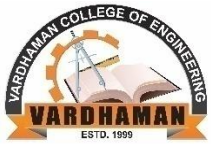

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD
Autonomous Institute, Affiliated to JNTUH
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Shamshabad - 501 218, Hyderabad, Telangana State, India.
www.vardhaman.org

BACHELOR OF TECHNOLOGY

ELECTRONICS AND COMMUNICATION ENGINEERING

(Accredited by NBA)

CURRICULUM AND SYLLABI (VCE R18)

UNDER CHOICE BASED CREDIT SYSTEM

B. Tech. - Regular Four Year Degree Program
(For batches admitted from the Academic Year 2018 - 2019)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the Academic Year 2019 - 2020)

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous Institute, Affiliated to JNTUH

PROGRAM CURRICULUM STRUCTURE

B. TECH - ELECTRONICS AND COMMUNICATION ENGINEERING

Regulations: VCE-R18

I YEAR I SEMESTER

Induction Program for Three Weeks

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4001	Linear Algebra and Ordinary Differential Equations	BS	3	1	0	4	30	70	100
A4003	Semiconductor Physics	BS	4	0	0	4	30	70	100
A4201	Basic Electrical Engineering	ES	3	1	0	4	30	70	100
A4301	Engineering Graphics & Computer Aided Drafting	ES	0	0	3	1.5	30	70	100
A4004	Semiconductor Physics Laboratory	BS	0	0	2	1	30	70	100
A4202	Basic Electrical Engineering Laboratory	ES	0	0	3	1.5	30	70	100
A4022	Engineering Exploration	ES	0	0	2	1	30	70	100
	TOTAL		**10**	**2**	**10**	**17**	**210**	**490**	**700**

I YEAR II SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4002	Advanced Calculus	BS	3	1	0	4	30	70	100
A4007	Engineering Chemistry	BS	4	0	0	4	30	70	100
A4501	Programming for Problem Solving	ES	3	1	0	4	30	70	100
A4009	Functional English	HS	3	0	0	3	30	70	100
A4302	Engineering Workshop	ES	0	0	3	1.5	30	70	100
A4008	Engineering Chemistry Laboratory	BS	0	0	2	1	30	70	100
A4502	Programming for Problem Solving Laboratory	ES	0	0	3	1.5	30	70	100
A4010	English Language Communication Skills Laboratory	HS	0	0	2	1	30	70	100
A4021	Social Innovation	ES	0	0	2	1	30	70	100
	TOTAL		**13**	**2**	**12**	**21**	**270**	**630**	**900**

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PROGRAM CURRICULUM STRUCTURE

B. TECH - ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS: VCE-R18

II YEAR I SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4011	Partial Differential Equations and Complex Variables	BS	3	1	0	4	30	70	100
A4401	Digital Logic Design	ES	3	0	2	4	30	70	100
A4402	Electronic Devices and Circuit Analysis	PC	3	0	2	4	30	70	100
A4403	Signals and Systems	PC	3	0	2	4	30	70	100
A4404	Random Variables and Stochastic Processes	PC	3	1	0	4	30	70	100
A4019	Verbal Ability and Logical Reasoning	HS	1	0	0	1	30	70	100
A4013	Gender Sensitization	MC	2	0	0	0	-	100*	100*
	TOTAL		**18**	**02**	**06**	**21**	**180**	**420**	**600**

II YEAR II SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4025	Managerial Economics and Financial Analysis	HS	3	0	0	3	30	70	100
A4405	Analog Electronic Circuits	PC	3	1	2	5	30	70	100
A4406	Analog Communications	PC	3	0	2	4	30	70	100
A4407	Computer Organization and Operating Systems	PC	3	0	2	4	30	70	100
A4408	Electromagnetic Theory and Transmission Lines	PC	3	1	0	4	30	70	100
A4017	Quantitative Aptitude	BS	1	0	0	1	30	70	100
A4014	Environmental Science	MC	2	0	0	0	-	100*	100*
	TOTAL		**18**	**02**	**06**	**21**	**180**	**420**	**600**

*Grade Points awarded for audit courses will not be considered for calculating SGPA and CGPA

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PROGRAM CURRICULUM STRUCTURE

B. TECH - ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS: VCE-R18

III YEAR I SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4409	Microprocessors and Microcontrollers	PC	2	1	2	4	30	70	100
A4410	Digital Communications	PC	3	0	2	4	30	70	100
A4411	Digital Design through Verilog HDL	PC	3	0	2	4	30	70	100
A4412	Antennas and Wave Propagation	PC	3	1	0	4	30	70	100
	Professional Elective - I	PE	3	0	0	3	30	70	100
A4441	Internship – I	PW	0	0	4	2	100	-	100
A4018	Engineering Design Thinking	ES	0	0	2	1	30	70	100
A4015	Essence of Indian Traditional Knowledge	MC	2	0	0	0	-	100*	100*
	TOTAL		**16**	**02**	**12**	**22**	**280**	**420**	**700**

III YEAR II SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4413	CMOS VLSI Design	PC	3	0	2	4	30	70	100
A4414	Linear Control Systems	PC	2	1	2	4	30	70	100
A4415	Digital Signal Processing	PC	3	1	2	5	30	70	100
	Open Elective – I	OE	3	0	0	3	30	70	100
	Professional Elective – II	PE	3	0	0	3	30	70	100
A4020	Product Realization	ES	0	0	2	1	30	70	100
A4442	Mini Project	PW	0	0	4	2	100	-	100
A4016	Indian Constitution	MC	2	0	0	0	-	100*	100*
	TOTAL		**16**	**02**	**12**	**22**	**280**	**420**	**700**

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PROGRAM CURRICULUM STRUCTURE

B. TECH - ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS: VCE-R18

IV YEAR I SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4418	Internet of Things	PC	3	0	2	4	30	70	100
A4419	Cellular and Mobile Communications	PC	2	0	2	3	30	70	100
	Professional Elective – III	PE	3	0	0	3	30	70	100
	Open Elective – II	OE	3	0	0	3	30	70	100
A4443	Internship – II	PW	0	0	4	2	100	-	100
A4444	Project Work Phase – I	PW	0	0	8	4	100	-	100
	TOTAL		**11**	**0**	**16**	**19**	**320**	**280**	**600**

IV YEAR II SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4026	Management Science	HS	3	0	0	3	30	70	100
	Professional Elective – IV	PE	3	0	0	3	30	70	100
	Open Elective – III	OE	3	0	0	3	30	70	100
A4445	Project Work Phase – II	PW	0	0	16	8	100	100	100
	TOTAL		**9**	**0**	**16**	**17**	**190**	**310**	**500**

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PROGRAM CURRICULUM STRUCTURE

B. TECH - ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS: VCE-R18

Professional Elective – I			
Code	**Course**	**Code**	**Course**
A4451	CPLD and FPGA Architectures and Applications	A4452	Design of ARM Based Systems
A4453	Computer Communication Networks	A4454	Smart antennas
Professional Elective – II			
Code	**Course**	**Code**	**Course**
A4455	Low Power VLSI Design	A4456	Real Time System Design
A4457	Image Analysis and Visualization	A4458	Microwave Engineering
Professional Elective – III			
Code	**Course**	**Code**	**Course**
A4459	Mixed Signal VLSI Design	A4460	Artificial Intelligence with Deep Learning
A4461	DSP Processors and Architectures	A4462	Advanced Communications
Professional Elective – IV			
Code	**Course**	**Code**	**Course**
A4463	VLSI Physical Design Automation	A4464	Embedded Networking
A4465	Bio Medical Instrumentation	A4466	Wireless Communications and Networks
Open Elective			
Code	**Course**	**Code**	**Course**
A4131	Project Planning and Management	**A4531**	Fundamentals of JAVA
A4132	Environmental Pollution and Management	**A4532**	Operation Research
A4133	Disaster Management	**A4533**	Fundamentals of DBMS
A4231	Transducers and Measurements	**A4534**	Fundamentals of Operating Systems
A4232	Solar Energy and Applications	**A4631**	Principles of Software Engineering
A4233	Energy Management and Audit	**A4632**	E-Commerce Trends
A4331	Basic Mechanical Engineering	**A4633**	Fundamental of Cyber Security
A4332	Introduction to 3D Printing	**A4031**	Numerical Techniques
A4333	Fundamentals of Robotics	**A4032**	Mathematical Programming
A4431	Fundamentals of IoT	**A4033**	Special Functions
A4432	Principles of Analog and Digital Communications	**A4034**	Entrepreneurship Development
A4433	Introduction to Signal Processing	**A4035**	Human Resource Management
		A4036	Logistics and Supply Chain Management

SYLLABI FOR I YEAR I SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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I B.TECH I SEMESTER

COURSE STRUCTURE

A4001 – LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Solution of system of linear equations, Eigen values and Eigen vectors, Quadratic forms, Differential equations and their applications, Laplace transforms and its applications to ordinary differential equations. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

1. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4001.1 Solve system of linear equations using rank of a matrix

A40012. Examine the nature of Quadratic form using Eigen values and Eigen vectors

A40013. Solve the first and higher order linear ordinary differential equations

A40014. Make use of ordinary differential equations to solve, Rate of growth/decay, Newton's law of cooling, Electrical circuits and Simple harmonic motion problems

A40015. Apply Laplace transforms to solve ordinary differential equations

3. Course Syllabus

THEORY OF MATRICES: Real, Complex matrices and their properties, Rank of a matrix by reducing to Echelon form and Normal form, Inverse of a matrix by Gauss-Jordan method, Consistency of system of linear equations using the rank of a matrix.

EIGEN VALUES, EIGEN VECTORS AND QUADRATIC FORMS: Linear dependence and independence of vectors, Linear transformation, Eigen values and Eigenvectors of a matrix, Properties of Eigen values and Eigen vectors of real and complex matrices, Cayley-Hamilton theorem (statement and verification), Inverse and powers of a matrix using Cayley-Hamilton theorem, Diagonalization of a

matrix, Quadratic forms up to three variables: Rank, index, signature and nature of quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation.

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Differential equations of first order and first degree: Exact equations and equations reducible to exact form using integrating factors, Linear and Bernoulli's equations. Equations not of first degree: Equations solvable for p , Equations solvable for y , Equations solvable for x and Clairaut's equation, Applications: Newton's law of cooling, Law of natural growth and decay.

HIGHER ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS: Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type $Q(x)=e^{ax}$, $\sin(ax+b)/\cos(ax+b)$, x^n, $e^{ax}V(x)$, $x^nV(x)$. Equations reducible to linear equations with constant coefficients: Cauchy's homogeneous linear equation, Legendre's linear equation, Method of variation of parameters, Applications: $L-C-R$ Circuits and Simple Harmonic Motion.

LAPLACE TRANSFORMS: Laplace transforms of elementary functions , First shifting theorem, Change of scale property, Multiplication by t^n , Division by t , Laplace transforms of derivatives and integrals, Laplace transform of unit step function, Second shifting theorem, Laplace transform of periodic function, Evaluation of some kind of integrals by Laplace transforms, Inverse Laplace transforms, Finding inverse Laplace transforms by different methods, Convolution theorem(without proof), Solving ordinary differential equations by Laplace transform method.

4. Books and Materials

Text Books:

1. B S Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. B V Ramana, *Engineering Mathematics*, 23rd Reprint, Tata Mc Graw Hill Education Private Limited, New Delhi, 2015.

REFERENCE BOOKs:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, Laxmi Publications, 2010.
3. D. Poole, *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole, 2005.

I B.TECH I SEMESTER

COURSE STRUCTURE

A4003 - SEMICONDUCTOR PHYSICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
4	0	0	56	0	0	4	30	70	100

1. Course Description

Course Overview

Semiconductor physics for engineers is the study of fundamental physics combined with problem solving and engineering skills. This interdisciplinary knowledge of quantum physics, semiconductor physics and devices, lasers and optical fiber physics encourages an understanding of technological applications of physics and its importance as a subject of social, economic and industrial relevance enabling the student to design and innovate.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4003.1. Analyze crystal structures in terms of lattice parameters and describe structures using X-rays. Identify various planes in crystals

A4003.2. Interpret the principles of quantum mechanics to classify solids. Relate semiconductor solid properties to the underlying physical concepts.

A4003.3. Analyze the charge carrier dynamics and transport properties in semiconductors

A4003.4. Apply the concepts of semiconductor physics to analyze the various basic electronic devices

A4003.5. Illustrate working of a laser and develop communication systems using optical fibers.

3. Course Syllabus

INTORODUCTION TO CRYSTALLOGRAPHY: Lattice parameters, lattice constant of cubic, packing factor of SCC, BCC, FCC and diamond, Miller indices, Crystal planes and directions, Interplanar spacing of an orthogonal crystal system. Crystal structures of ZnS, Silicon (diamond).

Basic principles of X-ray diffraction, Bragg's law, Laue method, Powder method, applications of X- ray diffraction.

INTRODUCTION TO QUANTUM PHYSICS: De-Broglie hypothesis, wave particle duality, Davison and Germer experiment, G P Thomson experiment, Wave nature of Particles, Time-independent Schrodinger equation, Application of Schrodinger wave equation: Particle in a 1-D box. Infinite and

Finite square well potential. Bloch's theorem, Particle in a periodic potential: Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram.

SEMICONDUCTORS: Types of electronic materials: metals, semiconductors, and insulators, Concept of effective mass of electron and hole, Density of states, Intrinsic and Extrinsic semiconductors, Fermi-Dirac distribution function, Fermi level, Carrier concentration in intrinsic semiconductors, donor and accepter impurities, Variation of Fermi level with temperature, Position of Fermi level in intrinsic and extrinsic semiconductor, Mobility of electrons and holes, charge densities in a semiconductor, direct and indirect band gap semiconductors, Carrier transport: diffusion and drift, Hall Effect.

SEMICONDUCTOR DEVICES:P-N junction diode – V-I Characteristics, Diode current equation, Temperature dependence of V-I characteristics, Diode resistances, Diode models, Diode capacitances, Breakdown mechanisms, Zener diode and their I-V characteristics, Recombination mechanisms, LED, Types of semiconductor photo detectors - PN junction, PIN, and Avalanche and their structure, materials, working principle, and characteristics, solar cell.

LASERS & OPTICAL FIBRES: Absorption, spontaneous and Stimulated emission, Einstein's coefficients, population inversion, pumping processes, three and four level laser systems, He-Ne laser, Semiconductor lasers (homo junction and hetero junction), Applications of lasers. Introduction to Optical fibres, total internal reflection, Acceptance angle, Numerical aperture, step and graded index fibre, Losses in optical fibres, Applications of optical fibres.

4. Books and Materials

Text Books:

1. B. K. Pandey and S. Chaturvedi. Engineering Physics. New Delhi: Cengage Learning India Pvt. Ltd., 2014.
2. D. K Bhattacharya and Poonam Tandon. Engineering Physics. New Delhi: Oxford University Press, 2017
3. M S Thyagi. Introduction to Semiconductor Materials and Devices, Wiley, 2008
4. S.M Sze, Semiconductor Devices Physics and Technology, John Wiley & Son, Inc. 2nd edition, 2002.
5. Satya Prakash, Swati Saluja. Quantum Mechanics, Kedar Nath Ram Nath, 2018

REFERENCE BOOKs:

1. Kittel Charles. Introduction to solid state physics. New Jersey: John Wiley and sons, 2005.
2. S.S. Islam. Semiconductor Physics and Devices. Oxford University Press, 2005.

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I B.TECH I SEMESTER

COURSE STRUCTURE

A4201 – BASIC ELECTRICAL ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

The course addresses the underlying concepts and methods behind Electrical Engineering. The course presents a problem oriented introductory knowledge of the Fundamentals of Electrical Engineering and focuses on the study of basic electrical parameters, basic principles, different types of electrical circuit and methods to solve electrical circuit. The principle and operating conditions of D.C. Machines (Motor & Generator), Transformers, Induction Motors, design of windings, types & characteristics will be discussed. Also the concepts related to electrical installation and protective devices will be discussed.

Course Pre/co requisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4201.1. Apply the network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.

A4201.2. Analyze the electrical Circuits using Nodal Analysis, Mesh analysis and Network theorems.

A4201.3. Study and Analyze the different types of DC Machines, Transformers.

A4201.4. Test the performance of DC Generator, DC Motor, transformer and Induction Motor.

A4201.5. Introduce components of low voltage electrical Installations.

3. Course Syllabus

DC CIRCUITS: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

AC CIRCUITS: Representation of sinusoidal waveforms, peak and RMS values, 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 in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.
TRANSFORMERS: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

ELECTRICAL MACHINES: Generation of rotating magnetic fields, Construction and working of a three phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed Characteristic and speed control of separately excited dc motor. Construction and working of synchronous generator.

ELECTRICAL INSTALLATIONS: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.

4. Books and Materials

Text Books:

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, 3rd edition 2010, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, *Basic Electrical Engineering*, McGraw Hill, 2009.
3. L. S. Bobrow, *Fundamentals of Electrical Engineering*, Oxford University Press, 2011.

Reference Books:

1. E. Hughes, *Electrical and Electronics Technology*, 10th edition Pearson, 2010.
2. Vincent Deltoro, *Electrical Engineering Fundamentals*, 2nd edition, Prentice Hall India, 1989.

I B.TECH I SEMESTER

COURSE STRUCTURE

A4301 – ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	28	1.5	30	70	100

1. Course Description

Course Overview

This course is an introduction to the students about Engineering drawings that are usually created in accordance with standardized conventions for layout, nomenclature, interpretation, appearance. The drawing technique is emphasized in how to draw an object graphically and projection drawing from different point of view. In the end, the student is capable of drawing different components. Rather than using conventional tools for drawing, students are made to use CAD software. The use of CAD process provides enhanced graphics capabilities which allows any designer to conceptualize his ideas, modify the design very easily, perform animation, and use colors, fonts and other aesthetic features.

