outline the strategies for reducing water consumption*
4. *To minimize the risks of floods, droughts and landslides.*
5. *To develop rural areas in the region with clear plans for improving the economy of the regions.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Underline the importance of water and describe the mechanism of hydrological cycle*
2. *Describe various elements associate with public water supply*
3. *Describe water quality criteria and standards, and their relation to public health*
4. *Recognize the cause of water pollution and influence of climatic changes on water resources*
5. *Summarize various water conservation techniques in practice*
6. *Explain need for watershed management and implement various Plans for watershed management*

UNIT-I
Water Demand and Sources of Water: Water demand -Types of water demands- Percapita Demand- Factors affecting the percapita demand–Water cycle-Sources of water-Surface and subsurface sources-Factors governing the selection of source of water - Water deficiency-Water crisis

Introduction to Water Supply: Importance and Necessity of protected water supply systems-Objectives of protected water supply system- Flow chart of public water supply system

UNIT-II

Water Quality: Requirement of water for domestic use-Impurities in water- Characteristics of water-Water quality standards – Flow chart of basic treatment process- Latest treatment process- Membrane filtration-Reverse process- Desalination process

UNIT-III

Water Pollution: Surface water pollution – Causes - Remedial measures – Ground water pollution – Causes - Remedial measures

Climatic Changes on Water Resources: Impact of climatic changes on water resources- Droughts- Extreme Precipitation- Melting Glaciers and Snow Drought- Greenhouse Gas emissions- Algal blooms

UNIT-IV

Water Conservation: Definition – Rain-water harvesting– Advantages of implementing the rain-water harvesting–Components of roof top rain-Water harvesting-Techniques in rain water harvesting–Catchment harvesting-Check dams-Farmponds-Percolation tank-Ground water recharge- Ground water recharge structures

UNIT-V

Watershed Management: Definition –Concept of Watershed Management-Need for watershed management- Objectives of watershed management-Characteristics of watershed – Planning of watershed management

TEXT BOOKS

1. Modi, P.N., *Water Supply & Waste Water Engineering, Vol. I & II*, Standard Book House, New Delhi, 2010.
2. J.V.S.Murty.,*Watershed Management*, New Age International Publications, New Delhi,2017.

REFERENCES

1. Garg, S.K., *Environmental Engineering Vol.I& II*, Khanna Publishers, New Delhi, 2015.
2. Madan Mohan Das, Mimi Das Saikia, *Watershed Management*, PHI Learning Pvt. Ltd., Delhi, 2012.
3. Ghanshyam Das, *Hydrology and Soil Conservation Engineering: Including Watershed Management*, PHI Learning Pvt. Ltd., Delhi.
4. https://theberkey.com/pages/a-guide-to-water-conservation
   https://blog.mygov.in/water-conservation-rainwater-harvesting/
   https://theconstructor.org/water-resources/methods-rainwater-harvesting/5420/

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(19EE0238) GENERTION OF ENERGY THROUGH WASTE

COURSE OBJECTIVES
The objectives of this course:

1. *To understand different types of waste as fuel*
2. *To introduce Pyrolysis methods and conversion processes*
3. *To understand gasification methods for biomass*
4. *To learn concepts of biomass resources, combustion types and biogas plant technology*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Analyse agro based, forest residue and industrial waste conversion processes.*
2. *Manufacture of Pyrolytic oils and gases*
3. *Manufacture of charcoal, yields and applications*
4. *Understand various types of gasifiers operation*
5. *Understand inclined and fluidized bed combustors operation*
6. *Understand types of biogas plants and biomass energy programme in India*

UNIT- I
Introduction to Energy from waste: Classification of waste as fuel –Agro based- Forest residue- Industrial waste- MSW- conversion devices- Incinerators- Gasifiers-Digestors.

UNIT- II
Bio-mass Pyrolysis: Pyrolysis- Types- Slow-Fast- Manufacture of Charcoal- methods- yields and application. Manufacture of Pyrolytic oils and gases – yields and applications.

UNIT- III
Biomass Gasification: Gasifiers- Fixed bed system- Downdraft and Updraft gasifiers- Fluidized bed gasifiers- construction and operation- Gasifier burner arrangement for thermal heating.

UNIT- IV

Biomass Combustion: Biomass stoves- Types- Inclined combustors- Fluidized bed combustors- construction and operation of above biomass combustors.

UNIT- V

Properties of Biogas: Biogas plant Technology and status – Biomass resources and their classification- Biomass conversion processes- thermo chemical conversion –Direct Combustion- Biomass gasification- Pyrolysis and liquefaction – bio-chemical conversion- anaerobic digestion- Types of biogas plants- applications-Biomass Energy Programme in India.

TEXT BOOKS

1. Desai Ashok V, *Non-Conventional Energy*, Wiley Eastern Ltd, 1990.
2. Khandelwal K.C. and Mahdi SS, *Biogas Technology – A Practical Hand Book* , Vol I & II. Tata Mc Graw Hill Publishing Co Ltd, 1983.

REFERENCES

1. Challal D.S, *Food, Feed and Fuel from Biomass*, IBH Publishing Co Pvt Ltd, 1991.
2. GD Roy, *Non-conventional Energy Sources,* Khanna Publishers, 6th Edition.
3. Khahid Rehman Hekeem, Mohammad Jawald, Umar Rashid, *Biomass & Bio-energy*, Springer International Publishing Ltd.

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(19ME0349) FUNDAMENTALS OF MECHANICAL ENGINEERING

COURSE OBJECTIVES

Objective of this course is to

1. *Impart knowledge on Engineering materials, alloying and Heat treatment.*
2. *Familiarize student with IC Engines and Air compressors.*
3. *Make the student learn about a Refrigeration& Air conditioning systems and working of various Power plants*
4. *Enable the student to know about Modern Machining processes.*
5. *Make the student understand about Robotics and computer aided drafting, manufacturing, quality control.*

COURSE OUTCOMES

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

1. *List the types of Engineering materials and also describe alloying, Heat treatment Processes.*
2. *Recognize the importance of IC Engines in automobiles and the classification of air compressors*
3. *Distinguish various types of air conditioning systems for house and Industrial applications*
4. *Explicate the working of various Power plants like nuclear, Hydro & thermal power plants*
5. *Classify various types modern machining processes and determine the best suitable process to machine a component.*
6. *Apply the working principles of CAD, CAM and CIM in the operation of Robotic manufacturing and quality control systems*

UNIT-I

Engineering Materials: Classification of Materials - Engineering properties of Materials, Necessity of alloying – Applications.

Heat Treatment of Alloys: Annealing - Normalizing – Hardening- Tempering- Surface hardening methods

UNIT-II

I.C. Engines- Definition of Engine and Heat Engine, I.C Engine Classification –Parts of an IC Engine, Working of Two Stroke & Four Stroke Engines.

Air Compressors: Reciprocating & Rotary Compressor - Types –Working.

UNIT-III

Refrigeration: Introduction to Refrigeration- Classifications of Refrigeration systems-Vapour compression and Vapour absorption systems.

Air conditioning: Introduction to Air conditioning - Classifications of Air conditioning systems-window air conditioning system, split conditioning system, Central air conditioning system.

UNIT-IV

Modern Machining: Traditional machining versus modern machining methods- Need of modern machining process – Classifications - Process selection, Materials, and applications, Ultrasonic Machining, Water Jet Machining, Abrasive Water Jet Machining.

UNIT-V

CAD/CAM: Role of computers in manufacturing– CAD, CAM, CIM, Computer aided quality control- Inspection Methods-Advantages & Applications.

Robotics: Robot-Necessity of Robot in manufacturing environment-Classification-Principle components-Degrees of freedom-End effectors-Advantages.

TEXT BOOKS

1. R. K. Rajput, *Engineering Materials and Metallurgy,* S. Chand Publishers, 3rd Edition, 2008.
2. C.P. Arora & Domkundwar, *Refrigeration and Air conditioning,* McGraw Hill, 3rd Edition, 2010.
3. M.P. Groover, *Industrial Robotics*, Tata McGraw Hill Publications, 2017.

REFERENCES

1. Dr. Kodgire V.D, *A Text Book of Material Science and Metallurgy for Engineers*, Everest Publishing House, 12th Edition, 2007.
2. Hassan Abdel, *Advanced Machining Processes*, McGraw-Hill, 2005.
3. A Zimmers & P.Groover, *CAD/CAM*, PE Publishing, 5th Edition, 2008.
4. R.K.Rajput, *Thermal Engineering*, Laxmi Publications, 6th Edition, New Delhi, 2010.

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(19CS0549) LINUX PROGRAMMING

COURSE OBJECTIVES
The objectives of this course:

1. *To explain Linux utilities and shell scripting language.*
2. *To implement standard Linux utilities such as ls, mv, cp etc. using system calls.*
3. *To develop the skills necessary for system programming including file system programming, korn shell and c shell.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the basic set of commands and editors in Linux operating system.*
2. *Implement and execute various shell scripts.*
3. *Work with filters, pipes and user communication, Vi-Editor commands.*
4. *Execute various commands related to regular expressions*
5. *Implement korn shell programming*
6. *Execute commands related to C shell.*

UNIT - I
Introduction: The UNIX Environment, Unix structure, Accessing UNIX, common and useful commands. The Vi Editor – Concepts, Modes and Commands.
File Systems: File names and types, regular files and Directories and their implementation. Operations on directories, files and on both. Security levels, Changing permissions, Ownership and group.

UNIT - II
Introduction to Shells: Shells**,** UNIX Session, standard streams, redirection, pipes tee Command, Command Execution and Substitution, Command-Line Editing, job control, Aliases, Variable Types and options, Shell Customization.

UNIT - III
Filters: Filters and Pipes – related Commands. Commands for Translating Characters, Files with duplicate Lines, Counting characters, words and Lines and Comparing files. User Communication, Electronic mail, Remote access, and File Transfer. Vi Editor – Local, Global and Range commands and Text manipulation in vi. Editor, Overview of ex Editor.

UNIT - IV

Regular Expressions: Atoms and Operators, grep – family and operations and searching for file contents. Overview of sed and awk

Interactive kornshell : An overview on sed, Korn shell - Features, Files, Variables, input and output. Environmental Variables and options.Startup Script, Command history and Execution process.

UNIT V

Korn shell Programming- Script Concept, Expressions, Decision making and Repetition, Special Parameters and variables, Changing Positional parameters, Argument Validation, Debugging Scripts and Examples.

Interactive C shell : An overview on awk, C Shell – Features, Files and Variables, output, input, eval Command, environmental Variables, on-off Variables, Startup and Shutdown Scripts, Command history and execution Script.

TEXT BOOKS

1. Behrouz A. Forouzan and Richard F. Gilberg, *UNIX and Shell Programming*, Cengage Learning Publications, Indian Reprint 2012.
2. Sumitabha Das**,** *UNIX Concepts and Applications*, 4th Edition, TMH.

REFERENCES

1. N. Mathew, R. Stones, Wrox, Wiley, *Beginning Linux Programming,* 4th Edition, India Edition.
2. Graham Glass, King Ables, *LINUX for programmers and users*, 3rd Edition, Pearson.
3. A. Hoover, *System Programming with C and LINUX*, Pearson.
4. K. A. Robbins, *LINUX System Programming*, Communication, Concurrency and Threads, Pearson Education.
5. S.G.Kochan and P.Wood, *LINUX shell Programming*, 3rd edition, Pearson Education.
6. S. Parker, *Shell Scripting*, Wiley India Pvt.Ltd.

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(19HS0813) MANAGEMENT SCIENCE

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the basic concepts, principles and processes of management*
2. *To help the students gain an understanding of the functions, responsibilities of managers*
3. *To get an awareness about the latest developments and contemporary issues in the field of management*

COURSE OUTCOMES (COs)

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

1. *Utilize appropriate theoretical frameworks to real life business and managerial problems.*
2. *Identify appropriate operational risks and develop appropriate responses to them.*
3. *Apply human resource principles to recruit, select and manage employees to achieve organizational goals.*
4. *Enact strategy, including contingent plans for the effective management of the organization.*
5. *Identify, plan, and implement the projects and evaluate the performance of the projects.*
6. *Analyze effective application of latest developments to diagnose and solve organizational problems.*

UNIT - I

Introduction to Management: Management-Concept and meaning-Nature-Functions-Management as a science and art and both. Schools of management thought-Taylor‘s scientific theory-Henry Fayol‘s principles- Weber‘s Ideal Bureaucracy-Eltan Mayo‘s Human relations-Systems theory- Situational or Contingency theory-Social responsibilities of management.

Organizational structure and Design: Features of organizational structure-work specialization - Departmentation-Span of control-Centralization and Decentralization. **Organisational Designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of organization.

UNIT - II

Operations Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study- Statistical Quality Control**:** *C* chart, *P* chart, (simple Problems) Deming’s contribution to quality.

Material Management: Objectives-Inventory- Functions, types, inventory classification techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management.
Marketing Management: Concept- Meaning - Nature-Functions of Marketing- Marketing Mix- Channels of distribution -Advertisement and sales promotion- Marketing Strategies based on Product Life Cycle.

UNIT - III
Human Resources Management (HRM): HRM- Definition and meaning – nature-Managerial and Operative functions-Evolution of HRM-Human Resource Planning(HRP)-Employee Recruitment-sources of recruitment- employee selection- process and tests in employee selection- Employee training and development-On- the- job and Off- the- job training methods-Performance Appraisal systems- Concept-Methods of Performance Appraisal-Placement-Employee Induction-Wage and Salary Administration-Objectives-Essentials of Wage and Salary Administration-Job Analysis- Process -Job Evaluation-Employee Grievances-techniques of handling Grievances.

UNIT - IV
Strategic Management: Definition& meaning-Setting of Vision- Mission- Goals-Corporate Planning Process- Environmental Scanning-Steps in Strategy Formulation and Implementation-SWOT Analysis. **Project Management (PERT/CPM):**Network Analysis-Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical Path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing.(Simple problems).

UNIT - V
Contemporary Issues In Management: concept of MIS – Materials Requirement Planning (MRP)-Just-In-Time(JIT)System-Total Quality Management (TQM)- Six Sigma Concept-Supply Chain Management-Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

TEXT BOOKS

1. A.R Aryasri, *Management Science*, TMH,2013
2. Stoner, Freeman, Gilbert, *Management*, Pearson Education, New Delhi,2012.

REFERENCES

1. Kotler Philip & Keller Kevin Lane: *Marketing Mangement*, PHI, 2013.
2. Koontz & Weihrich: *Essentials of Management*, 6th edition, TMH,2005.
3. Thomas N.Duening& John M.Ivancevich *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2004.

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(19EC0404) SWITCHING THEORY AND LOGIC DESIGN LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the Basics of logic Gates.*
2. *To know the concepts of Combinational circuits.*
3. *To understand the concepts of flipflops, registers and counters.*

COURSE OUTCOMES (COs)

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

1. *Verify the operation of Logic gates, combinational and Sequential circuits*
2. *Construct basic combinational circuits and verify their functionalities.*
3. *Apply the design procedures in designing basic sequential circuits.*
4. *Understand the functionality of counters.*
5. *Understand the sequencing of Shift registers.*
6. *Construct various digital circuits and verify their operation.*

LIST OF EXPERIMENTS:

1. Verify the truth tables of Basic Logic gates.
2. Verify the truth tables of Universal Logic Gates
3. Design & Verify the truth tables of Half /Full Adder/Subtractor using logic gates.
4. Design & Verify the truth tables of 4- bit binary adder / subtractor using logic gates.
5. Design & Verify the truth tables of Multiplexer and De-Multiplexer.
6. Design & Verify the truth tables of Encoder and Decoder using logic gates.
7. Verify the truth table of Magnitude comparator.
8. Verify the functionality of RS & JK FF using NAND gates.
9. Design & Realize Shift Register.
10. Design & Realize Synchronous counters.

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(19EC0405) ELECTRONIC DEVICES AND CIRCUITS LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the working of various Semiconductor devices and plot their characteristics.*
2. *To obtain the frequency response characteristics of BJT and FET amplifiers.*
3. *To apply basic electronic devices and circuits in real time applications.*

COURSE OUTCOMES (COs)

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

1. *Demonstrate knowledge in different electronic devices and analog circuits.*
2. *Analyze the characteristics of different electronic devices and circuits like Diodes-PN Junction Diode, Zener Diode and Transistors-BJT, FET.*
3. *Design and develop electronic circuits like rectifiers, clippers, clampers, BJT and FET Amplifiers.*
4. *Solve engineering problems with better Electronic circuits.*
5. *Function effectively as an individual and as a member in a group in the area of electronic devices and circuits.*
6. *Develop skills to communicate verbally and in written form in the area of electronic devices and circuits.*

PART - A

Electronic workshop practice (for 2 Lab sessions)

1. Identification, Specifications and Testing of passive & active components
2. Study the working of the electronic equipment used in the lab.

PART - B

List of Experiments (Minimum of TEN experiments to be completed)

1. Forward and Reverse bias characteristics of P-N Junction diode
2. Zener diode characteristics
3. Diode clippers
4. Diode clampers
5. Half Wave Rectifier with and without filter
6. Full Wave Rectifier with and without filter
7. UJT Characteristics
8. Input and Output characteristics of Transistor in CE Configuration

9. Drain and Transfer Characteristics of N-channel JFET
10. Frequency response of CE Amplifier
11. Frequency response of CC Amplifier
12. Frequency response of Common Source FET Amplifier

Additional Experiment:

PCB Design of a simple electronic device application

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(19EC0406) BASIC SIMULATION LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To introduce MATLAB and use it as a computation and visualization tool in the study of Signals & Systems.*
2. *To expose the applications of MATLAB to signal analysis and system design.*
3. *To perform basic signal processing applications in MATLAB.*

COURSE OUTCOMES (COs)

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

1. *Analyze various types of signals and sequences.*
2. *Apply convolution and correlation operations on different signals.*
3. *Determine the response of an LTI system to given signals.*
4. *Plot and analyze the spectrum of a given signal using MATLAB.*
5. *Verify the Sampling theorem.*
6. *Compute various statistical properties of a random noise.*

LIST OF EXPERIMENTS
(Minimum of 12 experiments has to be conducted)

1. Basic Operations on Matrices.
2. Generation of Various Signal and Sequences.
3. Basic Operations on Signals and Sequences.
4. Finding the Even and Odd parts of Signal/Sequence & Real and Imaginary parts of Signal.
5. Convolution between signals.
6. Auto Correlation and Cross Correlation between Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system.
9. Verification of Gibbs Phenomenon.
10. Finding the Fourier Transform of a given signal.
11. Waveform Synthesis using Laplace Transform.
12. Generation of Gaussian noise.
13. Sampling Theorem Verification.
14. Removal of noise by Autocorrelation / Cross correlation.