Course Pre/co-requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4301.1. Construct various types of scales and curves commonly used in engineering practice.
A4301.2. Distinguish between first, second, third and fourth angle projections of systems.
A4301.3. Estimate sheet metal requirement for making regular solids.
A4301.4. Compare isometric and orthographic views of an object.
A4301.5. Select CAD tools for modelling regular solids.

3. Course Syllabus

INTRODUCTION TO ENGINEERING DRAWING: Introduction to engineering drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epi-cycloid, Hypocycloid; Scales – Plain, Diagonal.

ORTHOGRAPHIC PROJECTIONS AND PROJECTIONS OF REGULAR SOLIDS: Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined to both Planes; Projections of Regular Solids: Prism, Cylinder, Pyramid, Cone-inclined to both planes.

SECTIONAL VIEWS AND DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS: Sectional views of right regular solids: Prism, Cylinder, Pyramid, Cone-Development of surface of right regular solids: Prism, Cylinder, Pyramid, Cone.

ISOMETRIC PROJECTIONS: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa.

COMPUTER BASED DRAWINGOVERVIEW OF COMPUTER GRAPHICS: Overview of Computer Graphics, Customisation, Demonstration of a simple team design project: listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software; Customisation& CAD Drawing: consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; **Annotations, layering & other functions:** applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings ; **Demonstration of a simple team design project:** Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids.

4. Books and Materials

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., *Engineering Drawing*, Charotar Publishing House, 2014.
2. Basant Agrawal B. & Agrawal C. M., *Engineering Graphics*, TMH Publication, 2016.

Reference Books:

1. Narayana, K.L. & P Kannaiah, *Text book on Engineering Drawing*, Scitech Publishers, 2016.
2. K. Balaveera Reddy et al, *Computer Aided Engineering Drawing*, CBS Publications, 2017.
1. Shah, M.B. & Rana B.C., *Engineering Drawing and Computer Graphics*, Pearson Education, 2008.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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I B.TECH I SEMESTER

COURSE STRUCTURE

A4004 – SEMICONDUCTOR PHYSICS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This lab course covers the concepts from semiconductors to electricity and magnetism to modern optics. These experiments have a number of applications in today's world and are a valuable tool in the arsenal of engineers across multiple fields. This Laboratory also prepares the students to study the photovoltaic materials and to compute the various parameters of semiconductor materials and devices. The course also makes the students familiar with instrumental methods and various properties of materials. This basic knowledge will enable the scientific fervour to solve the various engineering problems.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4004.1. Determination of Planck's constant and work function of a metal.

A4004.2. Evaluation of band gap of a semiconductor and understand the temperature dependence function of resistivity.

A4004.3. Analyze the diode characteristics.

A4004.4. Analyze the I-V characteristics of solar cell and LED.

A4004.5. Apply the principles of laser light and estimate the losses in the propagation of light in optical fibres.

3. Course Syllabus

1. Determination of Planck's Constant
2. Photoelectric effect
3. Temperature dependence of resistivity of a semiconductor material.
4. Energy gap of a semiconductor
5. Forward and reverse bias characteristics of P-N junction diode
6. Zener diode characteristics and Zener diode voltage regulator
7. V-I Characteristics of solar cell
8. V-I Characteristics of Light Emitting Diode
9. Hall Effect

10. Laser wave length
11. Measurement of Numerical Aperture and Acceptance Angle of given Optical Fiber
12. Losses in Optical Fibers

4. Laboratory Equipment/Software/Tools Required

1. Photo Emissive Cell
2. Regulated Power Supply (DC and AC)
3. Energy Gap Kit
4. Hall Effect Setup
5. Light Emitting Diode Kit
6. Solar Cell Kit
7. Semiconductor Laser Source
8. Plane Diffraction Grating
9. Optical Fiber Trainer Kit
10. Meters - Ammeter, Voltmeter, Digital Multimeter
11. Diodes, Resistors, Capacitors, Bread Board

5. Books and Materials

Text Books:

1. M. S. Tyagi, *Introduction to Semiconductor Materials and Devices*, John Wiley & Sons, India, 2008.
2. D. K. Schroder, *Semiconductor Material and Device Characterization*, Third Edition, John Wiley & Sons, New Jersey, 2015.
3. S. M. Sze and K. Ng. Kwok, *Physics of Semiconductor Devices,* 3rd edition, John Wiley & Sons, New Jersey, 2008.

Reference Books:

1. B. L. Worsnop and H. T. Flint, *Advanced Practical Physics for students*, 9th edition, Methuen, London, 1957.
2. M. Nelkon and J. M. Ogborn, *Advanced Level Practical Physics*, 4th edition, Heinemann Educational Publishers, London, 1985.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous Institute, Affiliated to JNTUH

I B.TECH I SEMESTER

COURSE STRUCTURE

A4202 – BASIC ELECTRICAL ENGINEERING LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	28	1.5	30	70	100

1. Course Description

Course Overview

The course addresses the verification and analysis of Kirchhoff laws and Network Theorems. It also gives the exposure of analyzing transient response of series RL, RC and RLC circuit. Testing of Single phase transformer is done to calculate voltage, current, real power, efficiency and regulation, also the performance of DC motor, three phase Induction Motor and Alternator will be analysed.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4202.1 Verify Ohms law, Kirchhoff laws and Impedance & Current of Series RL, RC and RLC Circuits.

A4202.2 Analyze the transient response of Series RL, RC and RLC series circuits.

A4202.3 Calculate the Voltage, Current Real power in a single phase Transformer.

A4202.4 Test the performance of DC Motor, 1- phase transformer, Alternator and 3 phase Induction Motor.

3. Course Syllabus

1. Verification of Ohms Law.
2. Verification of KVL and KCL.
3. Transient Response of Series RL and RC circuits using DC excitation.
4. Transient Response of RLC Series circuit using DC excitation.
5. Resonance in series RLC circuit.
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer.
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents.(Star-Delta, Delta-Delta, Delta-star, Star-Star).
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit.

11. Performance Characteristics of a Separately Excited DC Shunt Motor.
12. Torque-Speed Characteristics of a DC Compound Motor.
13. Performance Characteristics of a Three-phase Induction Motor.
14. Torque-Speed Characteristics of a Three-phase Induction Motor.
15. No-Load Characteristics of a Three-phase Alternator.

4. Laboratory Equipment/Software/Tools Required

1. Theorems boards.
2. Transformer panel.
3. DC compound Motor.
4. 3 Phase induction motor.
5. Separately Excited DC motor.
6. 3 Phase Alternator.
7. Resistors.
8. Bread boards.
9. Regulated Power Supply.

5. Books and Materials

Text Books:

1. Sudhakar, Shyammohan S. Palli, *Electrical Circuits,* 2nd Edition, Tata Mc Graw Hill, NewDelhi, 2003.

REFERENCE BOOKs:

1. B. L. Theraja, A. K. Theraja, *A text book of Electrical Technology,* 2nd edition, S. Chand Publishers, New Delhi, 2002.

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I B.TECH I SEMESTER

COURSE STRUCTURE

A4022 – ENGINEERING EXPLORATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This course starts with differentiating science and engineering, scientist and engineer, followed by describing engineering graduate attributes and what engineers "do". This course offers the fundamental principles, concepts of engineering, as well as the influences of engineering on society and also hands-on and experiential learning opportunities in specific areas of engineering. This course focuses on data collection and analysis, engineering problem-solving, mathematical modeling, contemporary tools (software and hardware), professional practice and expectations (e.g. communication, teamwork, ethics) and the diversity of fields and majors within engineering. Topics to be covered in this course include: engineering design process in multidisciplinary domain, and unique platform to showcase any idea into functional prototype, project management skills, exploring engineering skills with ethical and sustainability perspective.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4022.1 Compare and contrast the contributions of different types of engineers in the development of a product, process or system.

A4022.2 Apply the common engineering design process to solve complex problems and arrive at viable solution

A4022.3 Explore various contemporary software and hardware tools to provide solutions for the problems.

A4022.4 Apply skills needed for successful team work including the basics of project management and written and oral communication.

A4022.5 Identify the key elements of professional codes of ethics as well as the ethical and societal issues related to the disciplines and their impact on society and the world.

3. Course Syllabus

Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants.
Various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes
Engineering Design Process, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure.
Introduction to mechatronics system, generation of multiple solution, decision matrix, Concepts of reverse engineering.
Introduction to various plat form based development (Arduino) programming and its essentials.
Introduction to sensors, transducers and actuators and its interfacing with arduino Community study, develop questionnaire, identifying the causes of a particular problem.
Engineering Ethics: Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers.
Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas.

Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment.

Project Management: Introduction, Significance of team work, Importance of communication in engineering profession.

Project management tools: Checklist, Timeline, Gantt Chart, Significance of documentation.

4. Books and Materials

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, *Exploring Engineering : An Introduction to Engineering and Design*, Academic Press, 3rd edition, 2012.
2. Byron Francis, *Arduino: The Complete Beginner's Guide*, Create space Independent Publishers, 2016.
3. M. Govindarajan, S. Natarajan & V. S. Senthil Kumar, *Engineering Ethics*, 1st Edition, Phi Learning, 2009.

Reference Books:

1. Neerparaj Rai, *Arduino Projects for Engineers*, 1st edition, BPB Publications, 2016.
2. Simon Monk, *Programming Arduino : Getting Started with Sketches*, 2nd Edition, McGraw-Hill Education, 2016.
3. W. Richard Bowen, *Engineering Ethics – Outline of an aspirational approach*, Springer London.

SYLLABI FOR I YEAR II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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I B.TECH II SEMESTER

COURSE STRUCTURE

A4002 – ADVANCED CALCULUS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Evaluation of improper integrals, functions of single, several variables and their applications, Multiple integrals, Vector differential and integral calculus, Fourier series and Fourier transforms. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4002.1. Evaluate improper integrals and examine the extremum of a function of several variables.
A4002.2. Make use of multiple integrals to find the area and volume of a solid.
A4002.3. Determine scalar potential function for irrotational force fields.
A4002.4.Evaluate line, surface and volume integrals using vector integral theorems.
A4002.5. Develop Fourier series and Fourier transforms of a function.

3. Course Syllabus

CALCULUS: Evaluation of improper integrals: Beta and Gamma functions and their properties, Rolle's Theorem, Lagrange's mean value theorem and Cauchy's mean value theorem, Taylor's and Maclaurin's series. Functions of several variables: Limit, continuity and partial derivatives of functions of two variables (not to be examined), Jacobians, Functional dependence, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

MULTIPLE INTEGRALS: Double integrals, Change of order of integration, Change of variables, Area enclosed by plane curves, Triple integrals, Change of variables, Area, volume, mass and centre of gravity (constant and variable densities).

VECTOR DIFFERENTIATION: Scalar and vector point functions, Gradient, Directional derivative, Tangent plane and normal line to the surface, Divergence, Curl and their related properties, Scalar potential function, Laplacian operator, Vector identities.

VECTOR INTEGRATION: Line integral, work done, Surface integrals, Volume integrals. Vector integral theorems: Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem (without proof) and related problems, Irrotational fields.

FOURIER SERIES AND FOURIER TRANSFORMS: Euler's formulae, Dirichlet's conditions, Fourier series for functions having period $2l$, Fourier series for even and odd functions, Half range Fourier sine and cosine series. Fourier integral theorem (without proof), Fourier sine and cosine integrals, Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

4. Books and Materials

Text Books:

1. B.S. Grewal, *Higher Engineering Mathematics*, 43rdEdition, Khanna Publishers, New Delhi, 2014.
2. B.V. Ramana, *Higher Engineering Mathematics*, 23rdReprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.

REFERENCE BOOKs:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, Laxmi Publications, 2010.
3. G.B. Thomas and R.L. Finney, *Calculus and Analytic Geometry*, 9thEdition, Pearson Education, 2002.

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I B.TECH II SEMESTER

COURSE STRUCTURE

A4007 – ENGINEERING CHEMISTRY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
4	0	0	56	0	0	4	30	70	100

1. Course Description

Course Overview

This course emphasizes a strong base in physical chemistry and organic chemistry to spread over an orientation towards the materials and drug synthesis. This course also focuses on the general applications of chemical principles to the analysis and evaluation of engineering problems such as Water and its treatment, batteries and fuel cells.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

A4007.1. Apply knowledge of three - dimensional arrangements of atoms, molecules and their effects on chemical reactions

A4007.2. Identify differences and similarities of the Batteries

A4007.3. Evaluate the behaviour and interactions between matter and energy at both the atomic and molecular levels

A4007.4. Make use of different methods for softening hardness of water

A4007.5. Apply major chemical reactions in the synthesis of various drugs

3. Course Syllabus

ATOMIC AND MOLECULAR STRUCTURE: Introduction, Concept of atomic and molecular orbitals, Molecular orbital theory, and Molecular orbital energy level diagrams of diatomic molecules - O_2 and N_2.Crystal field theory – crystal field splitting in Octahedral, Tetrahedral and Square planar complexes.

STEREOCHEMISTRY OF CARBON COMPOUNDS: Isomerism**:** Definition and their classification: Constitutional isomers: Definition, examples of chain, functional and positional isomers. Stereoisomers: Definition, examples of enantiomers and diastereomers. Optical activity: Definition, chiral centres. Chiral molecules: Definition and criteria - asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans-1, 2-dichlorocyclopropane). R, S nomenclature, Cahn-Ingold-Prelog rules. Geometrical isomerism of alkenes– cis, trans and E, Z configuration.

ELECTROCHEMISTRY AND BATTERIES: Electrochemical cells -Types, cell notation, cell reaction and cell emf - concentration cells – Electrode and Electrolyte concentration cells, numerical problems. Electrochemical series and its applications. Electrode potential, standard electrode potential, types of electrodes –Hydrogen, Calomel and Quinhydrone electrode. Batteries**:** Primary battery (Zinc-Carbon Battery) and Secondary battery (lead acid and lithium ion battery) - Applications. Fuel cells**:** Concept of Fuel-Cells. Hydrogen –Oxygen fuel cell – advantages and applications.

ORGANIC REACTIONS, DRUG MOLECULES AND SPECTROSCOPY: Introduction, Types of organic reactions, reactions involving substitution (S_N1, S_N2), addition of H_2, X_2 andHX to C-C double bond – Markownikoff and Anti-Markownikoff rule, elimination (E1 and E2), reduction: Hydrogenation by H_2 by Nickel and Pd/C (any two examples for each). Drugs: Introduction and classification. Structure, preparation and uses of commonly used drug molecules- paracetamol, aspirin and ibuprofen. Spectroscopy: Introduction. Principle, selection rules and applications ofVibrational, rotational and electronic spectroscopy.

WATER TECHNOLOGY: Introduction, Hardness of water, causes of hardness and types of hardness: temporary and permanent – expression and units of hardness. Numerical problems. Potable water and its specifications. Treatment of water for drinking-filtration, sedimentation, chlorination and ozonization. Boiler troubles**:** Causes and effects.Sludges, scales and caustic embrittlement. Internal treatment of boiler feed water – Calgon conditioning, Phosphate conditioning, Colloidal conditioning – Softening of water by ion- exchange process. Desalination of water – Reverse osmosis.

4. Books and Materials

Text Books

1. Jain & Jain. *Engineering Chemistry:* Dhanapathrai Publications., 2015.
2. Prsanta Rath, B. Rama Devi, Ch. Venkata Ramana Reddy &SubhenduChakroborty, *Engineering Chemistry:* Cengage Publications., 2018.
3. B. H. Mahan, Rollie. J. Meyers. *University chemistry*: Pearson publications, 4th edition, 2009.
4. C. N. Banwell. *Fundamentals of Molecular Spectroscopy:* McGraw Hill Education India, 4th edition, 2016.
5. GL David Krupadanam, Vijaya Prasad, Varaprasad Rao K. *Drugs: Universities Press (India) Limited.*

REFERENCE BOOKs:

1. B. L. Tembe, Kamaluddin and M. S. Krishnan. *Engineering Chemistry (NPTEL Web-book)*
2. Peter Atkins, Julio de Paula's *Physical Chemistry*, Oxford University Press, Tenth Edition, 2014.
3. D. Nasipuri, *Stereochemistry of Organic Compounds – Principles and Applications*, 3rd Edition, New Age International (P) Limited.

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I B.TECH II SEMESTER

COURSE STRUCTURE

A4501 – PROGRAMMING FOR PROBLEM SOLVING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

The course is a Basic Engineering course for all computation aspiring students. It is designed to provide a comprehensive study of the C programming language that covers the fundamental principles of computer programming, with an emphasis on problem solving strategies using structured programming techniques. The syntax and constructs of data types, control statements, arrays, functions and pointers are elaborated. The derived data types like structures are discussed. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and reusable code to solve mathematical, engineering and simple data processing problems.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4501.1. Select right identifiers, data types and operators for effective computation.
A4501.2. Write programs using control statements.
A4501.3. Write programs demonstrating use of arrays, strings and their applications.
A4501.4. Demonstrate the applications of function and recursion.
A4501.5. Write programs for simple real life problems using pointers and structures.

3. Course Syllabus

INTRODUCTION TO PROGRAMMING: Introduction to components of Computer Systems.
ALGORITHM DEVELOPMENT: Steps to solve logical and numerical problems. Representation of Algorithm, Flowchart and Pseudo code with examples.
INTRODUCTION TO THE C LANGUAGE: C program structure, identifiers, data types, Formatting input/output, Syntax and Logical Errors in compilation, object and executable code.

OPERATORS: Arithmetic, Logical, Relational, Conditional, Assignment, Increment and Decrement operators.
EXPRESSIONS: Arithmetic Expressions, Operator precedence and associativity.

DECISION MAKING AND LOOPING: Writing and evaluation of decision making, branching and looping.

ARRAYS: Definition, Types of Arrays, declaration and Initialization of n-Dimensional Arrays and Character array, String manipulation.
SEARCHING AND SORTING: Linear search, Bubble sort and Selection sort.

FUNCTIONS: Functions, Parameter passing in functions through call by value, passing arrays to functions, storage classes.
RECURSION: Recursion as a different way of solving problems. Example programs, such as finding factorial, Fibonacci series.

POINTERS: Definition, Declaration, Pointer arithmetic, Pointer to Pointer, Pointer to an array (base pointer), Dynamic memory allocation, Command Line arguments, idea of call by reference in functions.
STRUCTURES: Defining, Declaring and initialization of structures, nested structures, Array of Structures.

4. Books and Materials

Text Book:

1. B. A. Fouruzan and R. F. Gilberg, C Programming & Data Structures, 3rd Edition, CENGAGE, Learning, India, 2014.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, 2nd Edition, Prentice Hall of India, 2015.
2. E. Balagurusamy, *Programming in ANSI C*, 7th Edition Tata McGraw-Hill, 2017.

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I B.TECH II SEMESTER

COURSE STRUCTURE

A4009 – FUNCTIONAL ENGLISH

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	28	3	30	70	100

1. Course Description

Course Overview

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic and communicative competencies of Engineering students. In English classes, the focus should be on the development of competence in the areas of grammar and vocabulary and skills development in terms of reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts/poems silently leading to reading comprehension. Reading comprehension passages are given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind. For instance, newspaper articles, advertisements, promotional material etc could be deployed as supplementary material to enhance their communication skills. The focus of the syllabus is on language acquisition and skill development.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

A4009.1. Demonstrate an understanding of the significance of humanity, love and service to mankind
A4009.2. Utilize appropriate vocabulary in the given contexts
A4009.3. Build competence in grammar
A4009.4. Develop effective academic reading skills
A4009.5. Develop effective academic writing skills

3. Course Syllabus

Vocabulary: Word Formation – Prefixes – Suffixes – Guessing the meanings of the words using prefixes and suffixes- Standard Abbreviations
Grammar: Articles
Reading: Presidential Address by APJ Abdul Kalam: Techniques for effective comprehension - Skimming and Scanning-Types of texts – Summarizing

Writing: Sentences – Paragraphs – Cohesion – Coherence – Logical, Lexical and Grammatical Devices – Punctuation – Types of Paragraphs: Description – Definition – Classification.

Vocabulary: Synonyms – Antonyms
Grammar: Prepositions
Reading: The Road Not Taken (Robert Frost): Reading using different strategies: Types of Reading – Extensive and Intensive-Do's and Dont's of reading
Writing: Letter Writing – Formats, Styles, Parts – Letters of Requisition, Letters of Inquiry, Letters of Apology.

Vocabulary: Homonyms, Homophones, Homographs, Foreign Words - Redundancies – Clichés
Grammar – Changing words from one form to another – Concord – Tenses: Present, Past and Future Active and Passive Voice.

Vocabulary: Idiomatic Expressions - One Word Substitutes
Grammar: Noun-Pronoun Agreement – Misplaced Modifiers
Reading: Good Manners (J C Hill): Practice in reading different types of texts efficiently - Predicting the Content – Understanding the gist - Note Making- Understanding Coherence- Sequencing Sentences
Writing: Information Transfer: Bar Charts – Flow Charts – Tree Diagrams**.**

Reading: *Exercises for practice
Writing: Essay writing: Introduction – Conclusion- Précis Writing: Introduction – Steps to Effective Précis writing – Guidelines.
*Reading material from Text books and Reference books

4. Books and Materials

Text Books:

1. *Fluency in English – A Course book for Engineering Students* (by Board of Editors: Orient BlackSwan Pvt. Ltd, Hyderabad, 2016.
2. Raman, Meenakshi , Sharma, Sangeeta, *Technical Communication- Principles and Practice,* 3rd Edition, Oxford University Press, New Delhi. Print, 2015.

Reference Books:

1. Green, David *Contemporary English Grammar –Structures and Composition,* MacMillan India, 2014.
2. Rizvi, M. Ashraf, *Effective Technical Communication,* Tata Mc Graw –Hill, 1995.
3. Michael Swan, *Practical English Usage,* 3rd Edition, Oxford University Press, 1995.
4. Wood F. T, *Remedial English Grammar for Foreign Students,* Macmillan, 2007.
5. Zinsser William, *On Writing Well,* Harper Resource Book, 2001.
6. Liz Hamp- Lyons, Ben Heasley, *Study writing,* Cambridge University Press, 2006.

I B.TECH II SEMESTER

COURSE STRUCTURE

A4302 – ENGINEERING WORKSHOP

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	28	1.5	30	70	100

1. COURSE DESCRIPTION

Course Overview

This is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. The course intends to impart basic knowledge and how various hand tools and their usage in different sections of manufacturing. Irrespective of branch, the budding engineer's use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems and develop prototype models whenever necessary. The workshop experiences would help to build the understanding of the complexity of the industrial job, along with time and skills requirements of the job with safety measures. Workshop curricula build the hands on experiences which would help to learn manufacturing processes and production technology to build learners innovative ideas to develop by models. Workshop practice is also important since only practice can make the man perfect. The students are advised to undergo each skill experience of blooms taxonomy levels like remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each shop.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. COURSE OUTCOMES (COS)

After the completion of the course, the student will be able to:

A4302.1. Demonstrate the applications of manufacturing tools & joining process.
A4302.2. Produce basic components using workshop trades.
A4302.3. Identify and apply the tools for different trades of engineering workshop practice.
A4302.4.Recognize the circuit and its operational features in house wiring.
A4302.5. Explain the different materials that are used in workshop trades.

3. Course Syllabus

PART – A (TRADES FOR LECTURES & VIDEOS)

Note: Minimum one Hour Lecture on each Trade, to be discussed by any class room teaching technique in following trades.

Manufacturing Methods:

1. Casting, Forming, Joining, Machining, Advanced Manufacturing Methods
2. CNC machining , Additive Manufacturing
3. Fitting Operation & Power Tools , Carpentry , Plastic Molding , Glass Cutting, Metal Casting
4. Welding (Arc Welding & Gas Welding), Brazing, Sheet Metal Forming

PART-B (TRADES FOR PRACTICE)

1. Fitting Trade:

a. L -Fitting Joint b. V- Fitting Joint
c. Square - Fitting Joint d. Semicircular - Fitting Joint

2. Carpentry Trade:

a. Lap Joint (Two Experiments) b. Bridle Joint (Two Experiments)

3. House wiring Trade:

a. House Wiring (5 Experiments)

4. Welding Trade:

a. Arc Welding (Two Experiments) b. Gas Welding (Two Experiments)

5. Foundry Trade:

a. Single Piece Pattern b. Multiple Piece Pattern

6. Tin Smithy Trade:

a. Open Scoop b. Funnel
c. Rectangular Tray d. Square & Cylindrical Pipes

7. Black Smithy Trade:

a. Round to Square and Vice Versa
b. S - Hook c. O - Ring

Note: Minimum one experiment from each Trade with total of 12 Experiments.

4. Books and Materials

Text Books:

1. B. L. Juneja, "*Workshop Practice*", 1st Edition, Cengage Learning India Private Limited, New Delhi, 2015.
2. H.S. Bawa, "*Workshop Practice*", 3rd Edition, Mc Graw Hill Education, New Delhi, 2017.
2. S.K.Garg, "*Workshop Technology (Manufacturing process)*" 4thEdition, Laxmi Publications (P) Ltd., New Delhi, 2017.

Reference Books:

1. K.Venkata Reddy," *Workshop Manual*", 6th Edition Reprint, BSP Publications, Hyderabad, 2018.
2. S Gowri & T Jeyapoovan, *Engineering Practices Lab Manual*, 5th Edition, Vikas Publishing House Private Limited, New Delhi, 2017.
3. Singh, Rajender, *Introduction to Basic Manufacturing Process & Workshop Technology*, 2nd Edition, New Age International (P) Ltd. New Delhi, 2014.

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I B.TECH II SEMESTER

COURSE STRUCTURE

A4008 – ENGINEERING CHEMISTRY LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This course emphasizes a strong background to carryout chemical analysis. The objective of engineering chemistry laboratory is to understand various instrumental techniques, physical properties of organic liquids, separation techniques, and organic synthesis to inculcate the knowledge of engineering chemistry discipline. The experiments on water treatment are proved to be vital in engineering applications on industrial level.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4008.1 Measure molecular/ system properties such as surface tension, viscosity, conductance of solutions and redox potentials.

A4008.2 Apply various titrations for the estimation of strengths of solutions and hardness of water.

A4008.3 Identify different samples from a mixture by using various separation techniques.

A4008.4 Estimate rate constants of reactions from concentration of reactants/products as a function of time.

A4008.5 Evaluate the percentage of yield of chemical substances by organic synthesis.

3. Course Syllabus

1. Estimation of strength of hydrochloric acid by conductometric titration.
2. Estimation of strength of hydrochloric acid by potentiometric titration.
3. Estimation of Iron in Mohr's salt by potentiometric titration.
4. Estimation of hardness of water by complexometry using EDTA
5. Determination of chloride content in water by Argentometry.
6. Determination of viscosity of a given fluid by Ostwald's viscometer.
7. Determination of surface tension of a given liquid by using Stalagmometer
8. Synthesis of Aspirin and Paracetamol.
9. Thin layer chromatography calculation of R_f values. Eg. ortho and para nitro phenols.
10. Verification of Freundlich adsorption isotherm of acetic acid on Charcoal.

11. Determination of partition coefficient of acetic acid between butanol and water.
12. Determination of the rate constant of acid catalyzed hydrolysis of methylacetate.

4. Laboratory Equipment/Software/Tools Required

1. Digital Conductometer
2. Digital Potentiometer
3. Electrical Water Heater
4. Wall Mount Distillation Plant
5. Analytical/Digital Weighing Balance
6. Ostawald's Viscometer
7. Stalagnometer
8. Stop watch
9. Thermometer
10. RB Flask condenser
11. TLC Plates (silica coated)
12. TLC Chambers
13. Magnetic Stirrer
14. Iodine Blowers

5. Books and Materials

Text Books:

NIL

Reference Books:

1. S.S.Dara, *Experiments and Calculations in Engineering Chemistry,* S-Chand Publications, Revised edition., 2008.
2. Dr.M.P.S Murali Krishna and M.Gopala Krishna, *Chemistry Lab Manual*, VGS Publications.
3. Dr. A.Ravi Krishnan, Dr.T.Syeda Jeelani Basri, and Mrs.M.B.Lakshmi, *Engineering Chemistry Laboratory Manual.*

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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I B.TECH II SEMESTER

COURSE STRUCTURE

A4502 – PROGRAMMING FOR PROBLEM SOLVINGLABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	28	1.5	30	70	100

1. Course Description

Course Overview

This hands-on course provides a comprehensive introduction to the ANSI C language, emphasizing portability and structured design. Students are introduced to all major language elements including data types, control statements. Thorough treatment is given to the topics of arrays, functions and pointers. The course also elucidates the use of structures. Comprehensive hands on exercises are integrated throughout to reinforce learning and develop real competency.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COS)

After the completion of the course, the student will be able to:

A4502.1. Demonstrate use of control statements, arrays and strings.

A4502.2. Demonstrate use of functions and recursive functions.

A4502.3. Design and implement C programs for simple real life problems using pointers and structures.

A4502.4. Debug erroneous programs related to the C language.

3. Course Syllabus

1. Programs using I/O statements and various operators.
2. Programs using expression evaluation and precedence
3. Programs using decision making statements and branching statements.
4. Programs using loop statements.
5. Programs to demonstrate applications of n dimensional arrays.
6. Programs to demonstrate searching and sorting.
7. Programs to demonstrate use of string manipulation functions.
8. Programs using user-defined functions.
9. Programs to demonstrate parameter passing mechanism.
10. Programs to demonstrate recursion
11. Programs to demonstrate use of pointers.
12. Programs to demonstrate command line arguments.

13. Programs to demonstrate dynamic memory allocation.
14. Programs to demonstrate applications of structures.
15. Programs to demonstrate file operations.

4. Books and Materials

Text Books:

1. B. A. Fouruzan and R. F. Gilberg, C Programming & Data Structures, 3rd Edition, CENGAGE, Learning, India, 2014.

Reference Books:

1. YashavantKanetkar, *Let Us C*, 15th Edition, BPB Publications, 2017.

I B.TECH II SEMESTER

COURSE STRUCTURE

A4010 – ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

The basic idea behind offering English as a practical subject at the undergraduate level is to acquaint the students with a language that enjoys currently as a lingua franca of the globe. In the ELCS lab the students are trained in Communicative English Skills: phonetics, word accent and intonation, making effective oral presentations – both extempore and prepared, role- play, telephonic skills, asking for and giving directions, etc. The lab encourages students to work in a group, engage in peer-reviews and inculcate team spirit through various exercises related to listening to native speakers' accent and participating in speaking activities.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4010.1. Improve his/her pronunciation
A4010.2. Take part in role-plays and perform effectively in real-life situations
A4010.3. Choose appropriate words and phrases to make effective telephonic conversations
A4010.4. Minimize stage fear and make effective presentations
A4010.5. Build sustained conversations

3. Course Syllabus

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

Module – 1:

ALL: Introduction to Phonetics - Speech Sounds – Vowels and Consonants

ICS: Ice-Breaking activity and JAM session.

Module – 2:

CALL: Past Tense Marker and Plural Marker – Syllable Structure – Consonant Clusters - Minimal Pairs

Module – 3:

ICS: Situational Dialogues – Role-Play – Expressions in Various Situations: Greetings: Self-introduction

and Introducing others – Apologies – Requests – Complaints – Congratulating – Expressing sympathy/ condolences.

Module – 4:
CALL: Basic Rules of Word Accent – Stress Shift – Weak Forms and Strong Forms

Module – 5:
ICS: Asking for and Giving Directions – Giving Instructions – Seeking Clarifications – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions
Module– 6:
CALL: Neutralization of Mother Tongue Influence-Common Indian Variants in Pronunciation – Differences between British and American pronunciation

Module – 7:
CALL: Intonation Patterns-Types of Tones - Sentence Stress

Module – 8:
ICS: Social and Professional Etiquette - Telephone Etiquette

Module – 9:
ICS: Oral Presentation Skills (short presentations) - Making a Presentation-Prepared –Extempore

Module – 10:
ICS: Listening-Types of Listening-Steps to effective Listening –Business Listening Comprehension exercises

4. Laboratory Equipment/Software/Tools Required

1. Computers with internet
2. K VAN Solutions Software
3. Headphones
4. Audio Visual Equipment

5. Books and Materials

Text Books:

NIL

Reference Books:

1. Mohanraj, J., *Let Us Hear Them Speak,* Sage Texts. Print, New Delhi, 2015.
2. Hancock, M., *English Pronunciation in Use* Intermediate, Cambridge University Press. Print, Cambridge, 2009.
3. Sanjay Kumar and Pushp Lata, *Communication Skills,* Oxford University Press, 2011.
4. *Exercises in Spoken English,* Parts I-III CIEFL, Oxford University Press, Hyderabad.

I B.TECH II SEMESTER

COURSE STRUCTURE

A4021 – SOCIAL INNOVATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

Social Innovation is an open ended course to develop social connectedness in engineering students through social awareness and social consciousness. This can be done through live field exposure along with faculty led conceptual presentations, real case reviews; self-study assignments, literature and field survey. Through this course, the students are expected to use their engineering knowledge to provide innovative solutions to existing social problems. This course also develops critical thinking ability among the students.

Course Pre/co-requisites

To create innovative solutions/ approaches to existing social problems by using basic engineering knowledge.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4021.1. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions and redox potentials.

A4021.2. Apply various titrations for the estimation of strengths of solutions and hardness of water.

A4021.3. Identify different samples from a mixture by using various separation techniques.

A4021.4. Estimate rate constants of reactions from concentration of reactants/products as a function of time.

A4021.5. Evaluate the percentage of yield of chemical substances by organic synthesis.

3. Course Syllabus

Introduction to Social Innovation: Core definitions, core elements and common features of social innovation, a typology of social innovation, Awakening social consciousness.

Create Mindsets: Seven mindsets– Empathy, Optimism, Iteration, Creative confidence, Making it, Embracing ambiguity, Learning from failures.

Wicked Problems: Distinguish between simple, complicated and complex problems; describe the characteristics of wicked problems, breakdown a given problem by unpacking its complexity..
Critical Thinking for Social Innovation: Definition, engineering thinking and learning, distinguish between creativity and innovation.

Models for Creative Thinking: Appreciative Inquiry (AI), Asset Based Community Development (ABCD) and Concept of Bricolage.
Process of Social Innovation:
Community study, develop questionnaire, identifying the causes of a particular problem.

Process of Social Innovation: Identify needs, record your learning's.
Process of Social Innovation: Generate ideas, select promising ideas, prototyping and testing.

Social Innovation across Four Sectors - The non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.
Stages of Innovation: Social organizations and enterprises, social movements, social software and open source methods, common patterns of success and failure.

4. Books and Materials

Text Books:

1. Robin Murray, Julie Caulier - Grice, Geoff Mulgan, "The open book of social innovation: Ways to Design, Develop and Grow Social Innovation", The Young Foundation, 2010.
2. Julie Caulier-Grice, Anna Davies, Robert Patrick & Will Norman, The Young Foundation (2012) Social Innovation Overview: A deliverable of the project: "The theoretical, empirical and policy foundations for building social innovation in Europe" (TEPSIE), European Commission–7th Framework Programme, Brussels: European Commission, DG Research.