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(19HS0816) INDIAN CONSTITUTION

COURSE OBJECTIVES
The objectives of this course:

1. *Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.*
2. *Address the growth of Indian opinion regarding modern Indian intellectual 'constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.*
3. *Know the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.*
4. *To acquire the knowlege to write civil service examinations.*
5. *Know the political economy of Indian international relations and gain knowledge in Judiciary system*

COURSE OUTCOMES (COs)
On successful completion of the course, students will be able to

1. *Explain the key concepts of political economy*
2. *Analyse the significant developments in the political ideologies*
3. *Describe the salient features of the constitution of India interpret, integrate and critically*
4. *Analyse the political economy of Indian international relations and gain knowledge in Judiciary system*
5. *Apply their knowledge and skills acquired to write various competitive examinations*

UNIT-I
Introduction to the Constitution

UNIT-II
Historical Perspective of the Constitution of India- Salient features and characteristics of the Constitution of India

UNIT-III
Scheme of the fundamental rights-The scheme of the Fundamental Duties and its legal status -The Directive Principles of State Policy – Its importance and implementation

UNIT-IV

Parliamentary Form of Government in India – Powers and Functions-The President of India - Status and Powers-The historical perspectives of the constitutional amendments in India- Judiciary system - Powers and Functions

UNIT-V

Local Self Government – Constitutional Scheme in India - Election Commission: Role and Functions

TEXT BOOKS

1. The Constitution of India, 1950 (Bare Act), Government Publication, 1952
2. Dr. Busi S. N, *Dr. B. R. Ambedkar ,Framing of Indian Constitution*, 1st Edition, 2015

REFERENCES

1. Jain M.P, *Indian Constitution Law*, 7th ed., Lexis Nexis, 2014.
2. Basu D.D, *Introduction to the Constitution of India*, Lexis Nexis, 2015.

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(19EC0407) ELECTRONIC CIRCUIT ANALYSIS

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the characteristics of BJT amplifiers at high frequencies, multistage amplifiers, Feedback amplifiers, Oscillators, Power amplifiers, Tuned amplifiers and Multivibrators.*
2. *To analyze and design of Small signal Amplifiers at High Frequencies, Multistage amplifiers with compound connections, Feedback amplifiers, Oscillators, Power amplifiers, Tuned amplifiers and Multivibrators.*
3. *To use the basic building blocks of analog electronic circuits for real time applications.*

COURSE OUTCOMES (COs)

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

1. *Acquire knowledge of BJT High Frequency Model, Multistage amplifiers, Feedback amplifiers, oscillators, Power amplifiers, Tuned amplifiers and Multivibrators.*
2. *Perform analysis of analog electronic circuits for meeting defined specifications.*
3. *Design and develop analog electronic circuits such as Multistage amplifiers, Feedback amplifiers, Oscillators, Power amplifiers, Tuned amplifiers and Multivibrators with given specifications.*
4. *Solve problems relating to analog electronic circuit design.*
5. *Select an Amplifier circuit suitable for a specific electronic subsystem.*
6. *Apply course knowledge to assess societal issues and understand the consequent responsibilities relevant to the professional engineering practice using analog electronic circuits.*

UNIT – I

BJT High Frequency Model Analysis: BJT Hybrid- π Common Emitter transistor model and its parameters, CE short circuit current gain, Current gain with resistive load.

Multistage Amplifiers: Need for cascading, Methods of coupling**,** Cascade transistor amplifier and its analysis, Cascode amplifier, Darlington pair and its analysis, Effect of cascading on Bandwidth.

UNIT – II

Feedback Amplifiers: Feedback concept, Classification of basic amplifiers - Voltage amplifier, Current Amplifier, Transresistance Amplifier and Transconductance Amplifier, Feedback amplifier topologies, Characteristics of negative feedback amplifiers, Analysis of feedback amplifiers, Performance comparison of feedback amplifiers.

UNIT – III

Oscillators: Principle of operation of oscillator, Barkhausen Criterion, Types of oscillators, Analysis of RC-phase shift and Wien bridge oscillators using BJT, Generalized analysis of LC Oscillators, Hartley and Colpitts's oscillators with BJT, Crystal oscillators, Frequency stability of oscillators.

UNIT – IV

Power Amplifiers: Types of power amplifiers, Class A large signal Amplifiers - Series fed, Directly Coupled and Transformer Coupled class A power amplifier and their Efficiency, Class B Amplifiers - Push Pull and Complementary Symmetry class B power amplifier and their Efficiency, Crossover Distortion.

Tuned Amplifiers: Introduction, Single Tuned Amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers.

UNIT – V

Multivibrators: Multivibrator - Definition and Types, Astable Multivibrator, Monostable Multivibrator and Bistable Multivibrator, Triggering methods for bistable Multivibrator.

TEXT BOOKS

1. S.Salivahanan, N.Suresh Kumar, *Electronic Devices and Circuits,* McGraw Hill Education (India) Private Limited, 3rd Edition, 2012.
2. Sedra and Smith, *Micro Electronic Circuits*, Oxford University Press, 6th Edition, 2011.

REFERENCES

1. Jacob Millman, C.Halkies, C.D.Parikh, *Integrated Electronics,* Tata Mc-Graw Hill, 2nd Edition, 2009.
2. Robert Boylested and Louis Nashelsky, *Electron Devices and Circuit Theory,* Pearson Prentice Hall, 10th Edition, July 2008.
3. David A. Bell, *Electronic Devices and Circuits*, Oxford University Press, 5th Edition, 2008.

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(19EC0408) ANALOG COMMUNICATIONS

COURSE OBJECTIVES
The objectives of this course:

1. *To study the fundamental concepts of the analog communication system.*
2. *To analyze various analog modulation and demodulation techniques.*
3. *To know the working of various transmitters and receivers.*
4. *To understand the influence of noise on the performance of analog communication systems, and to acquire the knowledge about information and capacity.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand different blocks in communication system and distinguish between different amplitude modulation schemes with their advantages, disadvantages and applications.*
2. *Analyze generation and detection of FM signal and comparison between amplitude and angle modulation schemes.*
3. *Study the different types of noises and its effects to analyze the behavior of different Analog modulation s0chemes in presence of noise & evaluate the performance of analogue communications in the presence of noise.*
4. *Differentiate between different analog pulse modulation and demodulation techniques and signal multiplexing for various applications.*
5. *Identify different radio receiver circuits and role of AGC and understand the concept of information and capacity*
6. *Identify source coding and channel coding schemes for a given communication link.*

UNIT – I
Amplitude Modulation –I: Introduction to communication systems – Modulation, Need for Modulation–Introduction to Amplitude Modulation, Power and transmission efficiency, Single tone AM, Generation of AM wave, Square law Modulator & Switchingmodulator, Detection of AM Wave–Square law detector & Envelope detector, AM Transmitters, Illustrative Problems.

UNIT – II
Amplitude Modulation –II: Introduction to DSB-SC, Power calculations, Generation of DSB-SC, Balanced Modulators& Ring Modulator, Coherent detection of DSB-SC–Time domain description of SSB–Hilbert transform, Generation of SSB wave, Frequency

discrimination & Phase discrimination method, Demodulation of SSB Wave–Introduction to Vestigial sideband (VSB) modulation and its Features–Comparison of AM Techniques–Illustrative Problems.

UNIT – III

Angle Modulation: Generalized concept of angle modulation –Frequency modulation, Narrow band frequency modulation (NBFM) and Wide band FM (WBFM), Generation of FM waves, Indirect method, Direct method, Demodulation of FM, Phase modulation – Pre-emphasis& De-emphasis filters – FM Transmitter – Illustrative Problems.

UNIT – IV

Radio Receiver: Introduction to radio receivers & its parameters–Superheterodyne AM & FM Receiver.

Noise: Review of noise and noise sources–noise figure–Performance analysis of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise – Illustrative Problems.

UNIT – V

Analog Pulse Modulation Schemes: Sampling theorem, Nyquist rate – Pulse amplitude modulation (PAM) & demodulation, Transmission bandwidth– Pulse-Time Modulation, Pulse Duration and Pulse Position modulations and demodulation schemes– Multiplexing Techniques, FDM, TDM.

Information Theory: Introduction to information theory, Entropy, Mutual information, Channel capacity theorem– Shannon-Fano encoding algorithm–Illustrative Problems.

TEXT BOOKS

1. Simon Haykin, *Communication Systems*, Wiley-India, 2nd Edition, 2010.
2. A. Bruce Carlson, & Paul B. Crilly, *Communication Systems – An Introduction to Signals& Noise in Electrical Communication*, McGraw-Hill, 5th Edition, 2010.

REFERENCES

1. Herbert Taub & Donald L.Schilling, *Principles of Communication Systems*, Tata McGraw-Hill, 3rdEdition, 2009.
2. R.E. Ziemer& W.H. Tranter, *Principles of Communication-Systems Modulation & Noise*, Jaico Publishing House, 2001.
3. George Kennedy and Bernard Davis, *Electronics & Communication System*, TMH, 2004.

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(19EC0409) LINEAR & DIGITAL IC APPLICATIONS

COURSE OBJECTIVES
The objectives of this course:

1. *To Design of OPAMPS, Classification of OPAMPs*
2. *To study and design various linear and non linear applications of OPAMPs*
3. *To Learn VHDL programming Language.*
4. *To design Complex Combinational and Sequential circuits using Standard Digital ICs.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Able to define internal structures of the op amp and basic concepts of filters, timers and converters*
2. *Able to experiment the linear, nonlinear applications of op-amp with specialized ICs and converters.*
3. *Evaluate the applications of op-amp circuits, specialized ICs and converters.*
4. *Able to design the op amp circuits and converters for real time applications.*
5. *Understand CMOS and TTL Logic families and their interfacing.*
6. *Describe various design style of VHDL programming.*
7. *Apply the knowledge of VHDL programming to develop VHDL model for standard combinational and sequential IC structures.*

UNIT – I
Op-Amp Characteristics: Basic information of Op-amp – ideal and practical Op-amp – Op-amp block diagram – Op-amp characteristics – DC and AC characteristics – 741 Op-amp and its features.

Op-Amp Linear Applications: Modes of operation-Inverting, Non-inverting, Differential– Basic applications of Op-amp, Instrumentation amplifier, AC amplifier, V to I and I to V converters **-S**ample & Hold circuits – Differentiator and Integrator, – Comparators– Schmitt trigger.

UNIT – II
Active Filters: Introduction – 1^{st} order LPF – HPF filters – Band pass, – Band reject and all pass filters.

Oscillators: Oscillator types – Principle of operation, RC phase shift, Wien Bridge.

Timers: Introduction to 555 timer, Functional diagram, Monostable and Astable operations, Applications.

UNIT – III

Phase Locked Loops: Introduction, Block schematic, Principles and description of individual blocks of 565, Basic IC Regulators.

D/A and A/D Converters: Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC– Different types of ADCs, Parallel comparator type ADC, Counter type ADC, Successive approximation ADC and dual slope ADC – DAC and ADC specifications.

CMOS Logic: Introduction to logic families – CMOS logic – Bipolar logic – Transistor logic – low voltage CMOS logic and interfacing – Emitter coupled logic.

UNIT – IV

Hardware Description Languages: HDL Based Digital Design, the VHDL Hardware Description Language – Program Structure – Types – Constants and Arrays – Functions and procedures – Libraries and Packages – Structural design elements – Dataflow design elements – Behavioral design elements – The Time Dimension.

UNIT – V

Combinational Logic Design Practices- Description of basic structures like Decoders – Encoders – Comparators – Multiplexers (74 – series MSI) – Adders & sub tractors VHDL models for the above standard building block ICs.

Sequential Logic Design Practices: Latches & flip flops – counters – shift register and their VHDL models for the above standard building block ICs.

TEXT BOOKS

1. D.Roy Chowdhury, *Linear Integrated Circuits,* New Age International (p) Ltd, 2nd Edition., 2003.
2. John F. Wakerly *Digital Design Principles & Practices,* PHI/ Pearson Education Asia, 3rd Ed.2005.

REFERENCES

1. Ramakanth A.Gayakwad, *Op-amps & Linear IC ,* PHI, 1987.
2. R.F.Coughlin & Fredric F.Driscoll, *Operational Amplifiers & Linear Integrated Circuits,* PHI.
3. Sergio Franco, *Design with Operational amplifiers & Analog Integrated circuits,* McGraw Hill, 3rd Edition , 2002.
4. Floyd and Jain, *Digital Fundamentals,* Pearson Education, 8th Edition 2005.
5. J. Bhasker, *A VHDL Primer,* Pearson Education/ PHI, 3rd Edition.

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(19EC0410) ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

COURSE OBJECTIVES

The objectives of this course:

1. *To be proficient in the use of time varying Electromagnetic fields in 3-D co-ordinate systems.*
2. *To understand the use of Maxwell's equation in Electric and Magnetic field.*
3. *To understand the use Transmission Lines and their applications.*

COURSE OUTCOMES

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

1. *Remembering the concept of time varying electromagnetic fields in three dimensional spatial co-ordinate systems.*
2. *Evaluate the Maxwell's Equation in Static Electric and Magnetic Field*
3. *Apply Maxwell's equation in Electromagnetic field.*
4. *Characterize Maxwell's equation in Time varying field.*
5. *Understand propagation of electromagnetic waves in different media.*
6. *Understand the concepts and characteristics of Transmission lines.*

UNIT – I

Electrostatic Fields: Coulomb's Law and Field Intensity - Electric Fields due to Continuous Charge Distributions – Line Charge, Surface Charge, Volume Charge - Electric Flux Density - Gauss Law – Applications of Gauss Law – Point Charge, Infinite Line Charge, Infinite Sheet Charge, Uniformly Charged Sphere - Electric Potential - Relations Between E and V - Illustrative Problems.

UNIT – II

Magnetostatic Fields: Biot-Savart Law - Ampere's Circuital Law – Applications of Ampere's Circuit Law – Infinite Line Current, Infinite Sheet of Current - Magnetic Flux Density, Maxwell's Equations for Static EM Fields – Magnetic Scalar and Vector Potential - Illustrative Problems.

UNIT – III

Maxwell's Equations (Time Varying Fields): Faraday's Law - Transformer and Motional EMFs – Stationary Loop in Time Varying B Field, Moving Loop in Static B Field, Moving Loop in Time Varying Field - Displacement Current - Maxwell's Equations in Different Final Forms - Illustrative Problems.

UNIT – IV

EM Wave Propagation: Waves in General – Wave Propagation in Lossy Dielectrics – Plane Waves in Lossless Dielectrics – Plane Wave in Free Space – Plane Waves in Good Conductors - Power and
the Poynting Vector - Reflection of a Plane wave at Normal Incidence - Reflection of a Plane wave at Oblique – Parallel Polarization, Perpendicular Polarization - Illustrative Problems.

UNIT – V

Transmission Lines: Transmission Line Parameters – Transmission Line Equations – Input Impedance, SWR and Power – The Smith Chart – Applications of Transmission Lines – Transients on transmission Lines – Microstrip Transmission Lines – Illustrative Problems.

TEXT BOOKS

1. Matthew N.O. Sadiku, *Elements of Electromagnetics*, Oxford University Press, 3rd edition, 2008.
2. William H. Hayt Jr. and John A. Buck, *Engineering Electromagnetics*, Tata McGraw-Hill publications, 7th edition, 2006.

REFERENCES

1. E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems*, PHI, 2nd Edition, 2000
2. John D. Krauss, *Electromagnetics*, Tata McGraw-Hill publications, 4th edition, 1991.
3. Schaum'south line series, *Electromagnetics*, 2nd edition, Tata McGraw-Hill publications, 2006.

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(19CE0143) FUNDAMENTALS OF URBAN PLANNING

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the concept of balanced town by ensuring that new and existing facilities are complimentary to each other*
2. *To provide sustainable buildings by considering the environmental, social and economic conditions.*
3. *To create awareness about the traffic management within the town*

COURSE OUTCOMES (COs)

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

1. *Recognize issues related to town planning and discuss the objectives, necessity and stages of town planning*
2. *Summarize importance of zoning, can classify various town planning practices and can conduct surveys for town planning*
3. *Classify the residential building, list the agencies involved in improving house and review the problems associated with residential housing*
4. *Discuss the issues associated with slums and recognize the methods to improve condition of slums*
5. *Interpret norms laid down for public and industrial building and can summarize building bye-laws*
6. *List and discuss various urban roads and the concepts of traffic management in a town*

UNIT – I

Introduction to Town Planning: Objects of town planning -Necessity of town planning - Principles of town planning -Stages of Town Planning - Origin and growth of towns - Development of towns - Modern townplanning in India - Socio - Economic aspects of town planning - Selection of site for an ideal town – Cost of town planning.

UNIT – II

Surveys & Planning: Various types of surveys to be conducted for town planning project - Data to be collected in different types of town planning survey - Types of planning -A brief note on urban, rural and regional planning.

Zoning: Definition - Objects and principles of zoning - Advantages of zoning - Special Economic Zone (SEZ) - Maps for zoning.

UNIT – III

Housing: Classification of residential building as per HUDCO norms - Low Cost Housing - Housing policy - Different types of housing agencies involved in housing - Investment in Housing - Housing Problems in India.

Slums: Causes - growth - Characteristics -Effects - Slum clearance and re-housing - Prevention of slum formation - Financial assistance for slum clearance.

UNIT – IV

Public Buildings & Industries: Classification - Location - Design Principles of public building - Grouping of public buildings - Effects of Industries on towns and cities - Classification of industries – Requirements of an industry - Regulation of their location.

Building Bye-Laws: Objectives of bye-laws - Importance of bye-laws - Function of local authority - Responsibility of owner - Applicability of bye-laws - Principles underlying building bye-laws.

UNIT – V

Urban Roads: Objectives – Requirements - Classification - Types of street systems - Through and bypass roads - Outer and inner ringroads - Expressways - Freeways.

Traffic Management: Objectives - Traffic surveys - Traffic congestion - Traffic control - Parking - Road accidents - Traffic capacity of roads - Road intersections - Traffic islands - Roundabouts - Traffic signals - Road signs - Road markings - Street lighting in a town.

TEXT BOOKS

1. Rangwala, *Town Planning*, Charotar Publishing, 30th edition, 2018.
2. G K Hiraskar, *Fundamentals of Town Planning*, Dhanpat Rai Publications, New Delhi, 17th edition, 2018.

REFERENCES

1. Abirbandyopadhyay, *Text book of Town Planning*, Books & Allied(P) Ltd, 2000.
2. Peter Hall and Mark Tewdwr-Jones, *Urban and Regional Planning*, Routledge Publications, 5th edition, 2010.
3. Catanese A J, *Urban Planning*, McGraw Hill Publications, 2nd edition, 2014.

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(19EE0233) INDUSTRIAL INSTRUMENTATION

COURSE OBJECTIVES
The objectives of this course:

1. *To Analyse the Common errors that occur in measurement systems, and their classification.*
2. *To understand the characteristics of signals, their representation, and signal modulation techniques.*
3. *To learn the Methods of Data Transmission, Telemetry, and Data acquisition.*
4. *To study working principles of different Signal Analyzers and Digitalmeters.*
5. *To learn about several types oftransducers and their use for measurement of non-electrical quantities.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Identify and explain the types of errors occurring in measurement systems.*
2. *Differentiate among the types of data transmission and modulation techniques.*
3. *Apply digital techniques to measure voltage, frequency and speed.*
4. *Analyse the working principles of different Signal Analyzers and Digital meters.*
5. *Understand the operation of several types of transducers.*
6. *Choose suitable Transducers for the measurement of non-electrical quantities.*

UNIT-I
Characteristics of Signals and their Representation: Measuring Systems, Performance Characteristics, Static Characteristics, Dynamic Characteristics, Errorsin Measurement Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation.

UNIT-II
Data Transmission, Telemetry and DAS: Methods of Data Transmission–General Telemetry System. Frequency Modulation (FM), PulseModulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Data Acquisition Systems–Components of Analog DAS–

Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing– Digital DAS–Block Diagram—Modern Digital DAS (Block Diagram).

UNIT-III

Signal Analyzers, Digital Meters: Wave Analysers-Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers-Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays,Vector Impedance Meter, QMeter. Peak Reading and RMS Voltmeters, Digital Voltmeters-Successive Approximation, Ramp and Integrating Type-Digital Frequency Meter-Digital Multimeter- Digital Tachometer

UNIT-IV

Transducers: Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers, Principle of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Synchros, Piezoelectric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes.

UNIT-V

Measurement of Non-Electrical Quantities: Measurement of strain, Gauge Sensitivity, Measurement of Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level.

TEXT BOOKS

1. A.K. Sawhney, Dhanpat Rai & Co, *A course in Electrical and Electronic Measurements and Instrumentation,* 2012.
2. D.V.S. Murty, *Transducers and Instrumentation,* Prentice Hall of India, 2nd Edition, 2004.

REFERENCES

1. A. Dhelfrick and W.D.Cooper, *Modern Electronic Instrumentation and Measurement Technique,* Pearson/Prentice Hall of India, 1990.
2. H.S.Kalsi, *Electronic Instrumentation,* Tata Mc Graw-Hill Edition, 2010.
3. T.R.Padmanabhan, *Industrial Instrumentation – Principles and Design,* Springer.

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(19ME0350) MECHANICAL MEASUREMENTS & CONTROL SYSTEMS

COURSE OBJECTIVES

The objective of this course :

1. *Impart brief knowledge on basic principles and performance characteristics of measurement.*
2. *Familiarize student with basic principles to measure the temperature, pressure with the help of Thermocouple and different pressure gauges.*
3. *Make the student learn measurement of Speed, Acceleration and Vibration with the help of various instruments.*
4. *Enable the student to understand the measurement of Fuel level, measurement of Flow and Humidity, parameters like Force, Torque, Power and also learn about the basic principles, and applications of various control systems.*
5. *Make the student to Select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance.*

COURSE OUTCOMES

On *successful completion of the course, student will be able to,*

1. *State the basic principles of measurement systems and explain its performance characteristics*
2. *Distinguish the types of various temperature and pressure measurement instruments and finds the best one for the industrial applications*
3. *Explicate the principle of measurement of Speed, Acceleration and Vibration instruments and describe its working*
4. *Illustrate the operation of Fuel level, measurement of Flow and Humidity Measurement instruments and also state the applications of various control systems*
5. *Identify the appropriate device for the measurement of temperature, pressure, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance.*
6. *Classify the various types of control systems for the measurement of temperature, speed and position*

UNIT-I

Definition - Basic principles of Measurement systems, configuration and functional descriptions of measuring instruments. Sources of error, Classification and elimination of error.

Measurement of Displacement: Types & Working - Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT-II

Measurement of Temperature: Classification of temperature measuring instruments, Principles - Types - Expansion, Electrical Resistance - Thermistor - Thermocouple - Pyrometers - Temperature Indicators.

Measurement of Pressure: Classification of pressure measuring devices – Principles - Manometers, Bourdon pressure gauges, Bellows - Diaphragm gauges. Low pressure measurement – Thermal Conductivity gauges - ionization pressure gauges, Mcleod pressure gauge.

UNIT - III

Measurement of Speed, Acceleration and Vibration: Tachometers, Seismic instruments - Vibrometer and accelerometer.

Stress & Strain Measurements: Electrical strain gauge, Resistance strain gauge , compressive and tensile strains, Strain gauge Rosettes.

UNIT -IV

Measurement of Level: Direct method - Indirect methods - capacitative, ultrasonic, magnetic, cryogenic fuel level indicators - Bubler level indicators.

Flow Measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot - wire anemometer Laser Doppler Anemometer (LDA).

UNIT - V

Measurement of Force, Torque and Power- Elastic force meters, load cells, Torsion meters, Dynamometers.

Elements of Control Systems: Classification - Open and closed systems Servo mechanisms- Temperature, speed & position control systems

TEXT BOOKS

1. D.S.Kumar, *Mechanical Measurements & Control*, Metropolitan Book Co Pvt. Ltd, 5th Revised Edition,2012.
2. Thomas G.Beckwith, Roy D.Marangoni & John H.Lienhard, *Mechanical Measurements*, Pearson Publishers,6th Edition.

REFERENCES

1. B.C.Nakra & KKChaudhry, *Instrumentation, measurement & analysis*, TMH Publishers, 3rd Edition.
2. R.K. Jain, *Mechanical and Industrial Measurements,* Khanna Publishers,11th Edition.

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(19CS0551) JAVA PROGRAMMING

COURSE OBJECTIVES
The objectives of this course:

1. *Introduce standard tools and techniques for software development.*
2. *Understand the object oriented approach for automated software build process.*
3. *Introduce the concepts of AWT framework.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Implement simple abstract data types and design abstraction functions.*
2. *Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.*
3. *Apply object-oriented design patterns for problem solving.*
4. *Implement Exception handling with synchronization.*
5. *Execute programs on Multithreading and String handling concepts.*
6. *Design applications with an event-driven graphical user interface.*

UNIT- I
The Java Language: Importance of Java -Programming Paradigms -The History and Evolution of Java -Java Byte Code.

Introduction of OOP: Abstraction, Encapsulation, Inheritance, Polymorphism-Understanding static -Varargs -Data Types -Type Casting -Java Tokens - Java Statements - Arrays.

UNIT- II
Introducing Classes –Class Fundamentals -Declaring Objects -Introducing Methods Introduction to Constructors -Garbage Collection-Introducing final -Inheritance - Method Overriding -abstract classes -Packages and Interfaces.

UNIT- III
Exception Handling - Exception Fundamentals - Exception Types -Uncaught Exceptions - Using try and catch - Nested try Statements -throw -throws –finally -Creating Your Own Exception Subclasses - Chained Exceptions.

UNIT-IV

Multithreaded Programming - The Java Thread Model -Thread Priorities -The Thread Class and the Runnable Interface - Creating Multiple Threads -Using isAlive( ) and join( ) – Synchronization- String Handling.

UNIT- V

Generics-A simple Generic Example-General form of Generic class -Generic Interfaces Collection Framework-Collections overview, Collection class, Collection interfaces.

Introducing the AWT - Using AWT Controls-Layout Managers -Introducing Swing - Exploring Swing.

TEXT BOOKS

1. Herbert Schildt, *The Complete Reference Java*, Eighth Edition , McGraw Hill.
2. Y Daniel Liang, *Introduction to Java programming* — Que E &T.

REFERENCES

1. P.J. Deitel and H.M. Deitel, *Java for Programmers,* Pearson education.
2. Bruce Eckel, *Thinking in Java*, Pearson Education.

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(19HS0814) INTELLECTUAL PROPERTY RIGHTS

COURSE OBJECTIVES

The objectives of this course:

1. *To provide an understanding of the concept and significance of intellectual property rights*
2. *To understand the concept of trademarks, copy rights, patents and the need for their protection*
3. *To comprehend the concept of competition, unfair competition and the latest developments in the laws pertaining to intellectual property rights*

COURSE OUTCOMES:

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

1. *Become aware of intellectual property rights, concepts, treaties, agencies and international organizations involved in sanctioning IP rights*
2. *Identify different types of intellectual properties, ownership rights and the scope of the protection*
3. *Get an adequate knowledge on patents, trademarks, copy rights and to get property rights for their intellectual work*
4. *Able to identify, apply, and assess ownership rights, registration processes for IP rights*
5. *To discern the approaches for intellectual property management and intellectual property audits*
6. *Demonstrate knowledge and understanding on unfair competition and latest developments in IP rights at international level*

UNIT-I

Introduction To Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-III

Law Of Copy Rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law Of Patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.
Unfair Competition: Misappropriation right of publicity, False advertising.

UNIT-V

New Development of Intellectual Property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS

1. Deborah, E. Bouchoux, *Intellectual property right*, cengage learning.
2. Nityananda KV, *Intellectual property rights: Protection and Management.* India, Cengage Learning India Private Limited.

REFERENCES

1. Prabuddha ganguli, *Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing Company Ltd.
2. Ahuja VK, *Law relating to Intellectual Property rights.* India. IN: Lexis Nexis
3. Neeraj P &Khushdeep D, *Intellectual Property Rights,* India, PHI learning pvt limited.

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(19EC0411) ELECTRONIC CIRCUIT ANALYSIS LAB

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the analysis and design of single stage and multi stage amplifiers.*
2. *To construct feedback amplifiers, oscillators, power amplifiers, Tuned Amplifiers and Multivibrators.*
3. *To simulate various analog electronic circuits and to determine their characteristics.*

COURSE OUTCOMES (COs)
On successful completion of the course, students will be able to

1. *Acquire knowledge in different electronic circuits using transistor amplifier.*
2. *Analyze and design of amplifiers, feedback amplifiers, oscillators, Tuned amplifiers and Multivibrators.*
3. *Measure and simulate important parameters of various amplifiers which are used to understand the behavior of analog electronic circuits.*
4. *Identify a suitable analog electronic circuit for various applications with a given specification.*
5. *Function effectively as an individual and as a member in a group in the area of analog electronic circuits.*
6. *Develop skills to communicate in verbal and written form in the area of analog electronic circuits.*

List of Experiments:
(Minimum of Twelve experiments to be conducted)

CYCLE-I

TESTING IN THE HARDWARE LABORATORY

(Any 6 experiments from the following)

1. A two stage RC coupled amplifier
2. Darlington pair amplifier
3. Voltage series feedback amplifier
4. RC phase shift oscillator using BJT
5. Colpitts oscillator using BJT
6. Class A power amplifier (Transformer less)
7. Single tuned voltage amplifier
8. Astable Multivibrator

CYCLE-II

SIMULATING IN THE SIMULATION LABORATORY USING ANY SIMULATION SOFTWARE:

(Any 6 experiments from the following)

1. A two stage RC coupled amplifier
2. Darlington pair amplifier
3. Voltage series feedback amplifier
4. RC phase shift oscillator using BJT
5. Colpitts oscillator using BJT
6. Class A power amplifier (Transformer less)
7. Single tuned voltage amplifier
8. Astable Multivibrator

Additional Experiment:

One Mini project of electronic application (PCB Design)

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(19EC0412) ANALOG COMMUNICATIONS LAB

COURSE OBJECTIVES
The objectives of this course:

1. *Toexperiencerealtimebehaviorofdifferentanalog&digitalmodulationschemes*
2. *To provide a real time experience for different analog modulation systems and demodulation schemes*
3. *To provide exposure to the real time behavior of different elements available in analog communication system such as filters, amplifiers etc*
4. *To perform radio receiver measurement.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Technically visualize spectra of different analog modulation schemes*
2. *Analyze practical behavior of different elements available in analog communication system such as filters, amplifiers etc.*
3. *Measure characteristics of radio receiver measurements.*
4. *Experience real time behavior of different analog modulation schemes*
5. *Acquire knowledge about pulse modulation systems*
6. *Observe the modulation and demodulation behavior of various modulation techniques*

List of Experiments: (All Experiments are to be conducted)

Cycle-I

1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation.
3. Phase modulation and demodulation.
4. Characteristics of Mixer.
5. Pre-emphasis & de-emphasis

Cycle-II

1. Pulse amplitude modulation & demodulation.
2. Pulse width modulation & demodulation
3. Pulse position modulation & demodulation.
4. Radio receiver measurements–sensitivity, selectivity, and fidelity.
5. Time division multiplexing

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(19EC0413) LINEAR & DIGITAL IC APPLICATIONS LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To apply operational amplifiers in linear and nonlinear applications.*
2. *To acquire the basic knowledge of special function ICs.*
3. *To design internal structure of the Digital Integrated Circuits, develop VHDL source code & verify functionality using simulation.*

COURSE OUTCOMES (COs)

On Successful Completion of this, Course the Student will be able to

1. *Design and analyze the various linear & Non-Linear applications of op-amp.*
2. *Design and analyze filter circuits using op-amp.*
3. *Design and analyze oscillators and multivibrators circuits using op-amp(IC741) or IC 555*
4. *Design and draw the internal structure of the various digital integrated circuits.*
5. *Develop VHDL/Verilog HDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.*
6. *Verify the logical operations of the digital IC"s (Hardware) in the laboratory.*

PART-A

Linear IC Applications Lab

(Any Six Experiments to be conducted)

1. Study the characteristics of Negative feedback amplifier - Inverting, Non-Inverting and Unit Gain Amplifiers
2. Active Filter Applications – LPF, HPF (first order).
3. Integrator and Differentiator
4. Comparator –Applications
5. Schmitt Trigger
6. IC 555 Timer – Monostable and Astable Operation Circuit.
7. Wein bridge oscillator
8. 4 Bit DAC using Op-Amp.

PART-B

Digital IC Applications Lab

(Any Six Experiments to be Conducted)

1. Logic Gates- 74XX.
2. Half Adder, Half Subtractor, Full Adder, Full Subtractor & Ripple Carry Adder.
3. 3-8 Decoder -74138 & 8-3 Encoder- 74X148.
4. 8x 1 Multiplexer -74X151 and 2x4 Demultiplexer-74X155.
5. 4-bit Comparator-74X85.
6. D Flip-Flop 74X74.
7. JK Flip-Flop 74X109.
8. Decade counter-74X90.

Equipment required for Laboratories

1. RPS
2. ASLK Pro Kit
3. CRO
4. Function Generator
5. Multi Meters
6. IC Trainer Kits (Optional)
7. Bread Boards
8. Components: - ICTL082, IC555, IC566, IC 565 and other essential components.
9. Analog IC Tester

For Software Simulation

1. Computer Systems
2. LAN Connections (Optional)
3. Operating Systems
4. VHDL/ VERILOG 5. FPGAS/CPLDS (Download Tools)

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(19HS0805) ENVIRONMNETAL SCIENCE

COURSE OBJECTIVES
The objectives of this course:

1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.
2. To identify the importance of interlinking of food chains.
3. Learn about various attributes of pollution management and waste management practices.

COURSE OUTCOMES (COs)
On Successful Completion of this Course, the Student will be able to

1. Recognize the physical,chemical and biological components of the earth's systems and show how they function.
2. Characterize and analyze human impacts on the environment.
3.Integrate facts,concepts and methods from multiple disciplines and apply to environmental problems.
4.Create informed opinions about how to interact with the environment on both a personal and a social level.
5. Perform independent research on human interactions with the environment.
6. Recognize the ecological basis for regional and global environmental issues

UNIT – I

Introduction: Definition, Scope and Importance of environmental science,Need for Public Awareness

Natural Resources: Forest resources: Use and over-exploitation, deforestation,Mining, dams and their effects on forests 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

Energy resources: Renewable and Non- Renewable sources of energy. Solar energy, Hydro electrical energy, Wind energy, Nuclear energy .

UNIT-II

Ecosystems: Concept of an ecosystem,structure and function of an ecosystem.Producers, Consumers and D ecomposers. Biogeochemical cycles, Ecological succession,energy flow in

an ecosystem,Foodchains, food webs and ecological pyramids.Types of ecosystems (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem.

UNIT-III

Biodiversity And Its Conservation: Introduction, Definition, genetic, species and ecosystem diversity, Bio-geographical classification of India, India as a Mega diversity Nation, Hot spots of biodiversity, Value of biodiversity, Threats to biodiversity, Endemic, Endangered and Extinct species of India, In-Situ and Ex-situ conservation of biodiversity.

UNIT-IV

Environmental Pollution And Global Environmental Issues: Natural Disasters: Droughts, Floods, Cyclone, Landslides, Earthquake.
Pollution episodes: Air pollution,Water pollution, Land pollution,Noise pollution, Automobile, Nuclear pollution. Global warming, Acid rain,Ozone layer depletion and controlling measures.
Global Environmental Issues: Population Growth, Urbanizations, Land Management, Water and Waste Water Management. Climate change and impacts on human environment.
Solid Waste Management: causes, effects and control measures of Municipal solid wastes.
E-waste and management, Role of an individual in prevention of pollution .

UNIT-V

Environmental Legislations, Laws, Policies For Sustainable Development: Environment

Protection Act, Air (Prevention and Control of Pollution) Act, Water Act.

Wildlife protection Act, Forest conservation Act.Municipal Solid Waste management. International conventions/Protocols Earth summit, Kyoto protocol and Montreal Protocol. Unsustainable to sustainable development, Role of NGO's for Sustainable development. Role of IT in Environment, GIS methods for Sustainable development.
Field work- visit to a local area to document environmental assets, river ,forest, grassland/hill, mountain and polluted sites (urban/rural/industrial/Agriculture).study simple ecosystems.

TEXT BOOKS

1. A.Kaushik and C.P.Kaushik, *Environmental Sciences, 5th edition*, New age international publishers, 2015.
2. M.Anji Reddy, *Text Book of Environmental Science and Technology*, BS Publications, 2016.

REFERENCES

1. Anil Kumar and Arnab Kumar De, *Environmental Studies*, New Age International Publishers, New Delhi, 3rd Edition 2015.
2. R.K. Trivedi, *Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards*, Vol.I and II, Enviro Media, 2016.

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(19EE0212) CONTROL SYSTEMS

COURSE OBJECTIVES
The objectives of this course:

1. *To make the students familiarize various representations of systems.*
2. *To make the students analyze the stability of linear systems in time domain and frequency domain.*
3. *To make the students analyze the stability of linear systems in frequency domain.*
4. *To make the students design compensator based on the time and frequency domain specifications.*
5. *To develop linear models mainly state variable model and Transfer function model*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Identify open and closed loop control system*
2. *Represent simple systems in transfer function and state variable forms.*
3. *Analyse simple systems in time domain.*
4. *Analyse simple systems in frequency domain.*
5. *Infer the stability of systems in time and frequency domain.*
6. *Interpret characteristics of the system and find out solution for simple control problems.*

UNIT-I
Systems And Representation: Control systems: – Open and closed loop systems –First principle modeling: Mechanical, Electrical and Electromechanical systems - Transfer function representations: Block diagram – Signal flow graph

UNIT-II
Time Domain Analysis: Time Response Analysis - Standard test input signals – Time response - Time domain specifications, Transient and steady state response of first and second order systems- Error constants, Steady state error and generalized error constants–- Proportional, integral and derivative Controllers.

UNIT-III

Stability Analysis: Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation. Effect of adding poles and zeros.

UNIT-IV

Frequency Domain Analysis: Frequency Response Analysis: Frequency domain specifications, Frequency response plots - Bode Plots, Polar plots, Nyquist Plots, Gain margin and Phase margin – Stability Analysis. Lead, Lag and Lag-lead compensators.

UNIT-V

State Space Analysis: State, state variables and state model, diagonalization, solution of state equations- State transition matrix and its properties. Concept of controllability and observability.

TEXT BOOKS

1. Benjamin C. Kuo, *Automatic Control Systems*, 7th edition PHI Learning Private Ltd, 2010.
2. Nagarath, I.J. and Gopal, M., *Control Systems Engineering*, New Age International Publishers 2010.

REFERENCES

1. Richard C.Dorf and Bishop, R.H., *Modern Control Systems*, Education Pearson, 3 Impression, 2009.
2. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, *Linear Control System*
3. *Analysis and Design with MATLAB*, CRC Taylor& Francis Reprint 2009.
4. Katsuhiko Ogata, *Modern Control Engineering*, PHI Learning Private Ltd, 5thEdition,2010
5. NPTEL Video Lecture Notes on *Control Engineering* by Prof

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(19EC0414) ANTENNAS AND WAVE PROPAGATION

COURSE OBJECTIVES

The objectives of this course:

1. *To learn the Fundamentals of electromagnetic: radiation, wave equation, retarded potential, short current element, near and far fields, Poynting's theorem.*
2. *To Design of antenna arrays: principle of pattern multiplication.*
3. *To understand broadside and end fire arrays, array synthesis, coupling effects and mutual impedance, parasitic elements, Yagi-Uda antenna.*

COURSE OUTCOMES (COs)

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

1. *Understand the basic principles of all types of antennas calculate the far field region.*
2. *Analyze different types of antennas and their parametric integral expressions for a given current source for various frequency ranges.*
3. *Calculate electromagnetic fields of a given vector potential for practical antennas.*
4. *Implement pattern multiplication principle for some practical array antennas such as dipole, Yagi - uda, and horn antenna.*
5. *Apply the radiation patterns of antennas through measurement setups.*
6. *Learn various modes of wave propagation and their parameters.*

UNIT-I

Antenna & Radiation Parameters: Antenna Basics & Parameters – Radiation Pattern, Radiation Intensity, Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam Efficiency. Matching, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole and Quarter wave monopole and its radiation parameters.