Reference Books:

1. Geoff Mulgan, "Social Innovation: What it is, Why it matters and How it can be accelerated", The Young Foundation, 2007.
2. Asset Based Community Development (ABCD) Model –http://www.nurturedevelopment.org/asset-based-community-development/.
3. Diana Whitney & Amanda Trosten-Bloom, "The Power of Appreciative inquiry – A Practical Guide to Positive Change", 2nd Edition, Berrett-Koehler Publishers, Inc, 2010.

SYLLABI FOR II YEAR I SEMESTER

II B.TECH I SEMESTER

COURSE STRUCTURE

A4011 – PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course deals with more advanced engineering mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The topics covered include: Partial differential equations and their applications, Analyticity of a complex function, Cauchy-Riemann equations, Elementary functions of a complex variable, Complex integration, Complex power series, Calculus of residues and various methods of contour integration, Conformal mapping. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts encountered in the program.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4011.1 Classify and solve first order partial differential equations.

A4011.2 Solve linear partial differential equations of higher order with constant coefficients.

A4011.3 Test for analyticity of complex functions using Cauchy-Riemann equations and identify real and imaginary parts of elementary functions.

A4011.4 Develop analytic function in series form using Taylor's series and Laurent's series

A4011.5 Evaluate integrals along a contour using Cauchy's integral formula and Residue theorem; Apply conformal mapping to transform complex regions into simpler regions

3. Course Syllabus

First Order Partial Differential Equations: Formation of partial differential equation by eliminating the arbitrary constants and arbitrary functions, Solutions of first order linear, quasi linear (Lagrange) equation and nonlinear (standard type) equations, Equations reducible to standard form

Higher Oder Partial Differential Equations: Classifications of second order partial differential equations, Solving linear equations with constant co-efficients by finding complementary function and particular integral, Method of separation of variables, Solution of one dimensional wave and heat equations

Differentiation of Complex Functions: Continuity, differentiability and analyticity of functions of a complex variable, Cauchy-Riemann equations in cartesian and polar form, harmonic and conjugate harmonic functions, Milne-Thomson method; Exponential, circular, hyperbolic and logarithmic functions of a complex variable, General and principal values of a logarithmic function.

Integration of Complex Functions: Complex integration: Line integral in complex plane, Cauchy's integral theorem and Cauchy's Integral formula (without proof), Zeros and singularities of analytic function, types of singularities. Complex power series: Taylor's series, Laurent's series.

Calculus of Residues: Residues, Residue theorem, Evaluation of real definite integrals of the form (i) $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$, (ii) $\int_{-\infty}^{\infty} f(x)dx$. Conformal mapping: Translation, rotation, inversion, bilinear transformation and their properties, determination of bilinear transformation of three given points.

4. Books and Materials

Text Books:

1. B.S. Grewal, *Higher Engineering Mathematics*, 43rdEdition, Khanna Publishers, New Delhi, 2014.
2. B.V. Ramana, *Higher Engineering Mathematics*, 23rdReprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.

REFERENCE BOOKs:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
2. J. W. Brown and R. V. Churchill, *Complex Variables and Applications*, 7thEdition, Mc-Graw Hill, 2004.
3. Ian N Sneddon, *Elements of Partial Differential Equations,* Dover Publications, 2006.

II B.TECH I SEMESTER

COURSE STRUCTURE

A4401 – DIGITAL LOGIC DESIGN

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	1	42	0	28	4	30	70	100

1. COURSE DESCRIPTION

Course Overview

This is the fundamental course in Electronics and Communication Engineering. This course will provide the fundamental background needed to understand how digital systems work and in particular digital computers. This course will be begun by covering the mathematical concepts necessary in the study of digital systems and then design and analysis of combinational circuits, and show how to construct the minimal (least number of gates) circuit necessary to implement a specific function. Then move on to sequential circuits which add a concept of memory or feedback to the combinational design and will analyze and design these circuits. Finally, some standard and common electronic components (such as counters and shift registers) will be designed and analyzed. The course is an integrated course having theory and practical components that integrates hands-on experience with LabVIEW software including logic simulation, implementation and verification of all the combinational and sequential circuits. This course forms the basis for the study of advanced subjects like Computer Architecture and Organization, Microprocessors and Interfacing and Embedded systems. It is imperative that these concepts are well understood.

Course Pre/ Co-requisites

- Basic Gates

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4401.1. Illustrate the knowledge of Boolean algebra concepts to simplify a digital circuit.
A4401.2. Construct various digital circuits used in digital systems.
A4401.3. Make use of various sequential digital circuits to develop basic building blocks.
A4401.4.Evaluate various experiments using Modern tools to demonstrate a given application.
A4401.5. Analyze an application of digital circuit.

3. Course Syllabus

Theory

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion. Logic gates.

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU.

Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK Flip-flops, Edge triggered FF, Ripple and Synchronous counters, Shift registers.

Concept of Programmable logic devices like PAL, PLA and FPGA. Logic implementation using Programmable Devices . Finite state machines, Design of synchronous FSM.

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements.

Practice

1. Realization of Logic gates
2. Realization of Boolean function using basic gates and using Universal gates
3. Implementation and verification of Code Converters
4. Realization of Boolean function using MUX
5. Implementation and verification of Half adder , Full adder and parallel adder
6. Design and verification of Flipflops
7. Implementation and verification of magnitude comparators
8. Design and implementation of Ripple and synchronous counters to count from 0 to 99
9. Design and implementation of Ring counter and Johnson counters
10. Implementation of RAM (using IC 74189)
11. Implementation of Ping – pong game.

4. Laboratory Equipment/Software/Tools Required

1. LabVIEW Simulation Software
2. MyDAC
3. MyRIO Hardware Components.

5. Books and Materials

Text Books:

1. M. Morris Mano, Michael D. Ciletti (2008), Digital Design 4th Edition, Pearson Education/ PHI, India.
2. Charles H RothJr, Larry L Kinney 6th Edition , Fundamentals of Logic Design , Cenage Learning

Reference Book:

1. Ronald J Tocci, Ronald J Tocci, Neal S Widmer, Gregory L Moss, Digital Systems Principles an Applications, 10th Edition, Pearson Education International.

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II B.TECH I SEMESTER

COURSE STRUCTURE

A4402 – ELECTRONIC DEVICES AND CIRCUIT ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. COURSE DESCRIPTION

Course Overview

This course covers fundamental topics that are common to a wide variety of electronic devices, circuits and systems. The topics include right from the inception of evolution of semiconductor devices to their real time applications. This course starts with basics of semiconductors, review of operation and characteristics of semiconductor devices (namely, semiconductor diodes, BJTs, JFETs and MOSFETs), and build-up to the construction of electronic circuits like rectifiers with and without filters, biasing circuits and transistor amplifiers. This course provides a basis for students to continue education by undertaking advanced study and research in the variety of different branches of semiconductor devices and applications.

Course Pre/co-requisites

- Semi-conductor Physics (A4003)
- Basic Electrical Engineering (A4201)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4402.1. Demonstrate the principle of operation of electronic devices and circuits

A4402.2. Construct electronic circuits making use of diodes and transistors

A4402.3. Analyze amplifier and oscillator circuits and verify using appropriate simulation tools

A4402.4. Distinguish between voltage amplifiers and power amplifiers

A4402.5. Analyze the effect of feedback and cascading in amplifiers

3. Course Syllabus

Theory

Diode Characteristics: Basic structure and operating principle, current-voltage characteristics, diode models.

Diode Applications: Rectifier circuits (half-wave and full-wave rectifiers, rectifiers with capacitor filter), voltage regulator (using Zener diode), clipper (limiter) circuits, clamper circuits.

Bipolar Junction Transistor Characteristics:

Structure, principle of operation, different configurations (such as CE, CB and CC), input and output characteristics, DC analysis - load line and operating point, biasing schemes, bias stability.

BJT Applications: Transistor as an amplifier, small-signal equivalent circuits, single-stage BJT amplifier (common-emitter mode); BJT as a switch.

Junction Field Effect Transistor (JFET): structure, principle of operation, characteristics.

Metal Oxide Semiconductor Field-Effect Transistors: structure and physical operation of n-type and p-type MOSFET; transfer and drain characteristics.

MOSFET Applications: MOSFET as a switch; Static CMOS logic circuits (Simple Logic Gates)

Multistage amplifiers and Power Amplifiers: Cascade and Cascode amplifiers, Darlington pair, various classes of operation (Class A, B, AB, C etc.), their power efficiency.

Amplifier Applications: Block diagram of public address system – voltage amplifiers and power amplifiers.

Concept of Feedback in amplifiers: Negative feedback - Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain and bandwidth. Positive feedback – review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitts).

Practice

1. Design of regulated power supply
2. Analyze how the diode clipper circuits change the shape of the input signal under different case studies.
3. Analyze how diode clamping circuits are used as voltage doublers or voltage multipliers.
4. Bias a given BJT to work in a desired Quiescent operating point by employing different biasing techniques.
5. Design and set up an RC-coupled CE amplifier using bipolar junction transistor and to plot its frequency response. Also measure its input and output impedances.
6. Study Transfer and drain characteristics of JFET and analyze how JFET acts as voltage variable resistor.
7. Analyze how gain and bandwidth vary with multi-stage amplifiers (Cascaded CE-CE).
8. Compute the efficiency of power amplifiers under various classes of operation (class A, B and C).
9. Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
10. Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency

4. Laboratory Equipment/Software/Tools Required

- CRO
- Function Generator
- Regulated Power Supply
- Multi-meter
- Multisim Software

5. Books and Materials

Text Books:

1. Robert L. Boylestad and Louis Nashelsky: *Electronic Devices and Circuit Theory*; PHI, 11e, 2013.

Reference Books:

1. Millman and Halkias: Electronic Devices and Circuits; Tata Mc Graw Hill
2. R.J. Smith and R.C. Dorf: *Circuits, Devices and Systems*; John Wiley & Sons, 1992.

II B.TECH I SEMESTER

COURSE STRUCTURE
A4403 – SIGNALS & SYATEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. COURSE DESCRIPTION

Course Overview

Signals and Systems is a foundation course to advanced courses on Communication Systems, Signal Processing and is predominantly useful to the students of Electronics and Communication Engineering students in their undergraduate semester. It is an introductory course essentially attempts to cover classification, representation of signals besides classification, representation and analysis (Time domain as well as frequency domain) of systems. The topical sequencing, pedagogical features and presentation of course will etch the concepts to the students, to make their further progress in the field of communication, easy and affable, that are generally offered in third and fourth year. This course provides coherent and comprehensive coverage of signals and systems.

The course is an integrated course having theory and practical implementation that integrates hands-on experience with MATLAB Tool including signal generation and classification, LTI systems, Frequency Response, Laplace Transform.

Course Pre/co-requisites

- A4001 - Linear Algebra and Ordinary Differential Equations

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4403.1. Understand the mathematical description and representation of signals and systems based on their properties and determine the response of LTI system using convolution.

A4403.2. Analyze the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.

A4403.3. Apply the Laplace transform and Z- transform for the analysis of continuous-time and discrete-time signals and systems.

A4403.4. Apply various basic tools of signals and systems to analyze causality, stability of systems.

A4403.5. Implementation of various signals and systems analysis techniques in MATLAB.

3. Course Syllabus

Theory

CLASSIFICATION OF SIGNALS: Continuous time (CT) and Discrete time (DT) signals, elementary signals- Unit, Step, Impulse, ramp signals, singularity functions and operations on signals.
SIGNAL TRANSMISSION THROUGH LTI SYSTEMS: Classification of systems, discrete time LTI systems and continuous time LTI systems, properties of LTI system, Impulse and unit step response of a linear system.

CONVOLUTION AND CORRELATION OF SIGNALS: System analysis by convolution, graphical interpretation of convolution, correlation and convolution. Properties of correlation function, correlation functions for non-finite energy signals.
FOURIER SERIES: Trigonometric Fourier series and Exponential Fourier series, relationship between trigonometric Fourier series and exponential Fourier series, convergence of Fourier series, symmetry conditions.

FOURIER TRANSFORMS: Fourier transform (FT), Fourier transform of standard signals, Fourier transforms involving impulse function, Fourier transform of periodic signals.
PROPERTIES OF FOURIER TRANSFORMS: Properties of continuous Fourier transforms Hilbert transform and its properties. Filter characteristics of LTI system, distortion less transmission.

LAPLACE TRANSFORMS: The Laplace transform (LT), The Region of convergence (ROC) for Laplace transforms, Properties of Laplace transforms, some Laplace transform pairs.
INVERSE LAPLACE TRANSFORMS: Inverse Laplace transforms, Partial fraction method and long division method, Laplace transforms methods in circuit analysis, the transfer function. Analysis and characterization of LTI system using Laplace transform.

SAMPLING: Sampling of continuous time signals, sampling theorem, reconstruction of signal from its samples, the effect of under sampling- aliasing, practical aspects of sampling.
Z - TRANSFORMS: The Z - Transform, The Region of Convergence (ROC) for Z - transform and its properties, properties of Z -transform, constraints on ROC for various classes of signals, transfer function, causality and stability, Inverse Z- transform using various methods.

Practice

1. Generation of Various Signals and Sequences such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Generate a signal $y(t) = 3r(t + 3) - 6r(t + 1) + 3r(t) - 3u(t - 3)$. Then plot it and verify analytically that the obtained figure is correct
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power

4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Verification of linearity and time invariance properties of a given continuous/ discrete systems
6. Convolution for Signals and sequences
7. Gibbs Phenomenon
8. Auto Correlation and Cross Correlation for Signals and Sequences
9. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
10. Finding the Fourier Transform of a given Periodic signal and plotting its magnitude and phase spectrum
11. Sampling Theorem Verification
12. Calculation of Laplace Transforms of standard signals using symbolic functions.
13. Calculation of Inverse Laplace transforms using symbolic functions.

4. Laboratory Equipment/Software/Tools Required

1. Simulation Software (MATLAB, Scilab, Octane etc.)

5. Books and Materials

Text Books:

1. Oppenheim A. V, Willisky (2009), Signals and Systems, 2nd edition, Prentice Hall of India, India.

Reference Books:

1. Anand Kumar, Signals and Systems, PHI Learning Pvt. Ltd.
2. B. P. Lathi (2001), Signals, Systems & Communications, BS Publications, New Delhi.
3. Hsu, Schaums (2003), Outline of Theory Problems of Signals and Systems, McGraw Hill.

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II B.TECH I SEMESTER

COURSE STRUCTURE

A4404 – RANDOM VARIABLES AND STOCHASTIC PROCESSES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This is the fundamental course in signal processing and communication Engineering.This course provides a foundation in the theory and applications of probability and stochastic processes and an understanding of the mathematical techniques relating to random processes in the areas of signal processing, detection & estimation theory, and communications. This course will begin by the introduction of probability concepts needed to understand the single and multiple random variables. Later it deals with the Operations on single and multiple random variables, where the concepts like expectations, moments, and characteristic functions are discussed using real-time applications. Also, other concepts like linear transformations of Gaussian random variables, the distribution functions of random variables; stochastic processes and representations of random processes are discussed. This course also focuses on the application of statistical techniques to the study of random signals and noise concepts. This course forms the basis for the study of advanced subjects like Analog and Digital Communications, Radar Communications, Cellular and Mobile Communications, Digital image processing and Speech processing.

Course Pre/co-requisites

This course enables graduating students to develop principles of random signals to solve engineering problems in the domain of signal processing and communications.

1.Probability Theory

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4404.1. Summarize the knowledge of various probability concepts.

A4404.2. Make use of probability concepts to construct the probability distribution of a random variable based on a real-world situation and analyze.

A4404.3. Apply the concepts of operations on single and multiple random variables to solve the problems.

A4404.4.Develop the relationship between random variables and random processes and solve real-time problems based on these relations.

A4404.5.Distinguish between temporal and spectral representations of stochastic processes and compare correlation and covariance functions.

3. Course Syllabus

PROBABILITY THEORY: Probability and axioms of probability, joint probability and conditional probability, total probability, Baye's theorem and Bernoulli's trials.

RANDOM VARIABLES: Definition of a random variable, classification of random variables, distribution and density functions- Gaussian, uniform, exponential, binomial, poisons, Rayleigh, conditional distribution and density functions.

OPERATIONS ON SINGLE RANDOM VARIABLE: Expectation, moments, variance and skew, Chebyshev inequality, Markov's inequality, Schwartz inequality, characteristic function, moment generating function, transformation of random variables.

MULTIPLE RANDOM VARIABLES: Joint distribution function, properties of joint distribution, marginal distribution functions, joint density function, properties of joint density function, conditional distribution and density point conditioning, interval conditioning, statistical independence, sum of two random variables, sum of several random variables, central limit theorem (without proof)..

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Expected value of a function of random variable, joint moments about the origin, joint central moments, joint characteristic functions, jointly Gaussian random variables, two random variables case, n random variable case, properties, transformations of multiple random variables, linear transformations of Gaussian random variables.

RANDOM PROCESS - TEMPORAL CHARACTERISTICS: Random process concept, classification of random processes, distribution and density functions, concept of stationary and statistical independence. first-order stationary processes, second- order and wide-sense stationary, Nth-Order and strict-sense stationarity, time averages and ergodicity, mean-ergodic processes, correlation-ergodic processes, autocorrelation function and its properties, cross-correlation function and its properties, covariance functions.

RANDOM PROCESS-SPECTRAL CHARACTERISTICS: Power spectrum: properties, relationship between power spectrum and autocorrelation function, cross-power density spectrum, properties, relationship between cross-power spectrum and cross-correlation function.

4. Books and Materials

Text Books:

1. Peyton Z. Peebles (2009), *Probability Random variables and Random signal principles*, 4th Edition, Tata McGraw Hill, New Delhi, India.