UNIT-II

VHF, UHF and Microwave Antennas –I: Folded Dipoles, Arrays with Parasitic Elements – Yagi-Uda Arrays. Helical Antennas, and its modes, Normal Mode, Axial Mode. Horn Antennas – Types, Optimum Horns- Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT-III

VHF, UHF and Microwave Antennas – II & Antenna Measurements: Micro strip Antennas – Introduction, features, advantages and limitations, Rectangular patch antennas –

Geometry, characteristics of Micro strip antennas, Introduction to Reflector Antenna, parabola reflectors, pattern characteristics, Feed Methods.
Antenna Measurements – Introduction, Concepts – Reciprocity, Near and Far Fields, Coordination system, sources of errors, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute).

UNIT-IV

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources – Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison of BSA & EFA, Binomial Arrays, Illustrative problems.

UNIT-V

Wave Propagation: Different modes of wave propagation, Structure of Ground wave propagation, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Illustrative problems.

TEXT BOOK

1. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, *Antennas and wave propagation*, TMH, New Delhi, 4th Ed., (special Indian Edition), 2010.
2. C.A. Balanis, *Antenna Theory- Analysis and Design*, John Wiley & Sons, 2nd Edition.2001.

REFERENCES

1. K.D. Prasad, Satya Prakashan, *Antennas and Wave Propagation*, 4th Ed.,Tech. India Publications, New Delhi, 2001.
2. E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems*, PHI, 2nd Edn, 2000.
3. E.V.D. Glazier and H.R.L. Lamont, *Transmission and Propagation - The Services Text Book of Radio*, vol. 5, Standard Publishers Distributors, Delhi.
4. F.E. Terman, *Electronic and Radio Engineering*, McGraw-Hill, 4th edition, 1955

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(19EC0415) DIGITAL COMMUNICATIONS

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the building blocks of digital communication system.*
2. *To Understand and analyze the signal flow in a digital communication system.*
3. *To learn the basic principles of baseband pulse transmission and passband data transmission.*
4. *To analyze error performance of a digital communication system in presence of noise and other interferences.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the Elements of Digital Communication System, Fundamental concepts of sampling theorem along with various base band and pass band transmission techniques.*
2. *Describe and determine the performance of line codes and methods to mitigate inter symbol interference.*
3. *Analyze the generation and detection of band pass and pass band systems.*
4. *Apply the concepts of signal space diagram, spectrum, and bandwidth efficiency in different transmission techniques.*
5. *Analyze the performance of various schemes for the reliable transmission of digital representation of signals and information over the channel.*
6. *Apply the knowledge of digital electronics in characterizing digital communication system.*

UNIT – I
Introduction & Source Coding Systems: Digital communication system model, analog vs. digital communication, Fundamental limitations of communication systems, Sampling process – quantization – quantization noise, Pulse Code Modulation (PCM) – Noise considerations in PCM systems, Differential PCM (DPCM), Delta modulation (DM), Comparison of the above systems, Illustrative Problems.

UNIT – II
Baseband Pulse Transmission: Introduction, Matched filter – Properties of Matched filter – Matched filter for rectangular pulse, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, Correlative coding, Duo binary & Modified duo

binary signaling schemes, Baseband M-array PAM transmission, Eye diagrams – Illustrative Problems.

UNIT – III

Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt Orthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Correlation receiver, Equivalence of correlation and Matched filter receivers, Signal constellation diagram - Illustrative Problems.

UNIT – IV

Passband Data Transmission: Passband transmission model, Coherent digital modulation schemes – ASK, binary phase shift keying (BPSK), Quadrature shift keying (QPSK) & Binary Frequency shift keying (BFSK), Error probabilities of BPSK, QPSK & BFSK, Generation and detection of Coherent ASK, BPSK, QPSK & BFSK, M-ary PSK, M-ary Quadrature amplitude modulation, non-coherent orthogonal modulation schemes -Differential PSK, Binary FSK, Generation and detection of non-coherent BFSK, DPSK, Illustrative Problems.

UNIT – V

Channel Coding: Introduction – Error Detection & Correction – Parity Check Codes – Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes–Matrix Representation of Block Codes(encoding) – Syndrome decoding, Convolutional Codes – Convolutional Encoding – Decoding Methods – Illustrative Problems.

TEXT BOOKS

1. Simon Hakin, "*Communication Systems*," Wiley India Edition, 4th Edition, 2011.
2. Bruce Carlson A, & Paul B. Crilly, "*Communication Systems – An Introduction to Signals & Noise in Electrical Communication*", Mc Graw-Hill International Edition, 5th Edition, 2010.

REFERENCES

1. Sam Shanmugam, "*Digital and Analog Communication Systems*", John Wiley, 2005.
2. B.P. Lathi, & Zhi Ding, "*Modern Digital & Analog Communication Systems*", Oxford University Press, International 4th edition, 2010.
3. Bernard Sklar, "*Digital Communications*", Prentice-Hall PTR, 2nd edition, 2001.
4. Herbert Taub & Donald L Schilling, "*Principles of Communication Systems*", Tata McGraw- Hill, 3rd Edition, 2009.
5. J. G. Proakis, M Salehi, Gerhard Bauch, "*Modern Communication Systems Using MATLAB*," CENGAGE, 3rd Edition, 2013.

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(19EC0416) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

COURSE OBJECTIVES
The objectives of this course:

1. *Explain basic concepts and definitions in measurement.*
2. *Describe the bridge configurations and their applications.*
3. *Elaborate discussion about the importance of signal generators and analyzers in Measurement.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the evolution and history of units which are useful in measuring various parameters.*
2. *Apply various methods that can be used to measure different parameters using electronic instruments.*
3. *Analyze the design techniques of various electronic measuring instruments.*
4. *Practice the construction of testing and measuring set up for electronic systems.*
5. *Understand the design of measuring instruments which can measure different frequency ranges and visualize the waveforms in communication system.*
6. *Relate the usage of various instrumentation standards.*

UNIT-I
Performance characteristics of Instruments: Static characteristics- Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration-Errors in Measurement and their statistical analysis, Dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters-DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters –multirange, range extension-Thermocouple type RF ammeter-ohm meters, series type, shunt type-multimeter for voltage, current and resistance measurements.

UNIT-II
Oscilloscopes: Standard specifications of CRO-CRT features-derivation of deflection sensitivity- vertical and horizontal amplifiers-horizontal and vertical deflection systems-sweep trigger pulse- delay line-sync selector circuits, probes for CRO – active, passive, and attenuator type-triggered sweep CRO, and Delayed sweep-dual trace/beam CRO-Measurement of amplitude, frequency and phase (Lissajous method)-Digital storage oscilloscope- Digital frequency counters.

UNIT-III

Signal generators-fixed and variable-AF oscillators-function generators-pulse, random noise, sweep, and arbitrary waveform generators, specifications and principles of working (Block diagram approach)-Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT-IV

Review of DC Bridges: Wheatstone bridge,Wein Bridge, errors and precautions in using bridges

AC bridges: Measurement of inductance-Maxwell‟s bridge, Anderson Bridge-Measurement of capacitance- Schearing Bridge.Kelvin Bridge-Q-meter-EMI and EMC.

UNIT-V

Sensors and Transducers : Active and passive transducers-Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) -Temperature (resistance thermometers, thermocouples, and thermistors)-Velocity- Acceleration-Vibration.

TEXT BOOKS

1. H.S.Kalsi, *Electronic instrumentation*, second edition, Tata McGraw Hill, 2004.
2. K. Lal Kishore, *Electronic Measurements & Instrumentations*, Pearson Education, 2009.

REFERENCES

1. A.D. Helfrick and W.D.Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI, 5th Edition, 2002.
2. Ernest O Doebelin and Dhanesh N Manik, *Measurement Systems Application and Design*, TMH, 5th Edition, 2009.
3. Oliver and Cage, *Electronic Measurement and Instrumentation*, TMH.
4. Robert A.Witte, *Electronic Test Instruments, Analog and Digital Measurements*, Pearson Education, 2nd Ed., 2004.
5. David A. Bell, *Electronic Instrumentation & Measurements*, PHI, 2nd Edition, 2003.

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(19CE0129) ELEMENTS OF ROAD TRAFFIC SAFETY
(OPEN ELECTIVE – III)

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the accident statistics globally and in India specifically, its causes and measures to overcome the situation.*
2. *The traffic regulation, parking problems, understanding of road signs, signals and marking are also taught; so that the student is well informed about all safety measures that a traffic engineer need to understand*
3. *To understand the various aspects of street lighting*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Identify the causes for road accidents and can implement measures to prevent road accidents*
2. *Describe traffic regulations and implement parking methods*
3. *Classify different traffic signal and can design traffic signal system*
4. *List and illustrate various traffic signs*
5. *List and discuss various road markings*
6. *Discuss importance of street lighting and classify various street lighting system*

UNIT–I
Road Accidents – Causes & Prevention: Road Accidents & Traffic Engineering – Accident Situation in India – International Comparison of Road Accidents – Road & its Effects on Accidents – The Vehicle – The Driven – Skidding – Speed in Relation of Safety – Weather & its Effects on Accidents – Pedestrian Safety -Cyclists – Motor Cycle & Scooter Rider – Parking & Its Influence on Accident – Legislation, Enforcement, Education & Propaganda – Cost of Road Accidents

UNIT–II
Regulations of Traffic: Basic Principals of Regulation – Regulation of Speed – Regulation of Vehicles – Regulations Concerning the Driver – Regulations Concerning Traffic – Parking Regulations – Enforcement of Regulations.

Parking: Traffic & Parking Problems – Ill-Effects of Parking – Zoning & Parking Space Requirement Standards – Design Standards for On-Street Parking Facilities – Traffic Regulatory Measures for On-Street Parking – Off-Street Parking Facilities – Peripheral Parking Schemes – Loading & Unloading Facilities – Truck Terminals – Long Distance Bus Terminal

UNIT–III

Traffic Signs: Importance of Traffic Signs – Need for International Standardization – The Situation in India – General Principals of Traffic Signing – Types of Traffic Signs – Danger Signs (Warning Signs or Cautionary Signs) – Prohibitory Signs – Mandatory Signs – Informatory Sings – Indication Signs – Direction Signs, Advance Direction Signs & Place Identification Signs – Overhead Sings – Route Marker Sings – Location, Height & Maintenance of Traffic Sings.

UNIT–IV

Traffic Signals: Advantages & Disadvantages of Traffic Signals – Signal Indications – Signal Face – Illustration of the Signals – Number & Location of Signals Faces – Amber Period, Red/Amber Period & Inter Green Period – Fixed Time Signals & Vehicle Actuated Signals – Determination of Optimum Cycle Length & Signal Settings for an Intersection with Fixed Time Signals – Warrants for Signals – Co-ordinated Control of Signals – Signal Approach Dimensions – Area Traffic Control – Delay at Signalized Intersection.

UNIT–V

Road Markings: Function – Types of Road Marking – General Principals of Longitudinal Pavement Markings – Material & Colour – Centre Lines – Traffic Lane Lines – No Overtaking Zone Markings – Pavement Edge Lines – Carriageway Width Reduction Transition Marking – Obstruction Approach Markings – Stop Lines – Pedestrian Crossings – Cyclist Crossings – Route Direction Arrows – Word Messages – Markings at Approaches to Intersections – Parking Space Limits – Object Markings

Street Lighting: Need for Street Lighting – Definition of Common Terms – Some Laws of Illumination – Mounting Height – Spacing – Lantern Arrangements – Type of Lamps – Lamp Installation of T' Junctions & Cross Roads – Illumination of Traffic Rotaries – Lighting of Bends – Lighting of Dual Carriageways – Lighting of Roads Carrying Only Local Traffic – Lighting Bridges – Tunnel Lighting – Maintenance of Lighting Installation.

TEXT BOOKS

1. L.R.Kadiyali and Lal, *Traffic Engineering and Transportation Planning*, Khanna Publications, 9th edition, 1999
2. S.K.Khanna & C.E.G.Justo, *Highway Engineering,* Published by Nemchand & Bros, 10th edition, 2012

REFERENCES

1. L.R.Kadiyali and Lal, *Principles and Practice of Highway Engineering Design*, Khanna Publications, 7th edition, 2013
2. R.Srinivasa Kumar, *Text book of Highway Engineering*, Universities Press
3. James H Banks, *Introduction to Transportation Engineering*, Tata McGraw hill Publications, 2nd edition.

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(19EE0239) SOLAR PHOTOVOLTAIC SYSTEMS

COURSE OBJECTIVES

The objectives of the course are

1. *To develop a comprehensive technological understanding in solar PV system components*
2. *To provide in-depth understanding of design parameters to help design and simulate the performance of a solar PV power plant*
3. *To pertain knowledge about planning, project implementation and operation of solar PV power generation*

COURSE OUTCOMES

After the end of the course, a student should be able to

1. *Understand of renewable and non-renewable sources of energy*
2. *Gain knowledge about working principle of various solar energy systems*
3. *Analyse the solar power PV power generation*
4. *Applying the knowledge on to installation and integration of PV modules for different applications*
5. *Understand the operation of different solar collectors in the market*
6. *Understand the solar thermal energy storage systems*

UNIT-I

Introduction: Sources of renewable energy; global potential for solar electrical energy systems. Solar radiation. Extra terrestrial and terrestrial solar spectrum; clear sky direct-beam radiation; total clear sky insulation on a collecting surface; radiation on the collector in tracking systems; calculation of average monthly insolation from measured data

UNIT-II

PV cells and modules: Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters, Efficiency of PV Module, Measuring Module Parameters

UNIT-III

Solar Photovoltaic Module Array: Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power, Selection of PV Module.

UNIT-IV

Solar PV System Design and Integration: Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant.

UNIT-V

Solar collectors and Solar energy storage: Different types of solar collectors, Flat plate and concentrated type collectors, Fundamental Terminologies of thermal storage, Sensible heat storage materials, Latent heat storage materials, Solar thermo-chemical energy storage systems, Advantages and disadvantages of solar thermal storage, application of thermal storage

TEXT BOOKS

1. Chetansingh solanki Solar Photovoltaic PHI, Learning private ltd., New dehli- 2018
2. G.D Rai Non-conventional Sources of Energy Khanna Publishers, Delhi, 2012

REFERENCES

1. Chetan Singh Solanki Renewable Energy Technologies; A Practical Guide for Beginners PHI School Books (2008)
2. Kothari D.P. and Signal K.C Renewable Energy Sources and Emerging Technologies, New Arrivals –PHI; 2 Edition (2011)

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(19ME0321) NON- CONVENTIONAL ENERGY RESOURCES
(OPEN ELECTIVE – III)

COURSE OBJECTIVES
The objective of the course:

1. *Know the importance of energy, resources of renewable energy, their usage and impact on environment.*
2. *Recognize the significance of Solar energy, its harnessing technologies & its applications*
3. *Identify the method of exploiting energy from wind and parameters to be considered for the selection of site for wind turbine installation*
4. *Explain the concept of bio energy and its conversion devices*
5. *Differentiate various renewable energies such as tidal energy, geothermal energy, fuel cells etc.*

COURSE OUTCOMES (COs)
On successful completion of the course, the student will be able to

1. *State various sources of Energies, its availability and explain the importance of them by observing the global energy scenario.*
2. *Distinguish the types of solar energy tapping devices and describe the method of harnessing the solar energy.*
3. *Summarize the Wind energy systems and elucidate the impact of it in environmental aspects.*
4. *Describe the Biomass conversion process and list out various bioenergy applications.*
5. *Interpret the knowledge of renewable energies such as tidal energy, OTEC, Fuel cell, etc. for effective construction of Hybrid systems.*
6. *Identify numerous applications renewable energy resources and illustrate its harnessing technologies*

UNIT-I
Introduction: Energy- World Energy use – Classification of Energy's - Reserves of Energy Resources– Environmental Aspects of Energy Utilization
Renewable energy: Need of Renewable Energy – Renewable Energy Scenario in Andhra Pradesh, India and Around the World.

UNIT-II
Solar thermal conversion: Flat Plate and Concentrating Collectors – Solar direct Thermal Applications– Solar thermal Power Generation

Photo voltaic Conversion: Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications, Solar Radiation Measurements

UNIT-III

Wind Energy: Wind Formation - Site Selection for Wind Turbine - Working Principle of Wind Turbine

Wind Energy System: Types of Wind Energy Systems – Performance – Details of Wind Turbine – Wind Energy Measurement, Safety and Environmental Aspects.

UNIT-IV

Bio – Energy: Biomass direct combustion – Biomass gasifiers – Biogas plants

Bio Fuel: Ethanol production – Biodiesel – Cogeneration - Biomass Applications

UNIT-V

Other Sources of Energy: Tidal energy – Wave Energy – Open and Closed OTEC Cycles, Geothermal Energy

Hydrogen Fuel: Hydrogen production and Storage - Fuel Cell Systems – Hybrid Systems.

TEXT BOOKS

1. R.K.Rajput , *Non-conventional Energy Sources and Utilization,* S. Chand Publishers, 2nd Edition, 2014.
2. G. D Rai, *Non-Conventional Energy Sources*, Khanna Publishers, 1st Edition, 2010.
3. Nicholas Jenkins & Janaka Ekanayake, *Renewable Energy Engineering*, Cambridge University Press; 1st Edition, 2017.

REFERENCES

1. Dr. R K Singal, *Non-Conventional Energy Resources*, S.K Kataria & Sons, 4th Edition, 2014.
2. John Twidell & Tony Weir, *Renewable Energy Sources*, Routledge publisher, 3rd Edition, 2015.
3. Sukhatme. S.P, *Solar Energy, Principles of Thermal Collection and Storage,* Tata McGraw Hill Publishing Company Limited, 6thEdition, 1990.

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(19CS0545) SOFTWARE DEVELOPMENT & TESTING
(OPEN ELECTIVE-III)

COURSE OBJECTIVES

The objectives of this course is to

1. *Illustrate the Software Development Models.*
2. *Explain Software Requirements Engineering Process and SRS document.*
3. *Illustrate the importance of modeling and modeling languages.*
4. *Explain various testing methodologies.*
5. *Explain Quality assurance and test cases.*

COURSE OUTCOMES (COs)

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

1. *Define and develop as software project from requirement gathering to implementation.*
2. *Ability to code and test the software.*
3. *Ability to plan, estimate and maintain software systems.*
4. *Understand the basic testing procedures.*
5. *Able to generate test cases and test suites.*
6. *Test the applications manually by applying different testing methods and automation tools.*

UNIT-I

Introduction: Introduction to Software Engineering, Software Process, Software Myths, A generic view of process, A layered Technology, A Process Framework, Software Process Models, Unified process

Introduction to Agility: Agility, Agile Process, Agile Process Models

UNIT-II

Requirements Analysis and Specification: Requirements Engineering, Eliciting Requirements, Requirements Analysis, Types of Requirements, Requirement Modeling and Data Modeling, Concepts.