Reference Books:

1. Athanasius Papoulis, Unni Krishna Pillai (2002), *Probability, Random variables and stochastic processes*, 4th edition, Tata McGraw Hill, New Delhi, India.
2. Henry Stark and John W. Woods, Probability and Random processes with applications to signal processing, 3rd edition, Pearson Education, 2009.
3. R. P. Singh and S.D. Sapre, Communication Systems Analog & Digital, 2nd edition, TMH -2007.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous Institute, Affiliated to JNTUH

II B.TECH I SEMESTER

COURSE STRUCTURE

A4019 – VERBAL ABILITY AND LOGICAL REASONING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	0	14	0	0	1	30	70	100

1. Course Description

Course Overview

This course provides the basic skills of verbal and logical reasoning as required by companies for Campus Recruitment and also for other Competitive exams. The contents of this course includes different techniques of solving problems on Coding and Decoding, Seating Arrangements, Syllogisms, Blood Relations, Visual reasoning and brief account on basic grammar such as Error detection, Modifiers, Articles etc .

Course Pre/co-requisites

To equip learners with the knowledge and skills required to get placed in reputed companies and other competitive exams.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4019.1 Identify efficient and appropriate methods to solve logical reasoning problems.

A4019.2 Choose the techniques to solve puzzles on analytical reasoning.

A4019.3 Apply the grammar rules for effective sentence formation

3. Course Syllabus

Coding and Decoding: Coding and Decoding, Arrow Method, Chinese coding, Series, Analogy, Odd man out.

Articles and Tenses: Introduction, usage of articles, Omission of Articles, Types of tenses, Forms and Usage of tenses.

Direction Sense: Introduction, Distance method, Facing Method and Shadow Method.

Blood Relations: Introduction, Direct, Puzzle and Coded models.

Voices and Forms of Speech: Introduction, conversion of active and passive voice, conversions of direct and indirect speech.

Data Arrangements: Linear Arrangement, Circular Arrangement, Multiple Arrangements.

Syllogisms: Introduction, Tick-Cross method, Inferential Technique, Venn-Diagram method.

Visual Reasoning: Patterns, Folded Images, Cubes and Analytical Reasoning.

Sentence Correction: Subject-Verb Agreement, Pronoun Antecedent, Parallelism, Verb-Time Sequence Error, Determiners and Modifiers.

4. Books and Materials

Text Books:

1. R.S. Aggarwal, Vikas Aggarwal, *Quick Learning Objective General English,* S.Chand, 2003.
2. *R*.S. Aggarwal, *A Modern Approach to Logical Reasoning*, Revised Edition, S Chand & Co Ltd.

Reference Books:

1. Edgar Thorpe, *Test of Reasoning for all competitive examinations*, 6th Edition, McGraw Hill Education, 2017.
2. Arun Sharma, *How to Prepare for Logical Reasoning for CAT and other Management Examination*s, 4th edition, McGraw Hill Education, 2017.
3. SimboNuga, *English Grammar and Verbal Reasoning – The Toolkit for Success*, Trafford Publishing, 2013.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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II B.TECH I SEMESTER

COURSE STRUCTURE

A4013 – GENDER SENSITIZATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	1	0	100	100

1. Course Description

Course Overview

Towards a World of Equals is a course that introduces students to different dimensions of gender issues. Gender Sensitization is one of the basic requirements for the normal development of an individual and primarily highlights the contribution of both the genders in creation and development of a well balanced society. A curriculum-based approach to bring a change is desired to inculcate sensitivity towards issues concerning the relationship between men and women, caste, declining sex ratio, struggles with discrimination, sexual harassment, new forums for justice, eve-teasing, etc., The need for this sensitivity has been felt and realized through times immemorial and in almost all kinds of human existence, across the globe.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4013.1. Build the significance of the process of socialization and relationships between men and women on the basis of a just and equal world

A4013.2. Examine the decline of female sex ratio and discrimination faced by people with different gender identities

A4013.3. Take part in house work, in order to allow for equality and share equal family spaces Estimate women's contribution to the nation's economy

A4013.4Analyze the consequences of sexual violence and importance of consent in friendship and other relationship

A4013.5. Perceive the invisibility of women in history and show how locating a women in history makes them visible

3. Course Syllabus

1. Gender Sensitization: Why should we study it?

2. Socialization: Making Women, Making Men
   Introduction
   Preparing for womanhood
   Growing up male
   First lessons in caste
   Different masculinities

3. Just Relationships: Being Together as Equals
   Mary Kom and Onler
   Love and Acid just do not mix
   Love letters
   Mothers and fathers
   Further Reading: Rosa Parks-The Brave heart

4. Missing Women: Sex Selection and Its Consequences
   Declining Sex Ratio
   Demographic Consequences

5. Gender Spectrum: Beyond the Binary
   Two or Many?
   Struggles with Discrimination

6. Additional Reading: Our Bodies, Our Health

7. Housework: The Invisible Labor
   "My Mother doesn't work"
   "Share the load"

8. Women's Work: Its Politics and Economics
   Fact and fiction
   Unrecognized and unaccounted work
   Further Reading: wages and conditions of work.

9. Sexual Harassment: Say No!
   Sexual harassment, not eve-teasing
   Coping with everyday harassment
   Further Reading: "Chupulu"

10. Domestic Violence: Speaking Out
    Is home a safe place?

When women unite (Film)
Rebuilding lives
Further Reading: New Forums for justice.

11. Thinking about Sexual Violence
Blaming the Victim- " I Fought for my life…"
Further Reading: The caste face of violence.

12. Knowledge: Through the Lens of Gender
Point of view
Gender and the structure of knowledge
Further Reading: Unacknowledged women artists of Telangana

13. Whose History? Questions for Historians and Others
Reclaiming a Past
Writing other Histories
Further Reading: Missing pages from modern Telangana history

4. Books and Materials

Text Books:

1. "Towards a World of Equals: A Bilingual Textbook on Gender". Telugu Akademi, Hyderabad, 2015

Reference Books:

NIL

SYLLABI FOR II YEAR II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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II B.TECH II SEMESTER

COURSE STRUCTURE

A4025 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course addresses the concepts, principles and techniques of Managerial Economics and Accounting. It covers the fundamentals of Managerial Economics and its various aspects. Apart from Capital budgeting and its techniques, Accounting gives clear idea about concepts and conventions of accounting, accounting procedures like journal, ledger and trial balance used to construct financial statements.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4025.1. Compare and contrast the contributions of different types of engineers in the development of a product, processor system.

A4025.2. Apply the common engineering design process to solve complex problems and arrive at viable solution.

A4025.3. Explore various contemporary software and hardware tools to provide solutions for the problems.

A4025.4. Apply skills needed for successful team work including the basics of project management and written and oral communication.

A4025.5. Identify the key elements of professional codes of ethics as well as the ethical and societal issues related to the disciplines and their impact on society and the world.

3. Course Syllabus

INTRODUCTION TO MANAGERIAL ECONOMICS & DEMAND: Managerial Economics - Meaning, Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand - Meaning, Types, Demand Determinants, Law of Demand and its assumptions & exceptions.

ELASTICITY OF DEMAND & DEMAND FORECASTING: Elasticity of Demand - Meaning, Types, Measurement and Significance. Demand Forecasting - Meaning, Need, Methods of demand forecasting.

PRODUCTION ANALYSIS: Production – Meaning, Production function, Production function with one variable input, Iso-quants and Iso-costs, MRTS, Least Cost Combination of Inputs, Law of returns to scale.

COST &BREAK EVEN ANALYSIS: Cost- Meaning, Cost Concepts - Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Marginal cost, Sunk cost. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Significance and limitations of BEA.

INTRODUCTION TO MARKETS: Market – Meaning, structure, Types of competition - Features of Perfect competition, Monopoly and Monopolistic Competition, Oligopoly - Price-Output Determination in case of Perfect Competition, Monopoly.

PRICING: Objectives and Pricing policies - Methods of Pricing -Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

INTRODUCTION TO FINANCIAL ACCOUNTING: Accounting Principles - Concepts, Conventions - Double-Entry Book Keeping - Journal, Ledger, Trial Balance

PREPARATION OF FINANCIAL STATEMENTS: Final Account problems with simple adjustments.

FINANCIAL ANALYSIS THROUGH RATIOS: Ratio – Meaning, importance - Types: Liquidity Ratios, Solvency Ratios, Turnover Ratios and Profitability ratios. (Simple problems).

CAPITAL BUDGETING: Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting - Payback Method, Accounting Rate of Return (ARR), Net Present Value Method, Profitability Index, Internal rate of return (simple problems).

4. Books and Materials

Text Books:

1. A.R. Aryasri (2011), *Managerial Economics and Financial Analysis*, TMH, India.

Reference Books:

1. Varshney &Maheswari(2003), *Managerial Economics*, Sultan Chand.
2. Ambrish Gupta (2011), *Financial Accounting for Management: An Analytical Perspective*, 4th Edition, Pearson Education, New Delhi.
3. Richard Lipsey and Alec Chrystal (2012), *Economics*, Oxford University Press.
4. Domnick Salvatore: *Managerial Economics in a Global Economy*, 4th Edition, Thomson.

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II B.TECH II SEMESTER

COURSE STRUCTURE

A4405 – ANALOG ELECTRONIC CIRCUITS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	2	42	14	28	5	30	70	100

1. Course Description

Course Overview

Today the growth of any industry is dependent upon electronics to a great extent. This Course deals with mathematical analysis of wave shaping circuits and generation of non-sinusoidal wave forms by multivibrator circuits and their design is covered extensively so as to apply in the electronics and communication systems. It also focuses on process of learning about signal condition, signal generation, filtering, timing and control using various IC circuitry. With modern digitization where there is a need to work with digital data and hence digital to analog and analog to digital converters are needed in connecting physical world to the more sophisticated digital world.

Course Pre/co requisites

1. Electronic Devices and Circuit Analysis (A4402)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4405.1. Understand the working and analysis of electronic circuits

A4405.2. Apply the knowledge of Kirchhoff's voltage and Current laws to observe the response of various Electronic circuits.

A4405.3. Analyze the functioning of various Electronic Circuitry, including wave shaping circuits, signal generation, filtering, timing and control circuits.

A4405.4. Design Signal Processing and Generation circuits for the given specifications.

A4405.5. Acquire hands-on laboratory experience in designing and testing various Electronic Circuits.

3. Course Syllabus

Theory

WAVE SHAPING CIRCUITS: High pass (differentiator) and low pass (integrator) RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs, RL response for step input.

SIGNAL GENERATORS: Design and analysis of fixed bias and self-biased Bistablemultivibrator, design and analysis of collector coupled Monostable and Astablemultivibrator.

OPERATIONAL AMPLIFIER AND ITS APPLICATIONS: Basic information of Op-Amp IC741, Differential Amplifier, the ideal Op-Amp, Op-Amp characteristics - DC and AC. Op-Amp Applications – Review of

inverting and non-inverting amplifiers, Integrator and differentiator, Summing Amplifier, Schmitt trigger and its applications. Active filters: Low pass, high pass (1st and 2nd order), band pass, band stop.

TIMERS & PLL: Introduction to IC 555 timer, description of functional diagram, Monostable and Astable operations, Introduction to PLL, Block diagram, monolithic PLL and applications of PLL.

DATA CONVERTERS: Digital to Analog Converters (DAC) - weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Analog to Digital converters(ADC) – Flash type, Single slope, successive approximation, dual slope.

Practice

1. Design of analog wave shaping circuit for different time constants.
2. Analyze how the High pass RC circuits used as differentiator or Peaking Circuit.
3. Analyze how the Low pass RC circuits used as Integrator or Triangular wave generator.
4. Design of Bistable Multivibrator as a Memory element.
5. Design of Monostable Multivibrator as a Pulse Width generator.
6. Design of Astable Multivibrator as a Square Wave generator.
7. Analyze how Op-Amp can be used as Amplifier (Inverting, Non-Inverting and Summing).
8. Design and analyze Practical Differentiator and Integrator using Op-Amp for different input signals.
9. Design and analyze 1st and 2nd order Butterworth filters and plot the frequency response.
10. Design and analyze Missing pulse detector and frequency divider using IC555 in Monostable mode of operation.
11. Design Adjustable duty cycle rectangular wave generator and frequency shift keying generator IC555 in Astable mode of operation.
12. Analyze the Lock in range and Capture range of Phase Locked Loop using IC565.
13. Design and analyze R-2R ladder type Digital to Analog Converter using IC 741
14. Design and analyze Parallel Comparator type Analog to Digital Converter using Op-Amps and 8 to 3 priority encoder.

4. Laboratory Equipment/Software/Tools Required

1. CROs
2. Function Generator
3. Regulator Power Supply
4. Multisim

5. Books and Materials

Text Books:

1. Jacob Millman, Herbert Taub, Mothiki S. Prakash Rao (2008), Pulse, Digital and Switching Waveforms, 3rd edition, Tata McGraw Hill, New Delhi.
2. D. Roy Choudhury, Shail B. Jain (2012), Linear Integrated Circuit, 4th edition, New Age International Pvt. Ltd., New Delhi, India.

Reference Books:

1. Anand Kumar (2005), Pulse and Digital Circuits, Prentice Hall of India, India.
2. Mothiki S. Prakash Rao (2006), Pulse and Digital Circuits, Tata McGraw Hill, India.
3. Sergio Franco (1997), Design with Operational Amplifiers and Analog Integrated Circuits, McGraw Hill, New Delhi.
4. Ramakant A. Gayakwad, (2012), OP-AMP and Linear Integrated Circuits, 4th edition, Prentice Hall / Pearson Education, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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II B.TECH II SEMESTER

COURSE STRUCTURE

A4406 – ANALOG COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

In this course, an introduction to analog (classical) communications with emphasis on Amplitude Modulation (AM), Frequency Modulation (FM) and Pulse modulation techniques and analyzing all the modulation schemes in time-domain and in frequency-domain. This course aims at developing statistical techniques and skills needed to evaluate the performance of analog communication system in presence of noise and realize these skills through a simple communication system design.

Course Pre/co requisites

1. Random Variables and Stochastic Processes (A4404)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4406.1. Explain analog and pulse modulation techniques in time and frequency domain.
A4406.2. Construct linear,non-linear modulators and demodulators.
A4406.3. Analyze the fundamental communication system parameters like power and bandwidth etc.
A4406.4. Analyze the communication system performance in presence of the noise.
A4406.5. Demonstrate various concepts in analog communications using appropriate trainer kits and simulation tool.

3. Course Syllabus

Theory

AM : Introduction to communication system, need for modulation, Amplitude modulation- time domain and frequency domain of AM signal-power relations in AM, Generation of AM waves, square law modulator , Switching modulator, Detection of AM waves: Square law detector, Envelope detector.
DSBSC: Time domain and frequency domain description, balanced modulator, Ring modulator, Coherent detection of DSBSC modulated waves.

SSB: SSB modulation frequency domain description, frequency discrimination method for generation of SSB modulated wave, time domain description, phase discrimination method for generating SSB, Demodulation of SSB waves: coherent detection.
VSB: Introduction to VSB, Time domain representation of VSBSC, Generation of VSB modulated wave, Synchronous detection, Envelope detection of VSB wave plus carrier, Comparison of AM techniques, Applications of different AM systems, Frequency division multiplexing.

Angle Modulation: Basic concepts of Frequency Modulation: Single tone frequency modulation, Spectrum analysis of sinusoidal FM wave, Narrow band FM, Wideband FM, Constant Average Power, Transmission Bandwidth of FM Wave –Comparison of FM&AM

Generation and Demodulation of FM: Direct method: VCO, Indirect Method: Armstrong Method, detection of FM waves: Balanced slope detector, Phase locked loop, Zero crossing detector.

NOISE: Introduction, Noise in DSBSC, Noise in SSBSC, Noise in AM, Noise in FM, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis.

PULSE MODULATION: Analog pulse modulation, PAM (Single polarity, double polarity) Generation & demodulation of PWM, Generation and demodulation of PPM.

TRANSMITTERS AND RECEIVERS:

Transmitters: Classification of Transmitters, AM transmitter, Effect of feedback on performance of AM transmitter, FM Transmitter, frequency stability in FM transmitter.

RECEIVERS: Introduction, TRF receiver, Super heterodyne receiver, Receiver characteristics, Local oscillator, Image frequency, Choice of IF, AGC, FM Receiver, Comparison with AM Receiver.

Practice

1. Amplitude Modulation and Demodulation
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector (Phase Shift Method)
4. Frequency Modulation and Demodulation
5. Pre-emphasis and De-emphasis
6. Pulse amplitude modulation and Demodulation
7. Pulse width modulation and demodulation.
8. Time division multiplexing and demultiplexing
9. Frequency synthesizer
10. AGC Characteristics
11. Squelch circuit.
12. Characteristics of Mixer

4. Laboratory Equipment/Software/Tools Required

1. CRO
2. Function Generator
3. RPS
4. Trainer Kits
5. MATLAB Software

5. Books and Materials

Text Books:

1. S.S.Haykin, Communication Systems, 2nd Edition, Wiley Eastern.

REFERENCE Books:

1. Taub and schilling, Principles of Communication Systems, Tata McGraw-Hill
2. George Kennedy, Electronic Communication Systems, Tata McGraw-Hill.

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II B.TECH II SEMESTER

COURSE STRUCTURE

A4407 – COMPUTER ORGANIZATION AND OPERATING SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. COURSE DESCRIPTION

Course Overview

The course gives a bottom up view of how a computer works. It begins with an overview of digital logic and the goal is to develop a clear understanding of the basic organization of computing systems. It covers logical basis of computer structure, machine representation of instructions, data flow of control and basic machine instructions then builds up the main architectural and system elements of a typical modern computer. In addition, this course is an integrated and covers the Operating Systems techniques to implement operating systems in real time. The concepts covered will be functions of operating systems, process management, processor scheduling, main-memory management and virtual memory management is to related UNIX commands and system calls.