Architectural Design Concepts: The Design Process, Design Concepts, Design Model, Software Architecture, Architecture Styles.

UNIT-III

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps.

Web App Design: Introduction, Web App Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component-Level Design.

UNIT-IV

Software Testing: Introduction, Levels of Software Testing – Unit Testing, Module Testing, Integration Testing, System Testing, Acceptance Testing, Alpha Testing, Beta Testing,

Approach to Software Testing: Types of Software Testing - Black Box Testing, White Box Testing, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Art of Debugging.

UNIT-V

Software Quality: Software Testing Life Cycle, Software Quality, Testing Principles, Test Process – Testing Activities, Quality Assurance.

Software Test Cases: Introduction to Test cases, Test Case Selection – Test Planning and Design – Test Execution – Case Study on Test tools and automation.

TEXT BOOKS

1. Roger S.Pressman, *Software Engineering*- A practitioner‘s Approach, McGraw-Hill International Edition, seventh edition, 2001.
2. Boris Beizer, *Software Testing techniques* , Dream tech, Second Edition.

REFERENCES

1. Ian Sommerville, *Software Engineering*, 8th Edition, Pearson Education, 2008.
2. Richard Fairley, *Software Engineering Concepts*, McGraw Hill, 2004.
3. Dr.K.V.K.K.Prasad, *Software Testing Tools*, Dreamtech

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(19HS0861) BUSINESS ETHICS
(OPEN ELECTIVE – III)

COURSE OBJECTIVES

The objectives of this course is to

1. *To provide basic knowledge of business ethics, personal ethics and values in modern context*
2. *To learn and develop best ethical practices in management disciplines to become good managers*
3. *To make them learn role of corporate culture and corporate governance*

COURSE OUTCOMES

After the completion of course Students will be able to

1. *Apply various ethical principles in business and corporate social responsibility practices.*
2. *Recognize how personal ethics can influence behaviour and apply in decision making.*
3. *Explain the ethical challenges facing the various functional departments.*
4. *Identify the organizational and cultural variables that impact ethical judgment.*
5. *Analyze various ethical codes in corporate governance.*
6. *Identify organizational policies and systems that employ ethical conduct.*

UNIT - I

Business Ethics: Introduction – Meaning - Scope – Types of Ethics – Characteristics – Factors influencing Business Ethics – Importance of Business Ethics - Arguments for and against business ethics- Basics of business ethics - Corporate Social Responsibility – Issues of Management – Crisis Management

UNIT - II

Personal Ethics: Introduction – Meaning – Emotional Honesty – Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind.

UNIT - III

Ethics In Management – I: Introduction – Ethics in HRM – Ethics in HRM: Selection, Training and Development – Ethics at work place – Ethics in performance appraisal - Marketing Ethics –Technology Ethics and Professional ethics.

UNIT - IV

Ethics In Management – II: Ethics in Finance: Insider trading - ethical investment - Ethical issues in Information Technology: Information Security and Threats – Intellectual Property Rights – Cyber crime

UNIT – V

Role of Corporate Culture in Business: Meaning – Functions – Impact of corporate culture – cross cultural issues in ethics - Modern Ethical Models for Decision Making, Ethics for manager, ethics in business competition

TEXT BOOKS

1. Murthy CSV, *Business Ethics and Corporate Governance,* HPH, 2007
2. Dr. K. Nirmala, Karunakara Readdy, *Business Ethics and Corporate Governance*, HPH

REFERENCES

1. M.G. Velasquez, *Business Ethics*, Prentice Hall India Limited, New Delhi, 7^{TH} Edition,2012
2. Dr. K. Nirmala, Karunakara Readdy, *Business Ethics and Corporate Governance*, HPH
3. K. Venkataramana, *Corporate Governance*, SHBP, 2018

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(19EC0417) ANTENNAS AND WAVE PROPAGATION LAB
(Virtual Lab)

COURSE OBJECTIVES

The objectives of this course:

1. *To design the antennas based on the requirement of the application using software tool and Hardware.*
2. *To understand different High frequency antennas and its radiation pattern.*
3. *To design and Analyse different parameters of an antenna based on the radiation characteristics.*

COURSE OUTCOMES (COs)

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

1. *Understand different parameters associated with antenna design.*
2. *Analyze Antenna model for High frequency applications.*
3. *Learn to plot the radiation pattern characteristics.*
4. *Understand the simulation tools and hardware used for antenna design.*
5. *Calculate different antennas parameters through hardware and software.*
6. *Design antennas for various real time applications.*

LIST OF EXPERIMENTS:

PART-A: Simulation Experiments

(Minimum of 5 experiments)

1) To study and plot the radiation pattern of Simple Dipole Antenna.
2) To study and plot the radiation pattern of Half Wave Dipole Antenna.
3) To study and plot the radiation pattern of Loop Antenna
4) To study and plot the radiation pattern of Yagi-Uda Antenna.
5) To study and plot the radiation pattern of Helical Antenna.
6) To study and plot the radiation pattern Parabolic Reflectors Antenna.
7) To study and plot the radiation pattern of Horn Antenna.

PART- B: Hardware Experiments
(Minimum of 5 experiments)

1) To study the variation of field strength and plot the radiation pattern of Half Wave dipole antenna.
2) To study the variation of field strength and plot the radiation pattern of Array antenna.
3) To study the variation of field strength and plot the radiation pattern of Yagi-Uda antenna.
4) To study the variation of field strength and plot the radiation pattern of Microstrip antenna.
5) To study the variation of field strength and plot the radiation pattern of Helical Antenna.
6) To study the variation of field strength and plot the radiation pattern Reflector Antenna.
7) To study the variation of field strength and plot the radiation pattern of Horn Antenna.

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(19EC0418) DIGITAL COMMUNICATIONS LAB

COURSE OBJECTIVES
The objectives of this course:

1. *This course gives students deep knowledge in digital communication systems at the practical level.*
2. *This lab focuses the fundamental concepts on Pulse modulations, digital modulation techniques, source coding techniques.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the background different techniques in communication systems.*
2. *Learn the modulation techniques used in Digital communication.*
3. *Conduct experiments to evaluate digital converters like PCM, DM.*
4. *Measure the Amplitude and Frequency of various Base band modulation techniques and observes the output waveforms.*
5. *Measure the Amplitude and Frequency of various Pass band modulation techniques and observes the output waveforms.*
6. *Apply channel coding like Linear Block Codes and Convolutional Codes in rectifying and correcting data errors in digital communication system.*

LIST OF EXPERIMENTS (Minimum of Ten experiments to be conducted)

1. Pulse Code Modulation.
2. Differential Pulse Code Modulation.
3. Delta Modulation.
4. Amplitude Shift Keying.
5. Frequency Shift Keying.
6. Phase Shift Keying.
7. Differential Phase Shift Keying.
8. Quadrature Amplitude Modulation.
9. QPSK Modulation and Demodulation.
10. Eye Diagrams.
11. Linear Block Codes- Encoder and Decoder.
12. Convolutional Codes- Encoder and Decoder.

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(19EC0419) ELECTRONIC MEASUREMENTS LAB
(Virtual Lab)

COURSE OBJECTIVES

The objectives of this course:

1. *To know the procedure for measuring Resistance, Capacitance and Inductance of*
2. *different ranges.*
3. *To perform the experiments to measure temperature, displacement and pressure.*
4. *To know the procedure for measuring voltage, frequency and phase using Oscilloscope.*

COURSE OUTCOMES (COs)

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

1. *Study the design of various electronic measuring instruments.*
2. *Determine unknown values in balancing Bridges.*
3. *Evaluate frequency, phase in Oscilloscope.*
4. *Use the Digital meters for measuring various parameters.*
5. *Determine strain, displacement, Velocity, temperature and Pressure.*
6. *Find the parameters using RTD, Maxwell bridge and strain gauge etc. using simulator tool.*

LIST OF EXPERIMENTS: (All experiments are to be conducted)

PART-A: (Hardware Experiments)

1) Study, operation and technical specifications of Multimeter.
2) Study of CRO.
3) Measurement of inductance using Maxwell's Bridge.
4) Measurement of resistance by kelvin's bridge .
5) Measurement of displacement using L.V.D.T.

PART-B: (using any simulation software)

1) Study, operation and technical specification of thermocouple.
2) Study the temperature & resistance characteristics of RTD.
3) Study of water level measurement using capacitive transducer.
4) Measurement of capacitance using Schering's Bridge.
5) Measurement of Strain using Strain Guage.

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(19HS0859) ENGLISH FOR CORPORATE COMMUNICATION SKILLS LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To improve the students' fluency in English, through a well-developed vocabulary.*
2. *To enable them listening spoken English at normal conversational speed by English speakers.*
3. *To respond appropriately in different social-cultural and professional contexts.*
4. *To develop drafting skills among the students.*
5. *To develop Inter-personal and Intra-personal Skills.*

COURSE OUTCOMES (COs)

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

1. *Use fluency in English for all kinds of professional communication.*
2. *Enhancing job required skills for getting success in their professions.*
3. *Improving Effective Speaking Abilities for their business or professional correspondence.*
4. *Prepare effective Interview techniques to get job in the present scenario.*
5. *Using the appropriate skills in all kinds of professional activities*
6. *Use effective communicative approaches by preparing job application, report and other kinds of spoken and written correspondences.*

UNIT I
COMMUNICATIVE COMPETENCY

1. Functional English
2. Reading Comprehension
3. Vocabulary for competitive purpose
4. Spotting Errors

UNIT II
TECHNICAL WRITING

5. Cover Letter
6. Curriculum vitae
7. Report writing

UNIT III
PRESENTATIONAL SKILLS

8. Impromptu Speech
9. Oral presentation
10. Power point presentation
11. Poster presentation

UNIT IV
CORPORATE SKILLS

12. Problem Solving
13. Team Work
14. Leadership Skills

UNIT V
GETTING READY FOR JOB

15. Group Discussion
16. Interview skills

Minimum requirements for English for Corporate Communication Skills Lab

1. Computer Assisted Language Learning (CALL) Lab: The Computer Assisted Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.

2. English for Corporate Communication Skills Lab with movable chairs and audio visual aids with a P. A. system, Projector, a Digital stereo audio & video system and Camcorder etc.

System Requirement (Hardware component):
Computer network, LAN with minimum 60 multimedia systems with the following

Specifications

1) Intel (R) core (TM) i3
2) Speed 3.10 GHZ
3) RAM – 4 GB
4) Hard Disk – 320 GB
5) Headphones with High quality

Software

Walden Info Tech Software

References

1. Effective Tech Communication, Rizvi, Tata McGraw – Hill Education, 2007.
2. Communication skills, Sanjay Kumar &Pushpalatha, Oxford University Press, 2012.
3. Writing Tutor. Advanced English Learners' Dictionary, 9th Edition, Oxford University Press, 2015.
4. Powerful Vocabulary Builder, Anjana Agarwal, New Age International Publishers, 2011.
5. Listening Extra, Miles Craven, Cambridge University Press, 2008.

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(19HS0812) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

COURSE OBJECTIVES

The objectives of this course:

1. *To familiarize the students with the concepts of microeconomics and make them understand the concept of demand and supply analysis in business applications.*
2. *To understand the pricing and output decisions under different market structures.*
3. *To understand the basic financial statements and techniques of financial statement Analysis.*

COURSE OUTCOMES (COs)

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

1. *Understand the nature of managerial economics and the role of it in business firms.*
2. *Identify the determinants of demand and apply cost analysis under different market conditions.*
3. *Integrate the concepts of price and output decisions of business firms.*
4. *Appreciate the importance of market structures and implement appropriate price and output decisions.*
5. *Assess the financial statements of a firm and the financial performance of the firm through the financial statements.*
6. *Measure operating, investing and financial performance of a firm.*

UNIT- I

Introduction to Managerial Economics: Managerial Economics- Definition, nature and scope-contemporary importance of Managerial Economics- DemandAnalysis: Determinants-Law of Demand –Elasticity of Demand. Significance–Types– measurement of elasticity of demand–Demand forecasting-factors governing demand Forecasting-methods of demand forecasting–Relationship of Managerial Economics with Financial Accounting and Management.

UNIT- II

Theory of Production and Cost Analysis: Production Function–Short-run and long-run production-Isoquants and Isocosts, MRTS, leastcost Combination of inputs- Cobb-Douglas production function-laws of returns–Internal and External Economies of scale.

Cost Analysis: Cost concepts -Break-Even Analysis (BEA)–Managerial Significance and limitations of BEA-Determination of Break Even Point, Problems.UNIT- III

Introduction to Markets and New Economic Environment: Market structures: Types of Markets-Perfect and Imperfect Competition -Features, Oligopoly-Monopolistic competition. Price-Output determination-Pricing Methods and Strategies. New Economic Environment-Economic systems–Economic Liberalization– Privatization and Globalization.

UNIT- IV

Capital and Capital Budgeting: Concept of Capital-Over and under capitalization– Remedial measures -Sources of Short term and long term capital-Estimating Working Capital requirement–Capital budgeting–Features of Capital Budgeting proposals– Methods and Evaluation of Capital budgeting–Pay Back Method–Accounting Rate of Return (ARR)–Net Present Value (NPV)–Internal Rate Return (IRR)Method (simple problems).

UNIT- V

Introduction to Financial Accounting and Analysis: Financial Accounting–Concept-emerging need and importance-Double-Entry Book Keeping-Journal- Ledger–Trial Balance-Financial Statements—Trading Account–Profit & Loss Account– Balance Sheet (with simple adjustments). Financial Analysis–Ratios– Techniques Liquidity, Leverage, Profitability and Activity Ratios (simple problems).

TEXT BOOKS

1. Aryasri, *Managerial Economics and Financial Analysis*,4/e, TMH, 2009.
2. SultanVarshney & Maheswari, *Managerial Economics*, Chand, 2009.

REFERENCES

1. Premchand Babu, MadanMohan, *Financial Accounting and Analysis*, Himalaya, 2009.
2. S.A.Siddiqui and A.S.Siddiqui, Managerial *Economics and Financial Analysis*, New Age International, 2009.
3. G.Nellis and David Parker Joseph, *Principles of Business Economics*, Pearson, 2/e, New Delhi
4. Domnick Salvatore, *Managerial Economics in a Global Economy*, Cengage 2009.
5. H.L.Ahuja, *Managerial Economics*, S.Chand, 3/e, 2009.

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III B.Tech. – II Sem.

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(19EC0420) DIGITAL SIGNAL PROCESSING

COURSE OBJECTIVES

The objectives of this course:

1. *To learn discrete Fourier transform, properties of DFT and its application to linear filtering.*
2. *To understand the designs of IIR and FIR filters and its realization for a given specifications.*
3. *To understand the effects of finite precision representation on digital filters.*
4. *To introduce the concepts of DSP architectures and its applications.*

COURSE OUTCOMES (COs)

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

1. *Understand the use of various transforms for the analysis of digital signals and systems.*
2. *Design FIR & IIR filters that can be used in various digital systems.*
3. *Evaluate the performance of different filters and compare them.*
4. *Analyze the effects of finite precision representation in digital filters.*
5. *Find the errors that commonly occur in digital signal based communication systems and study their effects.*
6. *Understand the architectures of various digital signal processors and their applications.*

UNIT-I

Discrete Fourier Transform (DFT): Discrete Fourier transform – Relationship of the DFT to other transforms, Properties of DFT, Linear filtering based on the DFT- Filtering of long data sequences - overlap save and overlap add method.

Fast Fourier Transform (FFT): Efficient computation of DFT - Radix-2 - Decimation-in-time (DIT), Decimation-in-frequency (DIF) algorithms.

UNIT-II

Infinite Impulse Response Filters: Design of Analog IIR (Butterworth & Chebyshev) filters - Impulse invariance method - bilinear transformation - Design of digital filters- Frequency transformation in the analog domain, Illustrative Problems.

Realization of IIR Filter: Structures for IIR system- Direct-Form, Cascade-Form, and Parallel- Form Structures.

UNIT-III

Finite Impulse Response Filters: Design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method, Illustrative Problems.

Realization of FIR Filter: Structures for FIR system – Direct-Form, Cascade-Form and Linear Phase Structure.

UNIT-IV

Finite Word Length Effects: Representation of Numbers-Fixed point Representation of Numbers and Binary Floating-point Representation of Numbers - Quantization – Error due to truncation and rounding – Input Quantization Error – Coefficient Quantization error- Steady State Input and Output Noise Power - Zero limit cycle oscillations, Dead band, scaling to prevent overflow.

UNIT-V

Introduction to Digital Signal Processors: Overview of DSP Processors - Architecture of fixed-point processor TMS320C50 – Architecture of Floating-point processor TMS320C54xx-Bus Structure, Central Processing Unit, On-Chip Memory and On-Chip Peripherals- Applications of Programmable Digital Signal Processors (PDSP).

TEXT BOOK

1. John G. Proakis & Dimitris G.Manolakis, *Digital Signal Processing – Principles, Algorithms & Applications*, 4th Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES

1. Emmanuel C. Ifeachor & Barrie. W. Jervis, *Digital Signal Processing*, 2nd Edition, Pearson Education / Prentice Hall, 2002.
2. A.V. Oppenheim, R.W. Schafer and J.R. Buck, *Discrete-Time Signal Processing*, 8th Indian Reprint, Pearson, 2004.
3. Sanjit K. Mitra, *Digital Signal Processing – A Computer Based Approach*, Tata Mc Graw Hill, 2007.
4. Andreas Antoniou, *Digital Signal Processing*, Tata Mc Graw Hill, 2006.
5. P.Ramesh Babu, *Digital Signal Processing*, SCITECH, 7th Edition, 2019.

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(19EC0421) MICROPROCESSORS AND MICROCONTROLLERS

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the basic architecture of computer, evolution, and its applications*
2. *To learn the architectures of Microprocessor and Microcontroller*
3. *To learn the programming of Microprocessors and Microcontrollers using their programming model*
4. *To learn the interfacing of memory, I/O, sensors and actuators to microprocessors and microcontrollers*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the evolution of computers, processors, and its applications.*
2. *Explain the various software and hardware parts of a microprocessors and computer.*
3. *Understand the architectures of 8085 microprocessor and 8051 microcontroller system*
4. *Analyze the programming model of 8085 Microprocessor & 8051 microcontroller development environment.*
5. *Implement the techniques of interfacing memories, various I/O devices, sensors and actuators with microprocessor and microcontrollers.*
6. *Design and develop various microprocessor/microcontroller-based systems for the real-life problems.*

UNIT – I
Microprocessors, Microcomputers and Assembly Language: Microprocessors – Microprocessor instruction set and computer languages – From large computers to single chip microcontrollers – Application: Microprocessor controlled temperature system (MCTS)
Microprocessor Architecture and Microcomputer Systems: Microprocessor Architecture and its operation – Memory – Input and output devices – Example of a microcomputer system

UNIT – II
8085 Microprocessor Architecture: The 8085 MPU - The 8085 Microprocessor, Microprocessor communication and bus timings, Demultiplexing the bus AD7-AD0,

Generating control signals and A detailed look at the 8085 MPU and its architecture– Instruction, Data format and Data Storage – Overview of the 8085 Instruction set.

UNIT – III

The 8051 Architecture: Introduction – 8051 microcontroller hardware – Input/output pins, ports and circuits – External memory – Counters and timers – Serial data input/output - Interrupts

UNIT – IV

Programming the 8051: Addressing modes - Moving data – Logical operations – Arithmetic operations – Jump and call instructions

UNIT – V

Applications: Introduction – Keyboards – Displays – D/A and A/D Conversion - Multiple interrupts

TEXT BOOKS

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, *Computer Organization,* McGraw Hill Eductaion Pvt. Ltd, 5th Edition, 2017.
2. Ramesh Gaonkar, *Microprocessor Architecture, programming and applications with the 8085,* Penram International Publications Pvt Ltd. 6th Edition, 2015.
3. Kenneth J Ayala, *The 8051 microcontroller,* Penram International Publications Pvt Ltd, 2nd Edition, 1997,

REFERENCES

1. Ray Bhurchandi, *Advanced Microprocessors & Peripheral interfacing*, MC graw hill Publications, 3rd edition, 2012.
2. N.Senthil Kumar, M.Saravanan, S.Jeevanathan, *Microprocessor and Microcontrollers,* Oxford Publishers. 1st Edition, 2015.

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(19EC0422) MICROWAVE THEORY AND TECHNIQUES

COURSE OBJECTIVES
The objectives of this course:

1. *To develop the knowledge on transmission lines for microwaves, cavity resonators and wave guide components and applications*
2. *To understand the scattering matrix parameters and its use*
3. *To understand the microwave tubes and microwave test bench for measure different parameters like attenuation, VSWR, etc.,*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the basics of microwaves and illustrate the various parameters.*
2. *Design and simulate waveguide components for various applications.*
3. *Compare between the conventional waveguides & microwave tubes.*
4. *Analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.*
5. *Understand the measurement of various parameters related to microwaves and waveguides.*
6. *Design and analyze the microwave devices that suits for different applications.*

UNIT- I
Introduction of Microwave: Introduction to Microwaves - History of Microwaves, Microwave Frequency bands, Applications of Microwaves. Mathematical Model of Microwave Transmission - Concept of Mode, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations. Power Transmission and Power Losses in Rectangular Guide - Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission.

UNIT- II
Microwave Parameters: Analysis of RF and Microwave Transmission Lines - Coaxial line, Rectangular waveguide, Circular waveguide, Cavity resonator, Strip line, Micro strip line. Microwave Network Analysis - Equivalent voltages and currents for non-TEM lines, Ferrite Components – Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT- III

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 - Rotary Vane types. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for – 2 port Junction, E- plane and H-plane Tees, Magic Tee, Hybrid Ring. Directional Couplers –2Hole, Bethe Hole types.

UNIT- IV

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.

M-Type Tubes: Introduction, Cross-field effects. Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave. Magnetron – Hull Cut-off and Hartree Conditions.

UNIT- V

Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Precautions. Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

TEXT BOOKS

1. Samuel Y. Liao, *Microwave Devices and Circuits*, PHI, 3rd Edition,1994.
2. Herbert J. Reich, J.G. Skalnik, P.F. Ordungand H.L. Krauss, *Microwave Principles*, CBS Publishers and Distributors, New Delhi, 2004.

REFERENCES

1. R.E. Collin, *Foundations for Microwave Engineering*, IEEE Press, John Wiley, 2nd Edition,2002.
2. M.L. Sisodia and G.S.Raghuvanshi, *Microwave Circuits and Passive Devices*, Wiley Eastern Ltd., New Age International Publishers Ltd.,1995.
3. Peter A. Rizzi, *Microwave Engineering Passive Circuits*, PHI,1999.
4. F.E. Terman, *Electronic and Radio Engineering*, McGraw-Hill, 4th Edition, 1955.

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(19CE0147) PROJECT PLANNING AND CONTROL
(OPEN ELECTIVE – IV)

COURSE OBJECTIVES

1. *To describe various elements of an engineering project and to draw the network*
2. *To perform PERT & CPM calculations and to identify the critical path*
3. *To perform various operations on the network*

COURSE OUTCOMES (COs)

After the successful completion of the course the student able to

1. *Differentiate various tools for planning and controlling the project*
2. *Construct the network for a project*
3. *Perform PERT computations and evaluate the critical path*
4. *Perform CPM computations and identify the critical path*
5. *Optimize time and cost for a project*
6. *Work with network during the progress of a project by updating the network and allocating the resource*

UNIT – I

Project Management: Project planning – Project scheduling – Project controlling – Project monitoring and control – Project monitoring and information cell – Decision making in project management – Project life cycle

Basic Techniques of Project Management: Bar charts – Steps for the construction of a bar chart – Limitations of bar charts – Milestone charts – Velocity diagrams – Development of Network – CPM/PERT Networks – Advantages of network over milestone chart

UNIT – II

Elements of Network: Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles

Development of Network: Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure – Hierarchies

UNIT – III

PERT: Time Estimates: Uncertainties: Use of PERT – Time estimates – Frequency distribution – Mean, variance and standard deviation – Probability distribution – Beta distribution – Expected time

PERT: Time Computations & Network Analysis: Earliest expected time – Formulation for T_E – Latest allowable occurrence time – Formulation for T_L – Combined tabular computations for T_E and T_L – Slack – Critical path – Probability of meeting scheduled date

UNIT – IV

CPM: Network Analysis: CPM Process – CPM Network – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for T_E and T_L – Start and finish times of activity – Float – Critical activities and critical path

UNIT – V

CPM: Cost Model: Project cost – Indirect project cost – Direct project cost – Slope of direct cost curve – Total project cost and optimum duration – Contracting the network for cost optimization – Steps in time cost optimization

CPM: Updating: Updating process – Data required for updating – Steps in the process updating – When to update

Resources Allocation: Resources usage profiles: histograms – Resources smoothing – Resources levelling

TEXT BOOKS

1. Dr.B.C. Punmia, K.K. Khandelwal, *Project Planning and Control with PERT AND CPM,* Laxmi Publications (P) Ltd., 4th Edition, Reprint 2006
2. Dr.P.N. Modi, Sanjeev Modi and Rajeev Modi, *Program Evolution and Review Technique and Critical Path Method,* Standard Book House, 5th Edition, 2012

REFERENCES

1. L.S. Srinath, *PERT and CPM Principles and Applications,* Affiliated East-West Press (Pvt.) Ltd.
2. S.K. Bhattacharjee, *Fundamentals of PERT/CPM and Project Management,* Khanna Publishers
3. Kumar Neeraj Jha, *Construction Project Management: Theory and Practice,* Pearson, 2 edition, 2015

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(19EE0231) NEURAL NETWORKS AND FUZZY LOGIC
(OPEN ELECTIVE-IV)

COURSE OBJECTIVES

The objectives of this course:

1. *To introduce the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.*
2. *To have knowledge on Associate Memories, Fuzzy sets and Fuzzy Logic system components.*
3. *To know Neural Network and Fuzzy Network system application to Electrical Engineering*
4. *The main objective of this course is to provide the student with the basic understanding of neural networks and fuzzy logic fundamentals.*

COURSE OUTCOMES (COs)

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

1. *Understand the basic concept of artificial neural networks*
2. *Understand different learning mechanism in artificial neural networks*
3. *Create Neural Network models for electrical engineering.*
4. *Understand the basic concepts of fuzzy sets.*
5. *Understand the basic concepts of fuzzy logic.*
6. *Create Fuzzy models for electrical engineering*

UNIT - I

Fundamentals Of Artificial Neural Networks: Neural networks-introduction, Organization of human brain, Biological neuron, artificial neuron, McCulloch-Pitts neuron model, Characteristics and Applications of artificial neural networks Architectures of artificialneural networks – activation functions, important terminologies of ANN, learning strategies-supervised,unsupervised, reinforced learning.

UNIT - II

Supervised Networks: Perceptron networks-Perceptron learning, Limitations of Perceptron, back propagation networks-architecture, Computations in each layer, Error calculation in Back propagation networks, Gradient descent method in learning, back propagation algorithm, learning factors - initial weights, leaning constant, momentum coefficient, Applications of Neural Networks to Electrical Engineering.

UNIT - III

Associative Memories: Introduction, Associative Memories- Auto associative Memory,

Bidirectional Associative Memory (BAM), Architectures, Storage and Recall Phases, Recognition of noisy patterns, Hamming distance and Energy functions. Discrete Hopfield network architecture and storage and recall algorithm.

UNIT - IV

Classical And Fuzzy Sets: Introduction to classical sets-properties–Fuzzy vs crsip Fuzzy sets , Membership functions, basic fuzzy set operation, properties of fuzzysets- Fuzzy relations–Fuzzy Cartesian product, operations on fuzzy relations.

UNIT -V

Fuzzy Logic Systems: Fuzzification–Fuzzy quantifiers, fuzzy inference, fuzzy rule based system-development of rule base and decision making system - Defuzzification to crisp sets-Fuzzification and Defuzzification methods. Applications of Fuzzy logic systems in Electrical Engineering.

TEXT BOOKS

1. S. Rajasekaran, G.A. Vijayalakshmi, *Neural Networks, Fuzzy Logic, and Genetic Algorithms Synthesis and Applications*, Pai, PHI, 2012
2. S.N. Sivanandam, S.N. Deepa, *Principles of Soft computing* , WileyIndia private Ltd.,2nd edition, 2013.

REFERENCES

1. Timothy J Ross, *Fuzzy Logic with Engineering Application* , McGraw HillInc.1997.
2. Jacek M. Zurada, *Introduction to Artificial Neural Networks*, Jaico Publishing House.
3. Simon Haykin, *Neural Networks - A Comprehensive Foundation* , Prentice- Hall Inc, 1999.

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(19ME0353) COMPUTER AIDED PROCESS PLANNING
(OPEN ELECTIVE-IV)

COURSE OBJECTIVES

The objective of the course is:

1. *Provide the student with an understanding of the importance of process planning role in manufacturing.*
2. *Classify the various methods of CAPP*
3. *Understand the importance of product development through CIMS, shop floor control, Computer Integrated Manufacturing and Automation*
4. *Understands about NC, CNC and DNC systems.*
5. *Know about capacity Planning, Adaptive control machining systems, FMS and MRP's*

COURSE OUTCOMES (COs)

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

1. *Know the importance of process planning role in manufacturing*
2. Describe the various methods of CAPP
3. *Recognize the importance of product development through CIMS, shop floor control, Computer Integrated Manufacturing and Automation*
4. *Gain the knowledge about NC, CNC and DNC systems.*
5. *Identify about capacity Planning, Adaptive control machining systems*
6. *Familiar in FMS and MRP I and MRP II*

UNIT- I

Introduction to Process Planning: Role of process planning in the manufacturing cycle- Information requirement for process planning system - Merits of conventional process planning over CAPP - Structure of automated process planning system, features recognition, methods.

UNIT- II

Generative CAPP System: Importance - Generative CAPP system - Automation of logical decisions - Knowledge based systems - Inference Engine, implementation, benefits.

Retrieval CAPP System: Significance - Retrieval CAPP system, structure, relative advantages and disadvantages- implementation and applications.

UNIT- III

Implementation Techniques for CAPP: MIPLAN system - The Bottom-up approach - The

Top-Down approach - Computer programming languages for CAPP- Criteria for selecting a CAPP system - Benefits of CAPP - MRP - I, MRP - II and benefits.

UNIT- IV

Computer Integrated Production Planning: Capacity planning- shop floor control- MRP-I, MRP-II- CIMS benefits.

Computer Integrated Manufacturing System (CIMS): Introduction to CIMS, Automation strategies, Automation and CAD/CAM, Scope of CIM- Computer controls in NC- NC, CNC and DNC systems, components, block diagram, applications- Part programming- Group technology, benefits.

UNIT- V

Flexible Manufacturing systems (FMS): Components of FMS, workstation, Material handling system and computer control system, FMS Layout configurations and benefits of FMS.

Adaptive control machining systems: Introduction to adaptive control machining systems, application- approaches, adaptive control optimization system, adaptive control constraint system, applications to machining processes, computer process monitoring and computer process control.

TEXT BOOKS

1. Mikel P.Groover Automation, Production systems and Computer Integrated Manufacturing Systems, Pearson Higher Education, Inc., 4th Edition, 2015.
2. Dr. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, 2009.

REFERENCES

1. Gideon Halevi and Roland D. Weill, “Principles of Process Planning", A logical approach, Chapman & Hall, 1995.
2. Chang T C and Richard A Wysk, “An Introduction to automated process planning systems”, Prentice Hall, 1985.
3. H.P. Wang and J.K. Li, “Computer Aided Process Planning”, Elsevier Science and Technology Publishers, 1st edition, 1991.

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III B. Tech – II Sem.

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(19CS0546) INTRODUCTION TO CYBER SECURITY
(OPEN ELECTIVE-IV)

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the fundamentals of cybercrime and the cyber offenses.*
2. *To learn the concepts of cyber threats and cyber security.*
3. *To analyze various cyber threats, attacks, vulnerabilities and mechanisms involved.*
4. *To understand the Tools and Methods Used in Cybercrime.*
5. *To explore the different security policies and practices.*
6. *To design suitable security policies for the given requirements.*

COURSE OUTCOMES (COs)

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

1. *Know fundamentals of cybercrimes.*
2. *Analyze the cyber offenses.*
3. *Realize the cyber threats, attacks, vulnerabilities and its defensive mechanism.*
4. *Understand the Tools and Methods Used in Cybercrime.*
5. *Design suitable security policies for the given requirements.*
6. *Explore the industry practices and tools to be on par with the recent trends.*

UNIT- I

Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT - II

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones.

UNIT- IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT- V

Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOKS

1. Nina Godbole and Sunil Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley INDIA.

REFERENCES

1. James Graham, Richard Howard and Ryan Otson, *Cyber Security Essentials*, CRC Press.
2. Chwan-Hwa(john) Wu, J.David Irwin, *Introduction to Cyber Security*, CRC Press T&F Group.

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III B.Tech. – II Sem. **(19HS0862) STRATEGIC MANAGEMENT** **L T P C**

(OPEN ELECTIVE - IV) **3 - - 3**

COURSE OBJECTIVES
The objectives of this course:

1. *To introduce the basic knowledge of concepts underlying in strategic management, its process.*
2. *To provide an insight to the tools and techniques used in analyzing and choosing strategies.*
3. *To make them learn the principles of strategy formulation, implementation, evaluation and control of strategy.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Describe major theoretical concepts, background work and research output in the field of strategic management.*
2. *Develop an understanding of the strategic management process and the functional strategies.*
3. *Conduct analysis using various tools and frameworks to make strategic decisions.*
4. *Explain the basic concepts, principles and practices associated with strategy formulation and implementation.*
5. *Analyze various strategies and explore appropriate strategic implementation at business and corporate levels.*
6. *Analyze and evaluate critically real life company situations and develop creative solutions, using a strategic management perspective.*

UNIT- I
Introduction to Strategic Management: Definition, significance and components- Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies, Environmental Scanning

UNIT- II
Strategic Analysis and Choice: Tools and techniques- Porter's Five Forces Model -BCG Matrix, GE Model, TOWS Matrix, Mc Kinsey 7'S framework - Organisation Analysis – VRIO frame work, Value Chain Analysis.

UNIT- III

Strategy Formulation: - Formulation of strategy at corporate and business level - Strategy Alternatives-Stability Strategy, Growth Strategy, Retrenchment Strategy, and Combination Strategy.

UNIT- IV

Strategy Implementation: Types of Strategies: Offensive strategy, Defensive strategy, vertical integration, horizontal strategy- Strategy and Leadership - Organization Structure - Resource Allocation as a vital part of strategy - Management of Change

UNIT- V

Strategy Evaluation and control – Establishing strategic controls - Role of the strategist - benchmarking to evaluate performance - strategic information systems – Guidelines for proper control- -strategic audit - Strategy and Corporate Evaluation and feedback in the Indian context.

TEXT BOOKS

1. P. SubbaRao, *Strategic Management*, Himalaya,2010.
2. Azar Kazmi, *Strategic Management and Business Policy*, Tata McGraw Hill Education, 2009.

REFERENCES

1. V.S.P. Rao, *Strategic Management – Text and Cases*, Excel books,2009
2. Fred R. David, *Strategic Management A competitive approach Concepts and Cases* , Pearson, 16th edition,2019
3. R. Srinivasan, *Strategic Management: the Indian context*, 5th edition, PHI,2014
4. N.Chandrasekharan. PS Ananthanarayanan, *Strategic Management*, Oxford publications, 2011
5. Charles L Hill, *Strategic Management an Integrated approach*, Cengage learning, 10th edition,2007

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(19EC0423) DIGITAL SIGNAL PROCESSING LAB

COURSE OBJECTIVES
The objectives of this course:

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

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the various fundamental signal processing operations.*
2. *Analyze the use of convolution and correlation in signal processing.*
3. *Measure the similarity between the sequences.*
4. *Design the FIR and IIR Filters.*
5. *Analyze the Multirate Signal Processing.*
6. *Apply various transforms for Discrete-Time sequences.*

LIST OF EXPERIMENTS:
(Minimum of 12 experiments has to be conducted)

Cycle- I (MATLAB based Experiments)

1. Generation of elementary Discrete-Time sequences.
2. Perform linear convolution and Circular convolution.
3. Computation of Auto correlation and Cross Correlation.
4. Computation of DFT and IDFT of given DT signal.
5. Design of Low Pass and High Pass IIR filter.
6. Design of Band Pass and Band Reject IIR filter.
7. Design of Low Pass and High Pass FIR filter.
8. Design of Band Pass and Band Reject FIR filter.
9. Analysis of Decimation Process.
10. Analysis of Interpolation Process.

Cycle- II (Processor Based Experiments)

1. Study the architecture of Digital Signal Processor.
2. Implementation of linear Convolution of the given sequence.
3. Implementation of circular Convolution of the given sequence.
4. Implementation of Fast Fourier Transform (FFT).
5. Implementation of DFT and IDFT of a given signal.

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(19EC0424) MICROCONTROLLER AND APPLICATIONS LAB

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the structure of assembly language and wiring programming.*
2. *Develop programs using various instructions and addressing modes of 8051 microcontroller*
3. *Design and simulate the interfacing of peripherals to microcontroller board.*

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

1. *Familiar with keil programming environment*
2. *Demonstrate arithmetic, logical and string operations using assembly language programming.*
3. *Develop embedded C language programs for various applications using 8051 microcontroller.*
4. *Explore the provided example code and online resources for extending knowledge about the capabilities of the 8051 microcontrollers*
5. *Test, debug, and deploy the 8051 microcontroller-based systems*
6. *Design and develop own microprocessor/microcontroller-based solutions for the real-world problems*

Note: Minimum **Ten** Experiments to be conducted (9 from Part A and one from Part B)

Part A: 8051 Microcontroller Programming

1. a) 8-bit addition operations
   b) 8-bit subtraction operations
2. a) 8-bit Multiplication operations
   b) 8-bit Division operations
3. Logical operations on an 8-bit number
4. a) String copy
   b) String concatenation
5. Interfacing LED

6. Interfacing Push button
7. Interfacing 7 segment display
8. Interfacing ADC
9. Interfacing Sensors
10. Interfacing Actuators

Part B: Mini projects

1. 4-way Traffic light control system.
2. Three floor elevator system.
3. Automatic streetlight control system.
4. Intruder alert system.
5. Automatic Tollgate system.
6. Water level control system.
7. Digital alarm clock.
8. Electronic code lock.
9. Automatic gardening system.
10. Self-developed project

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(19EC0425) MICROWAVE MEASUREMENTS LAB

COURSE OBJECTIVES
The objectives of this course:

1. *To study and analyze microwave components by measuring various parameters.*
2. *To be able to measure wave parameter like impedance, frequency, wavelength using microwave bench and VSWR/power meter.*
3. *To study various Digital and Hybrid modulation and demodulation schemes.*
4. *To analyze radiation pattern of horn antenna*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Identify and demonstrate the working of various microwave components.*
2. *Analyze Microwave Passive Devices by conducting experiments and measuring various parameters.*
3. *Analyze Microwave Active Devices by conducting experiments and measuring various parameters.*
4. *Perform standing wave analysis and measure scattering coefficients of various microwave components.*
5. *Assess the amount of bandwidth/bit rate required in each modulation scheme and compare the schemes.*
6. *Evaluate the antenna performance by finding different parameters.*

LIST OF EXPERIMENTS:

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Frequency and Wavelength measurements using slotted section.
8. Scattering parameters of Circulator.
9. Scattering parameters of Magic Tee.
10. Radiation pattern measurements of horn Antennas (at least two antennas).