Course Pre/co requisites

1. Digital Logic Design (A4401)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4407.1. Identify the basic components of a digital computer with their functions.

A4407.2. Interpret and demonstrate the Process Synchronization, resource control and scheduling for operating system.

A4407.3. Apply system call functions to develop process static diagram & multithreaded models.

A4407.4. Analyze types of memories in memory hierarchy and functions of memory management.

A4407.5. Design functional units of a processor for a simple computer.

3. Course Syllabus

Theory

Structure of Computers: Functional units, Computer types, Basic operational concepts, Von-Neumann architecture, Bus structures, Characteristics of multiprocessors, Interconnection structures, Shared memory multiprocessors, Data representation-fixed and floating point.

Machine Instructions: Computer registers, Instruction codes, Instruction cycle, computer instructions, instruction formats, addressing modes, RISC and CISC differences.

Computer Arithmetic: Fixed point-addition and subtraction, multiplication and division algorithms, floating point arithmetic operation.

Operating Systems Overview: Definition, Operating system services, Types of Operating system, systems calls, system programs.
Process Concepts: Definition, Process control block, Process state diagram.
Process Scheduling: Queues, Types of schedules, Algorithms, Multithreaded models and advantages.

Process Synchronization: Interprocess communication-pipes, messages, shared memory, Critical section problem, Peterson's solution, semaphores, Classic problems of synchronization-producer-consumer, Readers and Writers problem, Dining philosopher's problem, Monitors-solution and advantages.

Memory Management: Memory hierarchy, Introduction to cache and main memory, Swapping, Contiguous memory allocation- first, best and worst fit algorithms, Non-contiguous memory allocation, paging-hardware, structure of the page table, page-replacement algorithms, virtual memory, demand paging, segmentation, allocation of frames, thrashing.

Practice

1. Program to create a child process using fork, exec& wait
2. Program to implement FCFS scheduling
3. Program to implement SJF scheduling
4. Program to implement priority scheduling
5. Program to implement round robin scheduling
6. Program to implement Two way process communication using pipes
7. Program to implement shared memory
8. Program to implement message queue
9. Program to implement best-fit memory algorithm (contiguous)
10. Program to implement paging (non-contiguous)
11. Program to implement FIFO page replacement
12. Program to implement LRU page replacement.

4. Laboratory Equipment/Software/Tools Required

1. Personal computer
2. UNIX operating system

5. Books and Materials

Text Books:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2009), Operating System Concepts, 8th Edition, Wiley India Private Limited, New Delhi.

Reference Books:

1. Carl Hamacher, ZvonksVranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.
2. Sumitabha Das (2006), UNIX Concepts and Applications, 4th Edition, McGraw-Hill Education.

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II B.TECH II SEMESTER

COURSE STRUCTURE

A4408 – ELECTROMAGNETICS THEORY AND TRANSMISSION LINES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course will enable in understanding static and time-varying electromagnetic fields and electromagnetic waves and transmission line, which are of essential importance in modern communications.

Course Pre/co requisites

1. Linear Algebraand Ordinary Differential Equations (4001)
2. Semiconductor Physics(A4003)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4408.1. Understand the concepts of coordinate systems and vector algebra, calculus to interpret Electric and Magnetic field distributions in free space, materials and transmission lines

A4408.2. Apply the basic laws of Electromagnetism to determine Electric and Magnetic field intensities for various charge and current distributions

A4408.3. Apply Maxwell's equations to determine boundary conditions across various media

A4408.4. Analyse the behaviour of EM waves in different media

A4408.5. Design the transmission line elements for impedance matching under various load conditions

3. Course Syllabus

ELECTROSTATICS: Coulomb's law, Electric field intensity, Field due to different charge distributions, Electric flux and Flux density, Gauss law and its applications, Electric potential. Maxwell's equations for electrostatic fields, and illustrative problems.

MAGNETO STATICS: Biot-Savarts law, Amperes circuital law and applications, Magnetic flux and magnetic flux density, Maxwell's equations for magneto static fields.

TIME VARYING FIELDS & MAXWELLS EQUATIONS: Faradays law, Inconsistency of Amperes law and displacement current density, Maxwell's equations in differential, integral and word statements.

BOUNDARY CONDITIONS: Conditions at a boundary surface: dielectric-dielectric and dielectric – conductor interfaces, illustrative problems.

EM WAVE CHARACTERISTICS: Wave motion in free space, perfect, Lossy dielectrics and good conductors, Poynting theorem, polarization.

TRANSMISSION LINES: Equivalent model, parameters, equations, Infinite line concepts, distortion and its condition, Input impedance of open and short circuited transmission lines, reflection coefficient and VSWR, Elementary treatment of Smith chart.

4. Books and Materials

Text Books:

1. Matthew N. O. Sadiku (2008), Elements of Electromagnetics, 4th edition, Oxford University Press, New Delhi.

Reference Books:

1. William H. Hayt Jr., John A. Buck (2006), Engineering Electromagentics, 7th edition, Tata McGraw Hill, India.
2. E. C. Jordan, K. G. Balmain(2000), Electromagnetic Waves and Radiating Systems, 2nd edition, Prentice Hall of India, New Delhi.
3. John. D. Kraus (2007), Electromagnetics, 6th edition, McGraw Hill, New Delhi.

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II B.TECH II SEMESTER

COURSE STRUCTURE

A4017 – QUANTITATIVE APTITUDE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	0	14	0	0	1	30	70	100

1. Course Description

Course Overview

This course provides the basic skills required in solving the problems of Aptitude required by various companies for Campus Recruitment and competitive tests. The contents of course include solving problems on different concepts such as – Permutations and Combinations, Averages, Percentages and Logarithms etc.

Course Pre/co-requisites

To equip learners with the knowledge and skills required to get placed in reputed companies and appear for competitive exams.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4017.1 Interpret data using graphs and charts.

A4017.2 Apply the concepts of ratios, proportions and percentages to solve problems.

A4017.3 Solve problems on Logarithms, permutations, combinations, clocks, and calendars.

3. Course Syllabus

Ratio and Proportion: Ratio, Proportion, Variations, Problems on Ages

Average, Mixtures and Alligation: Averages, Weighted average, Difference between mixture and alligation, Problems on Mixtures and allegation

Percentages, Simple Interest (SI) and Compound Interest(CI): Fundamentals of Percentage, Percentage change, SI and CI, Relation between SI and CI.

Data Interpretation: Introduction, Tabulation, Bar Graph, Pie Charts, Line Graphs, Combined Graphs.

Profit and Loss, Partnerships: Basic terminology in profit and loss, Types of partnership, Problems related to partnership

Logarithms: Fundamental formulae of logarithms and problems, finding number of terms on expanding a given number.

Permutations and Combinations: Fundamentals counting principle, Definition of Permutation, Seating arrangement, Problems related to alphabets, Rank of the word, Problems related to numbers, Circular permutation, Combination.

Clocks: Introduction, Finding angle between hands of clock, Gain or loss of time
Calendar: Calendars method- 1, Calendars method -2

4. Books and Materials

Text Books:

1. R.S Aggarwal , *Quantitative Aptitude for competitive examinations*, 2017 edition, S.Chand.

Reference Books:

1. Abhijit Guha, *Quantitative Aptitude for competitive examinations*, 6th Edition, McGraw Hill Education.
2. Dinesh Khattar, *The Pearson guide to Quantitative Aptitudefor Competitive Examinations*, 3rd Edition, Pearson Education.

II B.TECH II SEMESTER

COURSE STRUCTURE

A4014 – ENVIRONMENTAL SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	0	100	100

1. Course Description

Course Overview

Through this course students engage with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The course requires that students identify and analyze natural and human-made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. It is essentially a multidisciplinary approach that brings about an appreciation of our natural world and human impact on its integrity. Its components include biology, geology, chemistry, physics, engineering, sociology, health, anthropology, economics, statistics, computers and philosophy.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4014.1. Identify the important components of environment

A4014.2. Identify global environmental problems and come out with best possible solutions.

A4014.3. Apply environmental laws for the protection of forest and wildlife

A4014.4. Apply the knowledge of Environmental ethics to maintain harmonious relation between nature and human being.

A4014.5. Illustrate the major environmental effects of exploiting natural resources.

3. Course Syllabus

INTRODUCTION: Definition, The Multidisciplinary nature of environmental studies, importance of environmental education, need for public awareness.

ECOSYSTEMS: Ecosystem Definition. Classification of ecosystems. Structure of an ecosystem: Producers, Consumers and Decomposers. Function of ecosystems: Food chains, food webs and Energy flow in an ecosystem. Ecological pyramids: Pyramid of number, Pyramid of biomass and Pyramid of energy. Ecological succession.

BIOGEOCHEMICAL CYCLES: Definition, Carbon cycle, Hydrologic cycle and Nitrogen cycle.

NATURAL RESOURCES

CLASSIFICATION OF RESOURCES: Renewable and Non-renewable resources.

NATURAL RESOURCES AND ASSOCIATED PROBLEMS:

FOREST RESOURCES: Use and over – exploitation, deforestation, Timber extraction, Mining, dams and other effects on forest and tribal people.

WATER RESOURCES: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.

MINERAL RESOURCES: Use and exploitation, environmental effects of extracting and using mineral resources.

FOOD RESOURCES: World food problems, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

ENERGY RESOURCES: Growing energy needs, renewable energy resources-solar energy, wind energy, geothermal energy. Bio fuels- definition, Gobar gas production and biodiesel production by trans esterification.

LAND RESOURCES: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

BIODIVERSITY AND ITS CONSERVATION :

Introduction and definition. Genetic diversity, species diversity and ecosystem diversity. Values of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values. Threats to biodiversity: Habitat loss, Poaching of wildlife, Man-wildlife conflicts. In-situ conservation of biodiversity. Ex-situ conservation of biodiversity. Endangered and endemic species of India. Hot-spots of biodiversity. India as a mega diversity nation.

ENVIRONMENTAL POLLUTION:

Definition, causes, effects and control measures of : Air Pollution, Water pollution, Marine pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution. Eutrophication, bio-magnification. Solid waste management: Causes, effects and methods of solid waste disposal. E-waste. Role of an individual in prevention of pollution. Disaster management: Floods, Earthquakes and Cyclones. Pollution case studies.

GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS: Global warming, Acid rain, Ozone layer depletion. Kyoto protocol1997, Carbon credits, clean development mechanism.

SOCIAL ISSUES AND THE ENVIRONMENT: Concept of sustainable development. Threats to sustainability: Population explosion, Crazy consumerism, Over exploitation of resources. Environmental economics: Strategies of environmental economics. Green Building definition, green building materials, energy considerations in green buildings, water requirement in green buildings, health considerations in green buildings. Role of information Technology in Environment and human health. Water conservation, Rainwater harvesting, watershed management, A brief study about Environmental performance Index(EPI), mission Kakatiya, water man of India Dr. Rajendra singh and

Anna hazare watershed management development programme. Environmental ethics. A brief study about Bishnoi tribe environmental conservation, Khejarli massacre.

ENVIRONMENTAL POLICIES AND LEGISLATIONS: Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

4. Books and Materials

Text Books:

1. Textbook of *Environmental Studies for Undergraduate Courses* by ErachBharucha for University Grants Commission.
2. *Environmental Studies* by R.J. Ranjit Daniels, JagdishKrishnaswamy,first edition,Wiley India (P)Ltd., New Delhi. ISBN 9788126519439.
3. *Environmental Studies* by Anubha Kaushik, C.P. Kaushik, 4th edition, New age international publishers, New Delhi.
4. *Environmental studies* by Benny joseph, Third edition, McGraw Hill Education (India) Private Limited, Chennai.

Reference Books:

1. *Environmental science* by Daniel B.Botkin & Edwards A.Keller, 8th edition, International student version, Wiley India (P) Ltd., New Delhi. ISBN 9788126534142.
2. *Environmental Science*: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. *Ecology And Environment* by P.D.Sharma, 2005 reprint edition, Rastogi Publications, Meerut, Uttar Pradesh. ISBN 8191339050.

SYLLABI FOR III YEAR I SEMESTER

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III B.TECH I SEMESTER

COURSE STRUCTURE

A4409 - MICROPROCESSORS & MICROCONTROLLERS

(Common to ECE, EEE & IT)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	1	2	28	14	28	4	30	70	100

1. Course Description

Course Overview

This course provides a comprehensive introduction to microprocessors (8086), microcontrollers (8051), ARM (LPC2418) systems and their architectures with an emphasis on its interfacing with external devices. Focus is on 8086 & 8051 families which includes internal architecture, pin diagram, instruction set, register organization, addressing modes, operating modes, interrupt structure, assembly language programming and etc. Various aspects of hardware design, such as interfacing of memory and different types of I/O devices will be covered in detailed. It also emphasis on ARM Processor, different interfaces and data transfer schemes. The course is accompanied by laboratory experiments directly linked to the lecture topics for hands-on learning of the material. This course will be useful to students as a first level course for embedded systems domain and provides an opportunity to develop RISC type embedded systems starting with electronic components, data sheets and progressing through construction of hardware and firmware.

Course Pre/co requisites

1. Computer Organization and Operating Systems (A4407)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4409.1. Explain the fundamentals of microprocessor, controller & ARM systems to investigate existing designs.

A4409.2. Utilize the assembly language programming proficiency to assemble and run on host machine.

A4409.3. Identify the required driver circuitry to microprocessor, controller & ARM system I/O ports to interface external devices.

A4409.4. Build and integrate the required hardware & software modules for a functional model.

A4409.5. Compare & contrast the processor and controller for the implementation of real time applications.

3. Course Syllabus

Theory

INTRODUCTION TO 8086: Architecture of 8086 microprocessor, Register organization, 8086 flag register and its functions, addressing modes of 8086, Minimum mode system operation, Timing diagrams

8086 ASSEMBLY LANGUAGE PROGRAMMING: 8086 Assembly Language Programming Process, Assembly language instructions involving evaluation of arithmetic expressions, branch, call instructions, sorting, string manipulation, assembler directives, procedures and macros, Simple programs

8086 MEMORY INTERFACING: Interfacing RAM, ROM, EPROM to 8086, Direct Memory Access (DMA-8257) Data Transfer

INTERRUPTS AND PROGRAMMABLE INTERRUPT CONTROLLERS: 8086 Interrupts and Interrupt Responses, 8259A Priority Interrupt Controller.

SERIAL DATA TRANSFER SCHEMES: Asynchronous and synchronous data transfer schemes, RS - 232C Serial data standard, USART, sample program of serial data transfer (Transmit & Receive).

THE 8051 ARCHITECTURE: Introduction, 8051 micro controller hardware, external memory interfacing, 8051 instruction set and simple programs, counter, timer and Interrupt programming

I/O INTERFACES AND ITS DEVICE DRIVER MECHANISMS: 8255 (Programmable Peripheral Interface), various modes of operation and interfacing to Microprocessor, CMOS 4511 or TTL 7447, L293D, ULN2003, ADC0808/0809, DAC0800, Keypad and Alphanumeric Displays (LCD) interfacing with 8051

Practice

Formulate/Compose/Compute an assembly language program under MASM (8086) and Keil (8051)
CYCLE - I

1. To list operational codes with pneumonic on the trainer board using serial &stand alone modes.
2. To evaluate all addressing modes (8) using debugger mode.
3. To perform arithmetic operations (ADD, SUB, MUL, DIV, ADC, SBB) of 8, 16 & 32 - bit operands.
4. To move the content (Block of data transfer) from memory location to other memory location in Intra & Inter segments.
5. To find GCD and Factorial of given operand, ASCII operations and also to authenticate the password of length 3 bytes.
6. To find the sum of a series, squares & cubes of 8-bit or 16 bit numbers in a given array of 5 numbers.
7. To perform code conversion i.e. conversion of unpacked to packed BCD and vice versa.
8. To find the largest and smallest number in an array of data & to arrange a given series of numbers in ascending and descending order.
9. To perform string manipulation operations on the string stored in the memory
10. To generate 5ms delay with and without interrupt for timer & Count no of pulses in the external

clock using counter in 8051.

CYCLE - II

11. To interface 8255 to 8051 and observe the following:
    a. Blink all LEDs connected to port B on/off with 2ms delay
    b. Blink LEDs alternatively connected to port A with 10 ms time delay.
    Note: Source code either in Assembly or Embedded C
12. To interface stepper motor to 8051 and observe the following:
    a. 5 rotations in clockwise direction
    b. 5 rotations in anticlockwise direction
    c. Continuous rotation in clockwise direction at much faster speed
    Note: Source code either in Assembly or Embedded C
13. To interface D/A converters to 8086/8051 and observe the following:
    a. Square wave
    b. Ramp signal
    c. Sinusoidal wave
    Note: Source code either in Assembly or Embedded C
14. To observe traffic signals by interfacing controller to 8086/8051 & observe the changes in signals like Red, Green, Amber & straight, left, right, pedestrian etc.

4. Laboratory Equipment/Software/Tools Required

1. Computer System
2. Assembler (MASM) Software (Open Source / Freeware)
4. 8086 Based Microprocessors Trainer Kit
5. KEIL Compiler Software (Open Source / Freeware)
6. 8051 based Microcontroller kits
7. Function Generators (0-1MHz)
8. 16 Channel ADC Interface
9. Study Card 8255
10. Study Card 8259
11. Dual DAC Interface
12. Elevator Interface
13. Stepper Motor Interface
14. Dual Channel Cathode Ray Oscilloscope (0-20MHz)
15. LCD interface
16. Keyboard interface
17. Traffic light Interface

5. Books and Materials

Text Books:

1. Douglas V. Hall (2007), *Microprocessors Interface*, 2nd edition, Tata McGraw Hill, New Delhi.
2. Kenneth J. Ayala (2008), *The 8051 Microcontroller*, 3rd edition, Cengage Learning, India.

Reference Books:

1. Walter A. Triebel, Avtar Singh (2003), *The 8088 and 8086 Microprocessors* 4th edition, PrenticeHall of India, New Delhi.
2. Mazidi (2000), *The 8051 Microcontroller and Embedded System*, Prentice Hall of India, New Delhi.
3. Deshmukh (2004), *Microcontrollers*, Tata McGraw Hill Edition, New Delhi.

III B.TECH I SEMESTER

COURSE STRUCTURE
A4410 - DIGITAL COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This course provides complete knowledge of sampling, quantization and encoding to convert the analog signals into digital form. Various analog to digital conversion techniques like PCM and Delta Modulation along with the refined forms like DPCM and ADM are also discussed. In addition to baseband transmission of digital data over the channel, carrier modulation schemes like ASK, FSK, PSK, DPSK and QPSK are analyzed. It focuses on source coding techniques like Huffman coding, Shannon fano coding for reducing redundant data and channel coding techniques such as linear block codes, cyclic codes and convolution codes for error detection and correction.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4410.1. Develop the basic concepts of modulation, sampling, need for digital data transmission with an insight into practical applications.

A4410.2. Compare and contrast ASK, FSK, PSK digital carrier modulation schemes in terms of occupied bandwidth, complexity etc., and extend these into QPSK for improved spectral efficiency

A4410.3. Apply the basics of information theory to calculate channel capacity and other measurements.

A4410.4. Analyze the differences between the usage of systematic linear block codes and convolutional codes for non-burst and burst channel applications

A4410.5. Examine various concepts of digital communications using trainer kits and simulation tool

3. Course Syllabus

Theory

INTRODUCTION: Introduction, elements of a digital communication system, PCM, quantization noise and SNR, Non uniform quantization, DPCM, DM, ADM, comparison of PCM and DM systems, noise in PCM systems, Noise in DM System

DIGITAL CARRIER MODULATION SCHEMES: Introduction to Band pass Transmission, Generation and detection of coherent binary ASK signalling schemes, binary PSK signalling schemes, binary FSK signalling schemes, DPSK, QPSK.
PROBABILITY OF ERROR: Probability of error Calculations for ASK, FSK and PSK, comparison of digital modulation schemes-bandwidth requirements

INFORMATION THEORY: Introduction, measure of information, Entropy, Rate of information, Joint entropy and conditional entropy, mutual information, channel capacity, Shannon's theorem
SOURCE CODING: Source coding theorem, Shannon - fano coding, Huffman coding, efficiency calculations
CAPACITY OF GAUSSIAN CHANNEL: Continuous channel, Shannon Hartley theorem, bandwidth-S/N trade off

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

CONVOLUTIONAL CODES: Encoding of convolutional codes, time domain approach, transform domain approach. Graphical approach: code tree, trellis and state diagram, maximum likelihood decoding of convolutional codes, sequential decoding of convolutional codes

Practice

1. Time Division Multiplexing and Demultiplexing
2. Pulse code Modulation and Demodulation
3. Differential Pulse code Modulation and Demodulation
4. Delta modulation and Adaptive Delta modulation
5. Amplitude Shift Keying
6. Frequency Shift Keying
7. Phase Shift Keying
8. Differential Phase Shift keying
9. Quadrature Phase Shift keying
10. Convolutional coder and decoder
11. Error detection and correction of cyclic code.
12. Convolutionally decode binary data using VITERBI algorithm.

4. Laboratory Equipment/Software/Tools Required

1. Computer System (PCs)
2. MATLAB Software
3. Digital Storage Oscilloscope

4. Function Generator
5. Dual Regulator Power Supply
6. Pulse code Modulation and demodulation trainer kit
7. Differential pulse code Modulation and demodulation trainer kit
8. Delta modulation and adaptive delta modulation trainer kit
9. Frequency shift keying trainer kit
10. Phase shift keying trainer kit
11. Quadrature phase shift keying trainer kit
12. Amplitude shift keying trainer kit

5. Books and Materials

Text Books:

1. K. Sam Shanmugam (2006), Digital and Analog Communication Systems, John Wiley & Sons, New Delhi.
2. R.P.Singh and S.D.Sapre, Communication Systems, second edition, TMH Publishing Company Limited, New Delhi.

Reference books:

1. Taub and Schilling, Principles of Communication systems, TMH Publishing Company Limited, New Delhi.

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III B.TECH I SEMESTER

COURSE STRUCTURE

A4411 - DIGITAL DESIGN THROUGH VERILOG HDL

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

Verilog HDL is an essential course to start career in VLSI design. Verilog HDL language is used for the design of digital integrated circuits. This course describes four levels of abstraction - behavioural, data flow, gate level, and switch level to represent the same Verilog HDL module. This course also emphasizes on synthesis and simulation constructs of Verilog HDL. Moreover, the students will get acquainted with Cadence Digital Design Tools and other open source EDA tools.

Course Pre/co requisites

- Digital Logic Design (A4401)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4411.1. Demonstrate the knowledge of constructs and conventions of Verilog HDL.

A4411.2. Build combinational and sequential digital systems using gate and switch primitives

A4411.3. Design digital systems using data flow and behavioral constructs in Verilog

A4411.4. Conduct experiments using EDA tool to demonstrate the constructs of Verilog HDL

A4411.5. Design an application of digital system using Verilog in teams and make an effective oral presentation and documentation

3. Course Syllabus

Theory

Introduction to Verilog: Evolution of CAD, emergence of HDLs, typical HDL-based design flow
Hierarchical Modeling Concepts: Design methodology, levels of abstraction, module, instances, and components of a simulation.

Basic Concepts: Lexical conventions, data types, system tasks and compiler directives, module definition, port declaration, connecting ports, hierarchical name referencing

Gate-Level Modelling: Gate primitives, delays, strengths and contention resolution

Data-flowModelling: Continuous assignments, delay specification, expressions, operators and operands

Behavioral Modelling-1: Structured procedures, initial and always, blocking and non-blocking statements, delay control, event control
Behavioral Modeling-2: conditional statements, multiway branching, loops, sequential and parallel blocks

Switch-Level Modelling: Switch modelling elements, delay specification on switches, examples.
Tasks, Functions and UDPs: Differences between tasks and functions, declaration, combinational and sequential UDPs

Practice

1. Introduction to EDA Tool
2. Gate-level Modeling: Adders, Multiplexers and Decoders, Instantiation of gate primitives and modules, Design of latches and flip-flops with gate primitives
3. Data flow description of adders, multiplexers and decoders
4. BehavioralModeling: Design Verilog HDL modules using conditional statements (*if* and *if-else*), multiway branching (*case, casex and casez*), looping statements (*while, for, repeat* and *forever*)
5. Design multiplexers using combinational UDPs and flip-flops using sequential UDPs
6. Design a Verilog HDL module for Multiplier using Carry Look Ahead Adders
7. Design a microcontroller using ALU unit, Data Memory Unit, Program Memory Unit and Control Unit.
8. Design a Verilog HDL module for FIFO memory
9. Design a Verilog HDL module of Car Parking System
10. Design a Verilog HDL module of a Digital Delay Timer

4. Laboratory Equipment/Software/Tools Required

1. Computers
2. Xilinx ISE 14.5
3. Cadence Design tools

5. Books and Materials

Text Book:

1. Samir Palnitkar (2013), Verilog HDL – A Guide to Digital Design and Synthesis, 2nd Edition, Pearson Education, New Delhi, India.

Reference Books:

1. T. R. Padmanabhan, B. Bala Tripura Sundari (2004), Design through Verilog HDL, Wiley & Sons Education, IEEE Press, USA.
2. Donald E. Thomas, Philip R. Moorby, Donald B. Thomas, The Verilog HDL, 5th Edition, Kluwer Academic Publication, 2002.
3. Stephen. Brown, ZvonkoVranesic (2005), Fundamentals of Logic Design with Verilog, Tata McGraw Hill, India.

III B.TECH I SEMESTER

COURSE STRUCTURE

A4412 - ANTENNAS AND WAVE PROPAGATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course explains the design and operation of transmission and receiving antennas for various applications. Further different modes of wave propagation of electromagnetic wave will be discussed.

Course Pre/co requisites

1. Electromagnetics Theory and Transmission Lines (A4408)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4412.1. Understand the fundamental parameters of antennas and wave propagation mechanisms
A4412.2. Apply the relevant antenna theory to various antennas suitable for different applications
A4412.3. Analyze the performance of different antenna structures with their specifications
A4412.4. Design various types of antennas for given specifications and application
A4412.5. Apply the concepts of wave propagation to solve for performance metrics of wireless systems like radio horizon, skip distance etc

3. Course Syllabus

ANTENNA BASICS: Introduction, Radiation Mechanism -Fundamental Antenna Parameters, Half wave dipole - Field, current pattern, Power Radiated, radiation resistance, effective aperture and directivity, Related Problems

ANTENNA ARRAYS: Two element arrays, Multiplication of patterns, Linear Array with n-isotropic point sources of equal amplitude and spacing (Broadside, End fire Arrays), EFA with Increased Directivity, Related Problems

BROADBAND ANTENNAS: The Helical Antenna - Significance, Geometry, helix modes, Design considerations of Log Periodic Antennas

RF ANTENNAS: Paraboloidal Reflectors – Feed systems, Introduction to Microstrip Antennas

WAVE PROPAGATION: Introduction, modes of Propagation, Ground Wave Propagation, Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, Virtual Height, MUF– Calculations, LUHF, Skip Distance, Optimum working Frequency, Space Wave Propagation – LOS.

4. Books and Materials

Text Books:

1. J.D. Kraus, Antennas, McGraw Hill, 1988.
2. C.A. Balanis, Antenna Theory - Analysis and Design, John Wiley, 1982.

Referencebooks:

1. K. D. Prasad, SatyaPrakashan, Antennas and Wave Propagation, Tech India Publications, New Delhi.
2. R.E. Collin, Antennas and Radio Wave Propagation, McGraw Hill, 1985.
3. I.J. Bahl and P. Bhartia, Micro Strip Antennas, Artech House, 1980.
4. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 2005

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III B.TECH I SEMESTER

COURSE STRUCTURE

A4451 - CPLD AND FPGA ARCHITECTURE AND APPLICATIONS

(PROFESSIONAL ELECTIVE - I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the VLSI design flow based on real time applications using FPGA and CPLD. This course depicts the digital systems as a hierarchical structure of block diagrams, state machines, flow charts, truth tables and HDL code (VHDL/Verilog). The Digital designs are extensively simulated to check for integrity, compile, synthesize and implement using CPLD or FPGA. This course is intended to provide opportunity in developing complex real time hardware designs.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4451.1. Identify the design issues and apply the knowledge to derive solutions in engineering fields related to CPLD and FPGA

A4451.2. Analysis of Performance parameters by using the EDA tools

A4451.3. Analysis and evaluation of complex digital system using FPGA and CPLD.

A4451.4. Design of Synthesizable Hardware modelling for real time applications.

3. Course Syllabus

Introduction to Programmable Logic Architectures: Programmable Sum-of-products Arrays, PAL fuse matrix and, Combinational Outputs, PAL Outputs with programmable polarity, PAL devices with programmable polarity, universal PAL and generic array logic.

Complex Programmable Logic Devices: Architectures- Altera series – Max 5000/7000 series and Altera FLEX logic – 10000 series CPLD, AMD's – CPLD (Mach 1 to 5); Cypres FLASH 370 Device Technology, Lattice LSI's Architectures – 3000 Series – Speed Performance in the system

FPGA Based Systems: Introduction, Digital Design and FPGAs, FPGA - Based System Design.

FPGA Fabrics:FPGA architectures, SRAM based FPGAs, permanently programmed FPGAs. Chip input/output, circuit design of FPGA fabrics, architecture of FPGA fabrics

Combinational Logic: The logic design process, combinational network delay, power and energy optimization, arithmetic logic.

Sequential Machines: Introduction, the sequential machine design process, sequential design styles, rules for clocking, performance analysis.

Logic Implementation Using FPGA: Syntax directed translation, logic implementation by macro, logic synthesis, technology independent and dependent logic optimizations, physical design for FPGAs, logicdesign process revisited.

Finite State Machine: State Transition table, state assignment for FPGAs, hazard and one hot encoding. CASE STUDIES:Case studies Xilinx XC4000 and ALTERA's FLEX 8000a) Programming Technologies: SRM Based and Anti-Fuse Programming Technologiesb) Concurrent Logic FPGA Design: Parallel Adder Cell Design and Parallel Controllers.

4. Books and Materials

TEXT BOOKS:

1. Wayne Wolf: *FPGA Based System Design*;Pearson Education, New Delhi, 2004.
2. Robert Dueck: *Digital design With CPLD Applications and VHDL*; Thomson Learning, USA, 2000.

REFERENCE BOOKS:

1. P. K. Chan, S. Moura:*Digital Design Using Field Programmable Gate Array*; PHI, 1994
2. S. Trimberger, Edr.: *Field Programmable Gate Array Technology*; Kluwer Academic Publications, New Delhi, 1994

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III B.TECH I SEMESTER

COURSE STRUCTURE

A4452 - DESIGN OF ARM SYSTEMS

(PROFESSIONAL ELECTIVE - I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Real Time Software Designers must be familiar with Computer Architecture and Organization, Operating Systems, Software related to embedded systems, Programming Languages(C, Assembly Language) and Compilation Techniques. This Course provides an overview of these techniques from the perspective of the real-time system designer. It covers techniques for Scheduling, Resource Access Control and Validation that are likely to be used in real-time computing and communication systems. It also provides the core elements for those who are building practical real time applications.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4452.1. Compare and contrast a Real Time Operating System & other Operating System and also rectify the Real Time Design Issues

A4452.2. Build the applications to run in parallel either using Process or Threads.

A4452.3. Analyze a Practical Real Time System and its optimal core elements.

A4452.4. Identify the Scheduling Schemes for Packet Switching Networks and Protocols for the Broadcast Networks.

A4452.5. Assess the Performance Analysis of different Real Time Systems which are available in market.

3. Course Syllabus

ARM ARCHITECTURE: ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families

INSTRUCTION SET: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

THUMB INSTRUCTION SET: Register Usage, Other Branch Instructions, Data Processing Instructions, Single - Register and Multi Register Load - Store Instructions, Stack, Software Interrupt Instructions

ARM PROGRAMMING: Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops

MEMORY MANAGEMENT: Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch

EMBEDDED COMPUTING: Introduction,Embedded System Design Process.
CASE STUDIES USING MULTIPROCESSORS: Consumer Electronics Architecture, Cell Phones, Audio Players, Digital Still Cameras

4. Books and Materials

Text Books:

1. Andrew N. Sloss, Dominic Symes and Chris Wright (2008), ARM Systems Developer's Guides - Designing & Optimizing System software, Elsevier, New Delhi, India.
2. Wayne Wolf (2008), Computers as Components-principles of embedded computer system design, Elseveir, New Delhi, India.

Reference Books:

1. Jean J. Labrosse (2000), Embedding System Building Blocks, 2nd edition, CMP publishers, USA.
2. Raj Kamal (2004), Embedded Systems, Tata McGraw hill, India.
2. James A Langbridge, Professional Embedded ARM development, WroxTM (A WILEY BRAND).
3. Jonathan W. Valvano – Brookes/ Cole (1999), Embedded Microcomputer Systems and Real Time Interfacing, Thomas Learning.

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III B.TECH I SEMESTER

COURSE STRUCTURE

A4453 - COMPUTER COMMUNICATION NETWORKS

(PROFESSIONAL ELECTIVE - I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides a comprehensive overview of computer communication networks, with emphasis on analysis and modelling. Basic communications principles are reviewed as they pertain to communication networks. Networking principles include layered network architecture, switching techniques, multiple accesses, Wired and Wireless LAN, framing, transport protocols for emerging high-speed networks.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4453.1. Define multiple access and describe its use in the data link layer

A4453.2. Apply the concepts of Computer Networks and Networks Models for Data Communication.

A4453.3. Analyze networking architecture and infrastructure for wired and wireless link.

A4453.4. Distinguish each layer in the TCP IP model with those in the OSI model

A4453.5. Inspect different versions of Internet Protocol

3. Course Syllabus

Data Communication, Networks, Interconnection of Networks, Layered tasks, OSI Model, Layers in OSI model, TCP/IP Suite, Addressing, Transmission Media, Guided media, Unguided media

Switching Techniques, Circuit switched networks, Datagram Networks, virtual circuit networks, structure of a switch, Telephone networks, Dial up modem, DSL, Cable TV for data transmission

Data link control, Framing, Flow and Error control, Protocols, Noiseless channels and Noisy channels, HDLC, point to point protocol, Multiple Accesses, Random access, Controlled access, Channelization

Wired LAN, IEEE standards, Standard Ethernet, Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth, Connecting Devices, Backbone networks and Virtual LANs

Network Layer, Unicast and Multicast Routing, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6, Transition from Ipv4 to Ipv6.Transport layer, Process to process Delivery, UDP, TCP, RTP, Congestion control and Quality of Service

4. Books and Materials

Text Book:

1. Data Communication and Networking, B Forouzan, 4th Ed, TMH 2006

Reference Books:

1. Computer Networks, James F. Kurose, Keith W. Ross: Pearson education, 2nd Edition, 2003.
2. Introduction to Data communication and Networking, Wayne Tomasi: Pearson education 2007
3. Computer Networks, Andrew S.Tanenbaum, Pearson education 4th Edition.