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(19HS0858) HUMAN VALUES AND PROFESSIONAL ETHICS

COURSE OBJECTIVES
The Objective of the course:

1. *Create awareness on Human Values.*
2. *Impart knowledge on an Engineering Ethics.*
3. *Instill morality, accountability in an engineering experimentation.*
4. *Create awareness on an assessment of safety, risk and rights.*
5. *Develop knowledge on global issues.*
6. *Create an awareness on Human Values and Engineering Ethics, Engineers social responsibility in an experimentation, appreciate the rights of others and ethics in global issues.*

COURSE OUTCOMES (COs)
Online completion of the course the student will be able to

1. *Identify and analyze human values in their relevant field.*
2. *Assess their own engineering ethics and have the social consciousness.*
3. *Get knowledge on codes of ethics and on an utilitarian thinking.*
4. *Identify safety, risks and an ethical concern in research and intellectual contexts.*
5. *know necessity of computer and an environmental ethics, give a picture on weapons development.*
6. *Upon completion of the course, the student should be able to apply the ethics in society, discuss an ethicalissues related to engineering and realize the responsibilities and rights in the society.*

UNIT- I
Human Values - Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Necessity of Yoga and meditation for professional excellence and stress management.

UNIT-II
Engineering Ethics - Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT- III

Engineering As Social Experimentation- Engineering as Experimentation-Engineering Projects VS. Standard Experiments, Engineers as responsible Experimenters– Conscientiousness- Comprehensive Perspective - Moral Autonomy - Accountability, Industrial Standards, Codes of Ethics – A Balanced Outlook on Law.

UNIT- IV

Safety, Responsibilities and Rights- Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk, Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT- V

Global Issues-Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TEXTBOOKS

1. R S Nagarajan, *Professional Ethics and Human Values*, New Age International (P) Limited Publishers,3rd Edition,2006
2. M.Govindarajan, S.Natarajananad, V.S.SenthilKumar,*Engineering Ethics includes Human Values* -PHI Learning Pvt. Ltd- 2nd Edition,2009

REFERENCES

1. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, *Engineering Ethics – Concepts and Cases*, Cengage Learning, 2nd Edition, 2009
2. John R Boatright, *Ethics and the Conduct of Business*, Pearson Education, New Delhi, 1st Edition,2003
3. Edmund G Seebauer and Robert L Barry, *Fundamentals of Ethics for Scientists and Engineers*, Oxford University Press, Oxford, 4th Edition,2001
4. PSR Murthy, *Indian Culture, Values and Professional Ethics*, BS Publication, 2nd Edition, 2013

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(19HS0815) ENTREPRENEURSHIP DEVELOPMENT

COURSE OBJECTIVES

The objectives of this course:

1. *To acquire necessary skills and knowledge required for organizing and carrying out entrepreneurial activities,*
2. *To develop the ability of analyzing and understanding business situations in which entrepreneurs act*
3. *To develop the ability of analyzing various aspects of entrepreneurship – especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development*

COURSE OUTCOMES (COs)

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

1. *The ability to discern distinct entrepreneurial traits and identify the successful elements of successful entrepreneurial ventures*
2. *Consider the legal and financial conditions for starting a venture and to assess the opportunities and constraints for new ventures*
3. *Design strategies for the successful implementation of ideas*
4. *To comprehend the evaluation of business opportunity from the prospective of an investor*
5. *Identify the most suitable sources of finance for start-ups*
6. *To write and execute their own business plan*

UNIT-I

Introduction to Entrepreneurship - Concept of Entrepreneur‘s, Enterprise and Entrepreneurship; Characteristics, Qualities, Functions of entrepreneur and Advantages of Entrepreneurship; Role of entrepreneurship in Economic development, Challenges faced by entrepreneurs, Entrepreneurial scenario in India and Abroad; Elements of Social Entrepreneurship, Types of Entrepreneurs, Entrepreneurship vs.Intrapreneurship.

UNIT-II

Small Business and its Importance - Introduction, Need, Classification of Micro, Small andMediumEnterprises(MSMEs),RoleofMSMEs,ProblemsofMSMEs,StepsforStarting MSMEs, The role of government in supporting MSMEs in India.

Forms of Business Organization: Evaluation of Form of Business organization: Sole Proprietorship, Partnership, Joint Hindu Family, Joint Stock Company and Co-operative Society. Special forms of business ownership: Licensing, Franchising and Leasing.

UNIT-III

Innovation and Idea Generation in Entrepreneurship - Concept of Invention and Innovation, types of innovation, Sources of Innovation, Importance of Innovation in Entrepreneurship. Sources of new ideas, Methods of generating ideas and Opportunity recognition and idea generation in entrepreneurship. Intellectual Property Rights (IPRs): Patents, trademarks, copyrights, and trade secrets. E-commerce and Business Start-ups, Sources of information for Start-up Entrepreneurs in India. Problems of Start-ups without IPRs.

UNIT-IV

Entrepreneurial Motivation - Concept of Motivation and Factors influencing the entrepreneurs; Motivational Theories-Maslow's Need Hierarchy Theory, McClelland's Acquired Need Theory. Entrepreneurship Development Programs (EDPs) - Need and Role of EDPs. Opportunities for Entrepreneurship in present scenario. Successful entrepreneurs

Financing of Enterprises - Source of financing - Debt capital, seed capital, venture capital, Loans available for starting ventures in India, Role of government agencies in small business financing. Role of consultancy organizations.

UNIT-V

Project Planning and Feasibility Study - Meaning of Project, Project Life Cycle, and Stages of Planning Process. Project Planning and Feasibility, Project proposal and report preparation.

TEXT BOOKS:

1. *Entrepreneurship*, 8/e, Robert D Hisrich, Mathew J.Manimala, Michael PPeters, Dean A.Shepherd, McGraw HillEducation.
2. *The Dynamics of Entrepreneurial Development and Management*, VasanthDesai, Himalaya Publishing House,Mumbai.

REFERENCES:

1. *Entrepreneurial Development*, S.S. Khanka, S. Chand and CompanyLimited.,
2. *Fundamentals of Entrepreneurship*, H. Nandan,PHI.
3. *Entrepreneurship Management* – text and cases, BholanathDutta, ExcelBooks.
4. *Entrepreneurship* – New venture Creation, Holt, andPHI.
5. *Entrepreneurial Development*, Ramachandran, Tata McGraw Hill, NewDelhi.

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(19EC0426) WIRELESS COMMUNICATIONS

COURSE OBJECTIVES
The objectives of this course:

1. *To understand wireless communication system and their evolution.*
2. *To compare recent technologies used for wireless communications and understand cellular concept.*
3. *To realise the Mobile radio propagation paths and understand multipath mitigation techniques.*
4. *To explain multiple access techniques and multiple antenna techniques for Wireless Communications.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the basics of wireless communication systems and their evolution, cellular concept, Path loss models and multiple accessing techniques.*
2. *Characterize a wireless channel and evolve the system design specifications.*
3. *Understand the basic principles behind mobile radio propagation path losses.*
4. *Discuss how the diversity and equalization can be exploited to improve performance.*
5. *Design a cellular system based on resource availability and traffic demands.*
6. *Identify suitable signaling and multiple antenna techniques for the wireless channel and system under consideration.*

UNIT-I
Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communication Systems, Examples of Wireless Communication Systems-Paging Systems, Cordless Telephone, Cellular Telephone systems. Modern Wireless Communication Systems - summary.

The Cellular Concept: Frequency reuse, Channel assignment strategies, Hand off strategies; interference & system capacity- Co-channel Interference, Adjacent Channel Interference, trunking & grade of service – Improving Coverage and capacity in cellular systems.

UNIT- II
Mobile Radio Propagation: Path loss models: Free Space and Two-Ray models - Three Basic Propagation Mechanisms: Reflection- reflection from Dielectrics, Brewster angle, reflection from perfect conductors. Diffraction- Knife edge diffraction model, Fresnel Zone geometry, Multiple Knife edge diffraction. Scattering- Radar cross section model.

UNIT -III

Small-Scale Fading and Multipath: Small-Scale Multipath Propagation, Parameters of mobile multipath channels- Time dispersion parameters, Coherence bandwidth, Doppler spread & Coherence time, Types of small scale fading- effects due to Multipath time delay spread and Doppler spread– fast fading, slow fading.

UNIT -IV

Equalization: Fundamentals of Equalization, Equalizers in a Communications Receiver, Adaptive equalization, Linear Equalizers and Non-Linear Equalization, Algorithms for Adaptive Equalization - Zero forcing and LMS Algorithms.

Diversity: Derivation of Selection Diversity Improvement, Practical Space Diversity Considerations, Micro and Macro diversity, Diversity combining techniques.

UNIT –V

Multiple Access techniques: Introduction to Multiple Access, FDMA, TDMA, CDMA, SDMA, Packet Radio, CSMA.

Multiple Antenna Techniques: MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

TEXT BOOKS

1. Rappaport,T.S., *Wireless communications*, Pearson Education, Second Edition, 2010.(UNIT I, II, IV)
2. Andreas.F. Molisch, *Wireless Communications*, John Wiley – India, 2006. (UNIT III,V)

REFERENCES

1. Andrea Goldsmith, *Wireless Communication*, Cambridge University Press, 2011
2. Van Nee, R. and Ramji Prasad, *OFDM for wireless multimedia communications*, Artech House, 2000
3. David Tse and Pramod Viswanath, *Fundamentals of Wireless Communication*, Cambridge University Press, 2005.
4. Upena Dalal, *Wireless Communication*, Oxford University Press, 2009.

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(19EC0427) EMBEDDED SYSTEMS AND IOT

COURSE OBJECTIVES
The objectives of this course:

1. *To describe the hardware and software components and development cycle of embeddedsystems.*
2. *To provide an overview on the ICT ecosystem and enabling environment to foster Internet of Things (including technology, standards, system management and applications) deployments.*
3. *Define the infrastructure for supporting IoT deployments.*
4. *To provide an understanding of the technologies and the standards relating to the Internet ofThings.*
5. *To develop skills on IoT applications.*

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

1. *Enumerate and describe the components of an embedded system.*
2. *Understand the technology and standards relating to IoT and Applications.*
3. *Understand the Networking in IoTand Arduino.*
4. *Learn the language and Identify the components and develop an IoT Applications.*
5. *Understand Sensors, Actuators, Configuration of Raspberry Pi and develop python code on Raspberry Pi for IoT application.*
6. *Apply the knowledge and skills acquired during the course to design, build and test a complete, working IoT system involving prototyping, programming and data analysis for IoT Application.*

UNIT – I
Introduction to embedded systems: Introduction - Classification – Applications – Architecture – Harvard and Von-Neuman architectures - RISC vs CISC design philosophy - Embedded processors and their types – Communication Interfaces - Onboard (I2C, SPI, UART, 1-wire interface, parallel interface) & External (RS-232 & RS-485, USB, IEEE 1394, IrDA, Bluetooth, Wi-Fi, ZigBee, GPRS) - Application specific circuitry - Reset, Brownout protection, Oscillator, RTC & Watchdog timer - Embedded firmware - Overview of design process of embedded systems – Programming languages and tools for embedded design.

UNIT – II
IoT Introduction & Concepts: Introduction to Internet of Things - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - IoT Levels & Deployment Templates.
Domain Specific IoTs: Home Automation – Cities – Environment – Energy – Retail – Logistics -Agriculture – Industry - Health & Lifestyle.

UNIT – III

IoT and M2M: Introduction – M2M – Difference between IoT an M2M - Software Defined Networking - Network Function Virtualization for IoT.

Introduction to Arduino: Arduino Board and I/O pins, LCD and Keyboard Programming – Counter and Timer Programming – Interrupt Programming – ADC and Sensor Programming – I2C interfacing with DAC programming – Stepper Motor Interfacing with programming – DC motor with PWM Programming.

UNIT – IV

Developing Internet of Things: IoT Design Methodology - Logical Design using Python - Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ TimeOperations, Classes, Python Packages.

UNIT – V

IoT Physical Devices & Endpoints: IoT Device – Raspberry Pi Board - Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming raspberry Pi with Python – Other IoT devices – Designing and developing IoT applications for real world problems.

TEXT BOOKS

1. Shibu K V, *Introduction to Embedded systems,* Tata McGraw-Hill Education, 1st Edition, 2009.
2. Vijay Madisetti - Arshdeep Bahga, *Internet of Things a Hands-on Approach,* Arshdeep Bahga &Vijay Madisetti , 1st Edition, 2014.
3. Make: Getting Started with Arduino, 3e: The *Open Source Electronics Prototyping Platform Paperback* – 16 January 2015 by Massimo Banzi and Michael Shiloh

REFERENCES

1. Raj Kamal, *Embedded Systems*, Tata McGraw-Hill Education, 2nd Edision, 2011.
2. Adrian McEwen & Hakim Cassimally, *Designing of Internet of Things,* John Wiley and sons Ltd,1st Edition, 2014,
3. Daniel Kellmereit - Daniel Obodovski, *The Silent Intelligence: The Internet of Things*, DnDVentures, 1st Edition, 2013.
4. Muhammad Ali Mazidi, Shujen Chen, Eshragh Ghaemi "*Arduino Programming from Beginning to Advanced",* Amazon Kindle, 1st Edition, 2021.

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(19EC0433) VLSI DESIGN
Professional Elective Course (PEC) –I

COURSE OBJECTIVES
The objectives of this course:

1. *Learn the operation of MOS Transistor and also fabrication of Various MOS transistors.*
2. *Come across to understand basic electrical properties of MOSFET.*
3. *Understand Basic MOS Transistors Inverter operation.*
4. *Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.*
5. *Learn MOS Transistor fabrication metrics.*
6. *Learn semiconductor integrated circuit architectures and CMOS testing.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to
1. *Remember the basic concepts of MOS transistor and history of Integrated Circuit.*
2. *Understand Fabrication steps of MOS transistor and their electrical properties.*
3. *Understand stick diagram and layout design rules.*
4. *Learn MOS transistor designing at gate level and physical level.*
5. *Understand various PLD structures and testing principles of Integrated circuits.*
6. *Apply layout design rules to design logic gates and digital subsystems.*

UNIT – I
Introduction: The Future of Microelectronics, Metal Oxide semiconductor VLSI Technology, Basic MOS transistors, Basic steps of IC fabrication: nMOS, CMOS & BiCMOS.
Basic Electrical Properties of MOS And BICMOS Circuits: Drain to Source Current Ids Versus Voltage Vds Relationships, Threshold Voltage Vt, Transconductance gm and Output conductance gds, Figure of merit ω0, various pull ups loads, Bi-CMOS Inverters.

UNIT – II
VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates.

UNIT – III
Gate Level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits.
Physical Design: Floor-Planning, Placement, routing, Power delay estimation, Clock and Power routing.

UNIT– IV

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, zero/one detectors, Counters, High Density Memory Elements.

UNIT – V

Semiconductor Integrated Circuit Design: Gate-arrays: PLDs, FPGAs, CPLDs and Standard Cells.

CMOS Testing: Need for testing, Testing during the VLSI Life cycle, test principles, design strategies for test.

TEXT BOOKS

1. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, *Essentials of VLSI circuits and*
2. *systems*, PHI, 2013 Edition.
3. Lal Kishore and V.S.V. Prabhakar, *VLSI Design*, IK Publishers.
4. Weste and Eshraghian, *Principles of CMOS VLSI Design*, Pearson Education, 1999.

REFERENCES

1. Wayne Wolf, *Modern VLSI Design*, Pearson Education, 3rd Edition, 1997.
2. John P. Uyemura, *Chip Design for Submicron VLSI: CMOS layout and Simulation*, Thomson Learning.

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(19EC0434) INFORMATION THEORY AND CODING
Professional Elective Course (PEC) –I

COURSE OBJECTIVES
The objectives of this course:

1. *To introduce the principles and applications of information theory.*
2. *To guide the student through the implications and consequences of fundamental theories and laws of information theory and coding theory with reference to the application in modern communication and computer systems.*
3. *To teach coding schemes, including error correcting codes.*
4. *To explain how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems.*

COURSE OUTCOMES (COs)
After the completion of the course, student will be able to

1. *Explain the concept of information.*
2. *Analyze the concept of entropy and error control coding.*
3. *Determine channel capacity.*
4. *Apply coding techniques to define channel capacities and properties using Shannon's Theorems.*
5. *Construct efficient codes for data on imperfect communication channels.*
6. *Analyse error correction and detection in receiver section.*

UNIT - I
Information Theory: Introduction-Measure of information-Information content of message - Average Information content of symbols in Long Independent Sequences-Average Information content of symbols in Long dependent sequences.

UNIT - II
Source Coding: Source coding theorem - Prefix Codes -Kraft McMillan Inequality property Encoding of the Source Output - Shannon’s Encoding Algorithm - Shannon Fano Encoding Algorithm - Huffman codes, Extended Huffman coding.

UNIT - III
Information Channels: Communication Channels-Channel Models-Channel Matrix-Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of Binary Symmetric Channel, Binary Erasure Channel, Murogas Theorem, Continuous Channels.

UNIT - IV

Error Control Coding: Introduction-Examples of Error control coding-methods of Controlling Errors- Types of Errors-Types of Codes-Linear Block Codes: Matrix description of Linear Block Codes-Error Detection and Error Correction Capabilities of Linear Block Codes-Single Error Correcting Hamming Codes.

UNIT - V

Cyclic Codes: Algebraic Structure of Cyclic Codes-Encoding using an (n-k) Bit Shift register-Syndrome Calculation-Error Detection and Correction.

Convolution Codes: Convolution Encoder-Time domain approach-Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

TEXT BOOKS

1. Murlidhar Kulkarni, *Information Theory And Coding*, Wiley India, 1st Edition, 2018.
2. Shu Lin and D.J. Costello Jr., *Error Control Coding*, Prentice Hall, 2nd Edition, 1983.

REFERENCES

1. M. Mansurpur, *Introduction to Information Theory*, McGraw Hill, 1987.
2. N. Abramson, *Information and Coding*, 1st Edition, McGraw Hill, 1963.
3. R.B. Ash, *Information Theory*, Prentice Hall, 1970.

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(19EC0435) BIO MEDICAL ELECTRONICS
Professional Elective Course (PEC) –I

COURSE OBJECTIVES
The objectives of this course:

1. *Understand the various physiological parameters both electrical and non-electricalmethods of recording and also method of transmitting these parameters.*
2. *Learn about the various assist devices used in the hospitals.*
3. *Understand the equipment used for physical medicine and various recently developeddiagnostic and therapeutic techniques.*
4. *Understand the working of ventilators.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the Bio potentials in medical domain.*
2. *Know the working of Non-Electrical Parameter measurement devices.*
3. *Understand the operations of medical Health Assist Devices.*
4. *Apply the telemedicine and telemetry for patient in Medical field.*
5. *Know the working principle of Measuring, Recording and Monitoring equipment.*
6. *Know the different types of ventilators, electronic components and its working.*

UNIT - I
Electro-Physiology and Bio-Potential Recording: The origin of Bio-potentials; bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT - II
Bio-Chemical and Non-Electrical Parameter Measurement: pH, PO2, PCO2, colorimeter, Auto analyser, Oximeters, Blood flow meter, cardiac output, respiratory measurement, Blood pressure,temperature, pulse, Blood cell counters.

UNIT - III
Assist Devices: Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine107.

UNIT - IV
Physical Medicine and Biotelemetry: Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radio pill, electrical safety

UNIT - V

Recent Trends in Medical Instrumentation: Thermograph, Endoscopy unit, Laser in medicine,cryogenic application, Introduction to telemedicine.

Ventilators: Mechanics of respiration, Artificial Ventilation, Ventilators, Types of ventilators, Ventilator terms, Classification of ventilators, Pressure-Volume-Flow diagrams, Modern ventilators, High frequency ventilators, Humidifiers, Nebulizers, and Aspirators.

TEXT BOOKS

1. Leslie Cromwell, *Biomedical instrumentation and measurement*, Prentice Hall of India,New Delhi, 2007.
2. John G.Webster, *Medical Instrumentation Application and Design*, 3rd Edition, Wiley IndiaEdition, 2007.

REFERENCES

1. Khandpur, R.S., *Handbook of Biomedical Instrumentation*, TATA McGraw-Hill, New Delhi,2003.
2. Joseph J.Carr and John M.Brown, *Introduction to Biomedical equipment Technology*, JohnWiley and Sons, New York, 2004.

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(19EC0436) MIXED SIGNAL DESIGN
Professional Elective Course (PEC) –II

COURSE OBJECTIVES
The objectives of this course:

1. *Study the mixed signal of submicron CMOS circuits*
2. *Understand the various integrated based filters and topologies*
3. *Learn the data converters architecture, modeling and signal to noise ratio*
4. *Study the integrated circuit of oscillators and PLLs*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Apply the concepts for mixed signal MOS circuit.*
2. *Analyze the characteristics of IC based CMOS filters.*
3. *Design of various data converter architecture circuits.*
4. *Analyze the signal to noise ratio and modeling of mixed signals.*
5. *Design of oscillators and phase lock loop circuit.*

UNIT – I

SUBMICRON CMOS CIRCUIT DESIGN: Submicron CMOS: Overview and Models, CMOS process flow, Capacitors and Resistors. Digital circuit design: The MOSFET Switch, Delay Elements, An Adder. Analog Circuit Design: Biasing, Op-Amp Design, Circuit Noise**.**

UNIT - II

INTEGRATOR BASED CMOS FILTERS: Integrator Building Blocks- low pass filter, Active RC integrators, MOSFET-C Integrators, gm- C integrators, Discrete time integrators. Filtering Topologies: The Bilinear transfer function, The Biquadratic transfer function, Filters using Noise shaping.

UNIT – III

DATA CONVERTER ARCHITECTURES: DAC Architectures- Resistor string, R-2R ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, and Pipeline DAC. ADC Architectures- Flash, Two-step flash ADC, Pipeline ADC, Integrating ADC‘s, Successive Approximation ADC.

UNIT – IV

DATA CONVERTER MODELING AND SNR: Sampling and Aliasing: A modeling approach, Impulse sampling, The sample and Hold, Quantization noise. Data converter SNR: An overview, Clock Jitter, Improving SNR using Averaging, decimating filter for ADCs, Interpolating filter for DACs, Band pass and High pass sinc filters - Using feedback to improve SNR.

UNIT – V

OSCILLATORS AND PLL: LC oscillators, Voltage Controlled Oscillators. Simple PLL, Charge pumps PLLs, non-ideal effects in PLLs, Delay Locked Loop.

TEXT BOOKS

1. R.Jacob Baker, *CMOS Mixed Signal Circuit Desig*n, Wiley India, IEEE Press, reprint 2008.
2. R.Jacob Baker, *CMOS Circuit Design, Layout and Simulation*, Wiley India, IEEE Press, Second Edition, reprint 2009.
3. Behzad Razavi, *Design of Analog CMOS Integrated Circuits*, McGraw Hill, 33rd Re- print, 2016.

REFERENCES

1. Phillip Allen and Douglas R. Holberg, "CMOS Analog Circuit Design", 3Rd Edn by Allen, Oxford University Press, 2013, Paperback
2. Willy M. C. Sansen,"*Analog Design Essentials"*, Springer; First Edition, 2006.
3. R.J.Baker, H. W. Li, D. E. Boyce, *CMOS Circuit Design, Layout, and Simulation*, PHI, 2002.

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(19EC0437) DIGITAL IMAGE PROCESSING
Professional Elective Course (PEC) –II

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the fundamentals of digital image processing.*
2. *To gain knowledge on image transformation techniques and color image processing.*
3. *To understand various image enhancement methods.*
4. *To know the various restoration and segmentation techniques used in image processing.*
5. *To understand the image compression methods.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Understand the fundamentals and basic mathematical operations on image processing.*
2. *Understand the significance of different image transforms.*
3. *Apply techniques for enhancement of Digital images.*
4. *Analyse the Image degradation/restoration methods.*
5. *Understand various image segmentation Techniques*
6. *Apply compression techniques for image storage.*

UNIT – I
Introduction To Digital Image Processing: Origins of Digital Image Processing, Fundamental steps, Example fields of its usage.
Image Sensing and Acquisition: Image sensing and acquisition –Sampling, Quantization and digital image representation - Classification of digital images and Image types -Basic relationships between pixels - Mathematical tools/operations applied on images.

UNIT– II
Image Transforms: 2D Orthogonal and Unitary transforms -Properties of Unitary transforms – 1D and 2D Discrete Fourier Transform - Discrete Cosine transforms- Hadamard Transforms- Walsh Transform – Discrete wavelet transform - Harr transforms- Hoteling Transforms, Comparison of image transforms.

UNIT – III
Image Enhancement: Background and basic intensity transformation - Histogram processing - Spatialfiltering – Image smoothing and sharpening, Basics of frequency domain filtering- Image smoothing & sharpening filters in frequency domain.
Color Image Processing: Color fundamentals-Color models and their conversion- Pseudo color processing – Color transformation- Smoothing and sharpening of color images.

UNIT– IV

Image Degradation/Restoration: Degradation model, Noise Models, Spatial domain restoration in presence of noise, Inverse filtering, Least mean square filters, Constrained least square restoration.

Image Segmentation: Region based Approach – Clustering techniques-Thresholding and its types- **E**dge detection-Gradient, Roberts, Prewitt, Sobel, Laplacian, LoG, Canny- Edge linking by Heuristic search algorithm- Hough transform-Watershed transform.

UNIT – V

Image Compression: Redundancies in Images- Image Compression model- Fundamentals of information theory-Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transform coding- Image Formats and compression standards.

TEXT BOOKS

1. R.C. Gonzalez & R.E. Woods, *Digital Image Processing*, Addison Wesley/Pearson education, 3rd Edition, 2010.
2. A.K. Jain, *Fundamentals of Digital Image processing*, PHI.

REFERENCES

1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, *Digital Image processing using MATLAB*, Tata McGraw Hill, 2010.
2. S Jayaraman, S Esakkirajan, T Veerakumar, *Digital Image processing*, Tata McGraw Hill, 1st edition, 2009.

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(19EC0438) SCIENTIFIC COMPUTING
Professional Elective Course (PEC) –II

COURSE OBJECTIVES
The objectives of this course:

1. *To give students a detailed description of the concepts of symbolic algorithms.*
2. *To provide students with up-to-date knowledge on some methods and techniques.*
3. *To make students familiar with some software packages and toolkits used to implement the methods mentioned above into practiced in scientific computing.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to:

1. *Master the main methods of non-numerical analysis of functions and processes.*
2. *Use the modern algorithms for searching information in targeted areas and the bases of algorithm construction and analysis.*
3. *Use symbolic software packages to perform engineering and science computations.*
4. *Apply these methods to academic and simple practical instances.*
5. *Develop the abilities to design and conduct advanced numeric and symbolic experiments appropriate for an applied mathematical model, analyze and interpret their results.*

UNIT- I
Symbolic Mathematics Systems: Introduction to symbolic mathematics systems. Effective use of symbolic mathematics systems and their limitations. Exact versus approximate computation. Use of symbolic mathematics systems to construct important mathematical examples, understand theorems, and to qualitatively and quantitatively explore various mathematical objects and their properties.

UNIT- II
Mathematical Algorithms: Key mathematical algorithms such as the Euclidean algorithm and the fast Fourier transform. Integer and polynomial arithmetic. Solution of systems of polynomial equations (introduction to Groebner Bases). Applications of Groebner bases (digital signal processing, robotics).

UNIT- III
Modular Algorithms: Introduction to modular algorithms, their efficient implementation for fast symbolic/numeric computations. Number theoretic algorithms in coding and cryptography. Fast algorithms for multiplication of numbers and polynomials, fast matrix manipulation. Fast algorithms for manipulation of series. Fast factorization of polynomials.

UNIT- IV

Applications for Design: Short vectors in lattices (LLL algorithm), applications for design of realistic optimal algorithms, in cryptography. Resultants and subresultants. Algorithmically solvable and unsolvable problems. Tarski-Seidenberg theorem. Mechanical theorem proving. Modern algorithms for sorting, searching and retrieving information with applications to genomic research and text processing.

UNIT- V

Algorithm Design and Analysis: Elements of algorithm design and analysis. Appropriate efficient data structures. Symbolic integration. Symbolic solution of differential equations. Quantifier elimination and applications to stability analysis and control theory. Other applications based on student interests.

TEXT BOOKS

1. T. M. Apostol. Calculus, Vol. 1: One-Variable Calculus with an Introduction to Linear Algebra.John Wiley & Sons, Inc., ISBN 0471000051
2. T. M. Apostol. Calculus, Vol. 2: Multi-Variable Calculus and Linear Algebra, with Applications to Differential Equations and Probability. John Wiley & Sons, Inc., ISBN 9780471000075.

REFERENCES

1. https://scholar.google.ru/citations?user=dey5ZnMAAAAJ&hl=en
2. https://www.researchgate.net/profile/Sergey_Tsarev Professor in Dept. of Applied Mathematics and Computer Security, Siberian Federal University, Krasnoyarsk, Russia http://www.sfu-kras.ru

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(19EC0439) HIGH SPEED ELECTRONICS
Professional Elective Course (PEC) –III

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the basic concepts of High Speed Devices and High Speed Circuits.*
2. *Discuss the nature, uses OF Materials for High Speed Devices and Circuits.*
3. *To understand the functioning of Silicon based MOSFET and BJT circuits for high speed operation.*
4. *An overview of Semiconductor Materials and Physics.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to:

1. *Know the basic Semiconductor Materials and Physics and their importance in design of high speed circuits.*
2. *understand the functioning of Silicon based MOSFET and BJT circuits for high speed operation*
3. *Able to analyze various methods for high speed low power applications.*
4. *Know the Difference between High Electron Mobility Transistors and Silicon based MOSFET.*
5. *Design high speed electronic circuit by using appropriately High Speed Devices and Circuits*
6. *Familiar with features of various Logic coupled circuits with scaled down devices.*

UNIT – I
Important parameters governing the high speed performance of devices and circuits: Transit time of charge carriers, junction capacitances, ON-resistances and their dependence on the device geometry and size, carrier mobility, doping concentration and temperature.
Electronic devices: p–n junction, Schottky diode, Silicon–germanium, heterostructures, High electron mobility transistor, Radio Frequency MOSFETs, Bipolar and hetero-bipolar transistors

UNIT – II
Materials For High Speed Devices and Circuits: Merits of III –V binary and ternary compound semiconductors (GaAs, INP, In GaAs, and AlGaAsETC.), silicon-germanium alloys and silicon carbide for high-speed devices, as compared to silicon based devices. Brief outline of the crystal structure, Dopants and electrical properties such as carrier mobility, velocity versus electric field characteristics of these materials. Material and device process technique with these III-V and IV – IV semiconductors.

UNIT – III

Silicon Based MOSFET And BJT Circuits for High Speed Operation: Emitter coupled Logic (ECL) and CMOS Logic circuits with scaled down devices. Silicon On Insulator (SOI) wafer preparation methods and SOI based devices and SOICMOS circuits for high speed low power applications.

UNIT – IV

High Electron Mobility Transistors (HEMT): Hetero-junction devices. The generic Modulation Doped FET(MODFET) structure for high electron mobility realization. Principle of operation and the unique features of HEMT InGaAs/InP HEMT structures.

UNIT – V

High Speed Circuits and Tunneling Devices: GaAs Digital Integrated Circuits for high speed operation- Direct Coupled Field Effect Transistor Logic (DCFL), Schottky Diode FET Logic (SDFL), Buffered FET Logic (BFL), SJ MOSFET.GaAs FET Amplifiers. Monolithic Microwave Integrated Circuits (MMICs) Resonant- tunneling hot electron transistors and circuits.

TEXT BOOKS

1. Sheila prasad-hermann Schumacher -Anand Gopinath, *High-Speed Electronics and Optoelectronics: Devices and Circuits***,** Tata Mc Graw-Hill.
2. *Robert Pierret-Pearson- Prentice Hall*, *Semiconductor Device Fundamentals*– 3th Edition-. III-VHigh Electron Mobility Transistor Technologies

REFERENCES

1. Baliga, B. Jaya, *Advanced Power MOSFET Concepts*-, Wiley Publishers
2. Refer the course contents at NPTEL website of IIT Madras of course- *High Speed Devices & Circuits.*

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(19EC0440) FIBER OPTIC COMMUNICATIONS
Professional Elective Course (PEC) –III

COURSE OBJECTIVES
The objectives of this course:

1. *To understand Optical Fiber Communications.*
2. *To understand the Ray Theory, single& amplitude; multimode fibers, fiber materials, losses, dispersion in OFC.*
3. *To understand the connectors, splices, couplers, LASER, LED sources.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.*
2. *Understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.*
3. *Learn the various optical source materials and optical receivers such as LED structures, quantum efficiency, Laser diodes, PIN, APD diodes, noise performance in photo detector, receiver operation and configuration.*
4. *Analyze the use of analog and digital links such as the various criteria like power loss wavelength to be considered for point-to-point link in digital link system.*
5. *Learn the fiber optical network components, variety of networking aspects, and operational principles WDM.*
6. *Analyze the different techniques to improve the capacity of the system.*

UNIT-I
Introduction: The general Optical Communication System, Advantages & disadvantages of Optical fiber communication, Ray Theory transmission: Optical Fiber Structure, Total internal reflection, Angle of incidence, Refractive Index, Numerical Aperture, Skew Rays, Single mode & multimode fibers, Step index & graded index fibers,

Transmission Characteristics of Optical Fibers: Attenuation, Absorption losses, scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave Guides-Information Capacity determination, Group Delay, Intermodal dispersion.

UNIT-II
Fiber Optical Sources and Coupling: Direct and indirect Band gap materials, LED structures, Light source materials, Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition, Rate equations, External Quantum efficiency, Resonant frequencies, Temperature effects.

UNIT-III

Fiber Optical Receivers: PIN and APD diodes, Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise, Comparison of Photo detectors. Fundamental Receiver Operation, pre-amplifiers, Error Sources, Receiver Configuration

UNIT- IV

Optical Fiber System Design & Technology: System specification, Point-to- links, link power budget, Rise Time Budget, Bandwidth Budget, Power Budget (Adaptors, Attenuators and its effects must be explained) and Receiver Sensitivity, Link Budget calculations, Optical Multiplexing & Demultiplexing techniques, Optical Amplifiers and its Applications.

UNIT- V

Optical Networks: Basic networks, Broadcast-and-select WDM networks, Wavelength-routed networks, Performance of WDM+EDFA systems, Optical CDMA, Ultra high capacity networks.

TEXT BOOKS

1. Gerd Keiser, *Optical Fiber Communication*, McGraw –Hill International, Singapore, 3rd ed.,2000.
2. J.Senior, *Optical Communication, Principles and Practice*, Prentice Hall of India, 1994.

REFERENCES

1. Max Ming-Kang Liu, *Principles and Applications of Optical Communications*, TMH, 2010.
2. S.C. Gupta, *Text book on optical fiber communication and its applications*, PHI, 2005.
3. Satish Kumar, *Fundamentals of Optical Fiber communications*, PHI, 2008.

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(19EC0441) ADAPTIVE SIGNAL PROCESSING
Professional Elective Course (PEC) –III

COURSE OBJECTIVES
The objectives of this course:

1. *To understand the basic concepts of concept of signal processing and apply it to the signals which can process adaptively.*
2. *To provide a comprehensive treatment of mathematical signal processing algorithms for designing optimum and linear filters.*
3. *To get overview on designing, implementation, and analysis of adaptive filters applied to system identification, inverse modeling.*
4. *To understand the importance of Adaptive modelling.*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to

1. *Devise filtering solutions for optimising the cost function indicating error in estimation of parameters and appreciate the need for adaptation in design.*
2. *Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters of stationary random process clearly considering practical application specifications.*
3. *Analyse convergence issues associated with adaptive filter design and come up with optimum solutions for real life applications taking care of requirements in terms of complexity and accuracy.*
4. *Apply stability concepts in the design of adaptive filters to achieve finest and accurate model.*
5. *Design and implement filtering solutions for applications such as channel equalisation, interference cancelling and prediction considering present day challenges.*
6. *Estimate the applications of adaptive modelling in multipath communication and geophysical exploration.*

UNIT – I
Adaptive Systems: Definitions and characteristics - applications – properties examples - adaptive linear combiner input signal and weight vectors - performance function-gradient and minimum mean square error - introduction to filtering smoothing and prediction - linear optimum filtering-orthogonality - Wiener – Hopf equation-performance surface.

UNIT – II
Searching Performance Surface-Stability And Rate Of Convergence: Methods of searching the performance surface, Basic ideas of gradient search methods, Learning curve gradient search - Newton's method - method of steepest descent - comparison - Gradient estimation - performance penalty - variance - excess MSE and time constants – Mis adjustments.

UNIT – III

LMS Algorithm Convergence Of Weight Vector: LMS/Newton algorithm - properties - sequential regression algorithm - adaptive recursive filters – random search algorithms - lattice structure – adaptive lattice predictor - adaptive filters with orthogonal signals.

UNIT – IV

Applications-Adaptive Modeling And System Identification: General description, Modelling the single input & single output plant, Learning curves showing convergence, Modelling a multi input & multi output plant, Multipath communication channel, geophysical exploration, FIR digital filter synthesis.

UNIT – V

Inverse Adaptive Modeling: General description of inverse modelling with examples, Adaptive equalization of telephone channels: Overall communication with adaptive channel equalization, Adaptive equalizer with decision direct learning - adapting poles and zeros for IIR digital filter synthesis.

TEXT BOOKS

1. Simon Haykin, "Adaptive Filter Theory", Pearson Education, 2003.
2. Bernard Widrow and Samuel D. Stearns, "Adaptive Signal Processing", Person Education, 2005.

REFERENCES

1. John R.Treichler, C.Richard Johnson, Michael G.Larimore, "Theory and Design of Adaptive Filters", Prentice-Hall of India, 2002.
2. S.Thomas Alexander, "Adaptive Signal Processing-Theory and Application", Springer-Verlag.
3. D. G. Manolokis, V. K. Ingle and S. M. Kogar, "Statistical and Adaptive Signal Processing", McGraw Hill International Edition, 2000.