4. III B.TECH I SEMESTER

COURSE STRUCTURE
A4454 - SMART ANTENNAS
(PROFESSIONAL ELECTIVE - I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The basic objective of this course is to provide the knowledge on smart antennas and to understand the concepts of basic signal processing algorithms to design the adaptive array systems to use in the modern wireless communication systems. This also explores various fundamentals of signal processing and antenna schemes to enable the antenna to perform the beam formation and signal direction detection.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4454.1. Understand the architecture of the smart antennas

A4454.2. Analyze the direction of arrival of the signals transmitted to the antenna

A4454.3. Apply various beam forming techniques to maximize the signal performance

A4454.4. Analyze various signal processing techniques for the effective functionality of the antenna systems

3. Course Syllabus

Introduction to Smart Antennas: Introduction, Need for Smart Antennas, Smart Antenna Configurations, Switched Beam Antennas, Adaptive Antenna Approach – Space Division Multiple Access. Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Basic Principles, Mutual Coupling Effects.

DOA Estimation of Fundamentals: Overview, The Array response Vector, Received Signal Model, The Array response Vector, Received Signal Model, Introduction to DOA Estimation Methods

Beam Forming Fundamentals: Classical Beam former, Statistically Optimum Beam forming Weight Vectors, Adaptive Algorithms for Beam forming

Integration and Simulation of Smart Antennas: Overview, Antenna Design, Mutual Coupling, Adaptive Signal Processing Algorithms, Trellis-Coded Modulation (TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Adhoc Networks (MANETs)

Space–Time Processing: Introduction, Discrete Space–Time Channel and Signal Models, Space– Time Beam forming, Inter symbol and Co-Channel Suppression, Space–Time Processing for DSCDMA, Capacity, and Data Rates in MIMO Systems, Discussion

4. Books and Materials

Text Books:

1. Constantine A. Balanis& Panayiotis I. Ioannides, "Introduction to Smart Antennas", Morgan & Claypool Publishers' series-2007
2. Joseph C. Liberti Jr., Theodore S Rappaport, "Smart Antennas for Wireless CommunicationsIS-95 and Third Generation CDMA Applications", PTR – PH publishers, 1st Edition, 1989.

Reference Books:

1. T.S Rappaport, "Smart Antennas Adaptive Arrays Algorithms and Wireless Position Location", IEEE press 1998, PTR – PH publishers 1999.
2. Lal Chand Godara, "Smart Antennas", CRC Press, LLC-20

III B.TECH I SEMESTER

COURSE STRUCTURE

A4018 - ENGINEERING DESIGN THINKING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

Engineering Design Thinking is an extension to Engineering Exploration course studied at first year level. This course links the primary fields of engineering and explores the engineering design process from conceptual design and optimal choice evaluation to prototyping and project construction. This course provides insights into particular design challenges within their specific fields of engineering and enables the learners to apply the knowledge in real time - designing, constructing and testing a prototype (actual physical build) to solve a real-world engineering problem. In extent, this course is an excellent roadmap for the design engineers seeking to broaden their engineering knowledge to design concepts to their current work.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4018.1. Interpret the problem-solving skills and product design skills

A4018.2. Apply foundational knowledge of the primary fields of engineeringand scientific concepts to find the solution

A4018.3. Identify various techniques and applications of the engineering design process

A4018.4. Inspect the design and assess a prototype that solves an engineering problem

A4018.5. Interpret the solutions and document the findings/reflections

3. Course Syllabus

1. **Introduction**
   Definition of design, design process, different problem types, characteristics of novice and informed designers, enhance negotiation and iteration in design.

2. **Case Studies**
   Recognized organizations for design and innovation, shopping cart case study, benefits of failure in design

3. **Human Centered Design**
   Introduction to HCD (Human Centered Design), HCD as a Mindset, personas and scenarios, best practice working with communities

4. **Specification Development**
   Definition of specification, three examples of ways to generate specifications, how to manage specifications, functional decomposition
5. **Prototyping**
   Three kinds of prototypes, how prototypes can be used in the design process, how to use prototypes can be used to elicit input from users

6. **Ideation, Innovation & Creativity**
   Concept Selection, Interpretation of Creativity and Innovation, Brain storming Expanding the Design Space, case study using decision matrix
7. **Teamwork and Leadership in Design**
   Professional Preparation, Recognizing differences in teammates, VRE Model, Best Model for Leadership, Conflict Vs. Effectiveness, Code of Cooperation, Project (Team) and individual Artifacts, Evaluating Teams

8. **Design for Robustness**
   Review the design, Brainstorm potential failure models, List potential effects of failure & potential causes for each failure, Rank failures, Develop action plan, Implement fixes, Revisit potential failure risks

4. Books and Materials

Text Books:

1. Oakes, Leone, and Gunn (2004). *Engineering Your Future*. Okemos, MI: Great Lakes Press.
2. Crismond, D. (2007). *Contrasting strategies of beginning and informed designers:* One representation of learning progressions in engineering design.
3. Ryan Jacoby and Diego Rodriguez, *Innovation, Growth, and Getting to Where You Want to Go*, Design Management Review Vol. 18 No. 1
4. G.Pahl and W.Beitz," Engineering design: A systematic approach", Springer 2nd Editon.

Reference Books:

1. Ali k.Kamrani, EmadAbouel Nasr, "*Engineering design and Rapid Prototyping*", Springer.
2. Ken Hurst," Engineering design principles", Elesiever,2nd edition.

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III B.TECH I SEMESTER

COURSE STRUCTURE

A4015 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	0	100	100

1. Course Description

Course Overview

The course focuses on introducing Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system to the students. The course is intended to develop the understanding of Traditional Knowledge in terms of various government acts and modern society and science among students.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

A4015.1. Interpret traditional knowledge
A4015.2. Organize traditional knowledge
A4015.3. Identify the role of government in preserving traditional knowledge
A4015.4. Develop the understanding of the protection of Traditional Knowledge in terms of various government acts
A4015.5. Compare the relationship between Traditional Knowledge in modern society and science

3. Course Syllabus

Module 1:
Introduction to traditional knowledge and basic structure of Indian Knowledge System: Features of Indian Traditions: Nature and Characteristics of traditional knowledge-scope and importance-kinds of traditional knowledge-traditional knowledge Vs western knowledge.

Module 2:
Philosophical Tradition and Protection of traditional knowledge: Significance of traditional knowledge protection-value of traditional knowledge in global economy-role of government to harness traditional knowledge –Various Acts regarding protection of Traditional Knowledge

Module 3:

Modern Science and Indian Knowledge System:Historical Background- the global problem today-Indian contributions to global science

Module 4:
Yoga and Holistic Health care**:** Science and Spirituality in India- the need for both outer and inner sciences- yogic science

Module 5:
Indian Artistic Tradition: Visual arts and culture- the journey of Indian art from traditional to modern era

4. Books and Materials

Text Books:

NIL

Reference Books:

1. Sengupta, Nirmal. Traditional Knowledge in Modern India: Preservation, Promotion, Ethical Access and Benefit Sharing Mechanisms, Springer, London. 2018. Print.
2. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
3. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan
4. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Ernakulam
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
6. GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, VidyanidhiPrakashan, Delhi 2016

SYLLABI FOR III YEAR II SEMESTER

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III B.TECH II SEMESTER

COURSE STRUCTURE

A4413 - CMOS VLSI DESIGN

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This course is primarily designed for students to learn fundamentals of MOSFET based digital circuit design through hands on experience. It covers basic theories and techniques of digital VLSI design in CMOS technology. This course gives knowledge about the design, analysis, simulation of circuits used as building blocks in VLSI devices. It gives knowledge about different processes used for fabrication of an IC. It explains the characteristics of MOS transistor and its device equations. The course leverages switch-level abstraction of transistors to learn the design of static CMOS logic, transmission gate logic, and dynamic logic, but then delves into some details of transistor operation to understand circuit delays and power dissipation. A course project using state-of-the-art computer aided design (CAD) tools in VLSI gives students hands-on exposer to the most current technology/process

Course Pre/co requisites

1. Digital Logic Design (A4401)
2. Electronics Devices and Circuit Analysis (A4402)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4413.1. Analyze the electrical properties of MOS devices and different processes used for fabrication of ICs.

A4413.2. Analyze the characteristics and operation of simple static CMOS circuits to complex functions

A4413.3. Construct and analyze the operation of transmission gate (TG) based logic circuits..

A4413.4. Analyze charge sharing problem and data synchronization in dynamic circuits

A4413.5. Use modern CAD tools for design, analysis and simulation of various circuits used as building blocks of VLSI systems.

3. Course Syllabus

Theory

MOS Transistor Theory: Introduction, MOS device design equations, threshold voltage, body effect, channel length modulation, MOS models, the CMOS Inverter-DC characteristics.

CMOS Processing Technology: Overview – wafer processing, oxidation, epitaxy, deposition, ion-implantation and diffusion, the silicon gate process, basic CMOS technology.

Analysis and Design of CMOS Inverter: Basic circuit and DC operation-DC characteristics, noise margins, layout considerations, inverter switching characteristics - switching intervals, high-to-low time, low-to-high time, maximum switching frequency, transient effects on the VTC, RC modelling, propagation delay, inverter design-DC design, transient design, power dissipation.

Static Logic Gates: Complex logic functions, CMOS NAND gate-DC characteristics, transient characteristics, design, N-input NAND, CMOS NOR gate-DC transfer characteristics, transient times, design, N-input NOR, comparison of NAND and NOR gates, layout, complex logic gates- examples of complex logic gates, logic design techniques, FET sizing and transient design, SR and D-type latch, the CMOS SRAM cell-receiver latch, pseudo-nMOS logic gates- complex logic in pseudo-nMOS, simplified XNOR gate.

Transmission Gate Logic Circuits: Basic structure- the TG as a tri-state controller, electrical analysis-logic-1 transfer, logic-0 transfer, RC modelling- TG resistance estimate, equivalent resistance, TG capacitances, layout considerations, TG-based switch logic gates-basic multiplexors, OR gate, XOR and equivalence, transmission-gate adders, TG registers, the D-type flip-flop.

Dynamic Logic Circuit Concepts: Charge sharing-RC equivalent, the Dynamic RAM cell- cell design and array architecture, DRAM overhead circuit, clocks and synchronization-shift register, TGs as control elements, extension to general clocked systems, clocked-CMOS, clock generation circuits.

Practice

1. Analyze the DC characteristics of NMOS and PMOS transistors.
2. Analyze the Voltage Transfer Characteristics of CMOS inverter and perform transient analysis to verify its operation.
3. Construct static CMOS NAND2 and NOR2 logic gates and perform transient analysis to verify its operation.
4. Construct static CMOS AND2 and OR2 logic gates and perform transient analysis to verify its operation.
5. Construct static CMOS EX-OR and EX-NOR logic gates and perform transient analysis to verify its operation.
6. Construct static CMOS logic circuits for the given Boolean functions.
7. Implement Pseudo-nMOS inverter and analyze is characteristics.
8. Implement XOR and XNOR function using mirror circuits.
9. Implement Transmission Gate (TG) based OR, XOR and XNOR gates.
10. Implement Transmission Gate (TG) based full-adder circuit.
11. Implement Transmission Gate (TG) based 4-to-1 multiplexer network. full-adder circuit.
12. Implement C^2MOS NAND2 and NOR2 gates.

4. Laboratory Equipment/Software/Tools Required

1. Computers installed with Linux Operating System
2. Cadence Virtuoso Analog Design Environment

5. Books and Materials

Text Book:

1. John .P. Uyemura (2011), CMOS LOGIC CIRCUIT DESIGN, Springer International Edition, India.

Reference Books:

1. Neil H. E. Weste, Kamran Eshraghian (2001), Principles of CMOS VLSI Design – A System Perspective, 2nd Edition, Pearson Education Asia, India.
2. Kenneth William Martin (2000), Digital Integrated Circuit Design- Oxford University Press.

III B.TECH II SEMESTER

COURSE STRUCTURE
A4414 – LINEAR CONTROL SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	1	2	28	14	28	4	30	70	100

1. Course Description

Course Overview

From this course students can understand the principles and applications of control system in daily life. This course will introduce time-domain systems dynamic control fundamentals and their design issues. Emphasis will be on linear, time-invariant, multi-input multi-output continuous time systems. Topics include open and closed-loop state-space representations, analytical solutions, computer simulations, stability, controllability, observability, and controller/observer design.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4414.1. Compare the various types of controllers and control systems.
A4414.2. Build the mathematical models for a given system.
A4414.3. Identify the stability of control systems by using various methods.
A4414.4. Analyze the time and frequency response of control systems.
A4414.5. Analyze the performance of control systems using modern tools

3. Course Syllabus

Theory

Basics In Control System And Transfer Function: Introduction of Control Systems, Various types of systems (Open Loop and closed loop) and their differences- Classification and Feed-Back Characteristics of control system-Effects of feedback.
Mathematical Models of Control System Components: Differential equations, block diagram reduction techniques, Signal Flow Graph representation, Reduction using Mason's gain formula

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

Stability Analysis: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots
Stability Analysis: Polar Plots, Nyquist Plots-Stability Analysis

Design of Controllers: Compensation techniques **–** Lag, Lead, and Lead-Lag Controllers design, PID Controllers, Design using Root-loci method, Bode plot method.
State Space Analysis: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and observability.

Practice

Simulate the following experiments using LABVIEW/MATLAB:

1. Analyse the step and impulse response of the given control systems.
2. Obtain the time domain specifications of a unity feedback system with the given open loop transfer function G(s).
3. Study the transient and steady state performance of an analog PPD & PID controller on second order system.
4. Determine the stability of the system for the given characteristic equation by using R-H criteria.
5. Analyze the stability of the system by plotting Root locus.
6. Determine the frequency domain specification by plotting Bode plot for any given system.
7. Find the frequency domain specifications of a Lead compensator for a unity feedback system with an open loop transfer function G(s).
8. Analyze the stability of the system for different gains (K) to the open loop transfer function by using Polar plot.
9. Analyse the stability of the system for different gains (K) to the open loop transfer function by using Nyquist plot.
10. Derive the transfer function from the State space model.

4. Laboratory Equipment/Software/Tools Required

1. MATLAB Software

5. Books and Materials

TEXT BOOK:

1. J.Nagrath, M .Gopal (2011), Control Systems Engineering, 5th edition, New Age International (P) Limited, New Delhi, India.

REFERENCEBOOKS:

1. K. Ogata (2008), Modern Control Engineering, 4th edition, Prentice Hall of India Pvt. Ltd, New Delhi.
2. N. K. Sinha (2008), Control Systems, 3rd edition, New Age International Limited Publishers, New Delhi

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III B.TECH II SEMESTER

COURSE STRUCTURE

A4415 - DIGITAL SIGNAL PROCESSING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	2	42	14	28	5	30	70	100

1. Course Description

Course Overview

This course introduces fundamental concepts, algorithms and applications of digital signal processing. Starting from a description of how signals can be represented as digital waveforms and how systems may be modelled as digital filters; the course investigates the processing and analysis of signals using the most common approaches and algorithms. The familiarity with the Fourier and Laplace transforms and concepts such as linearity and shift invariance is used in the description and analysis of linear analog systems. This idea is extended to the field of discrete time systems. Major parts of the course will concentrate on signal analysis using Fourier transforms, linear system analysis, Filter design and a few more advanced topics. While this course deals largely with the theory of DSP, we will use a powerful software package, MATLAB, to look at applications of this theory, particularly Fourier analysis and digital filter design.

Course Pre/co requisites

1. Signals and Systems (A4403)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4415.1. Interpret the concepts of Discrete time signals, systems and multirate signal processing

A4415.2. Analyze digital systems using various transform techniques.

A4415.3. Design and implement FIR and IIR filters for given specifications.

A4415.4. Examine digital signal processing algorithms using simulation tool.

3. Course Syllabus

Theory

INTRODUCTION TO DIGITAL SIGNAL PROCESSING and FOURIER SERIES:

Discrete time signals & systems, linear shift invariant systems, stability and causality, Discrete Fourier series representation of periodic sequences, Properties of discrete Fourier series

FOURIER TRANSFORMS:

Frequency domain representation of discrete time signals, Discrete Fourier transforms: frequency domain sampling, Relationship of DFT to other transforms,Properties of DFT, linear convolution of sequences using DFT, Computation of DFT, Fast Fourier transforms (FFT) - Radix-2 FFT algorithm, Inverse FFT

APPLICATIONS OF Z-TRANSFORM:

Review of Z-Transforms, Discrete Time Transfer Function, Stability: Constraints of poles and Eigen Values, Test for common factors, Schur-Cohn Stability criterion, Schur - Cohn-Fujiware Stability Criterion, Jury-Marden Stability Criterion, Lyapunov Stability Criterion, Time Domain and Frequency domain analysis

REALIZATION OF DIGITAL FILTERS: Structures for FIR systems: Direct form structure, Cascade form structures, Structures for IIR systems: Direct form structures, cascade form structures, Parallel form structures

DESIGN OF FIR DIGITAL FILTERS:

Symmetric and antisymmetric FIR filters, Design of linear phase FIR Digital Filters using Windows, Design of linear phase FIR Digital Filters by Frequency Sampling method

DESIGN OF IIR DIGITAL FILTERS:

IIR filter design by Approximation of Derivatives, IIR filter design by impulse invariance, IIR filter design by bilinear transformation, Characteristics of commonly used analog filters (Butter worth and Chebyshev), Frequency transformations, comparison of IIR & FIR filters

Practice

The programs shall be implemented in software (using MATLAB/ LAB view/ C Programming/OCTAVE or Equivalent)

1. Generation of various sequences.
2. Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding
3. Verification of linearity and time invariance properties of a given continuous/discrete time system.
4. Convolution between sequences
5. To find frequency response of a given system given DT domain system.
6. To find DFT/IDFT of given discrete time signal.
7. Convolution using DFT
8. Implementation of FFT of given sequence.
9. Design of FIR filter using windowing technique and verify the frequency response of the filter
10. Design of IIR filters for a given sequence and verify the frequency response of the filter

Hardware (Using TI/Analog Devices/Motorola/ Equivalent DSP processors)

1. Generation of sinusoidal signal
2. Linear and Circular Convolution
3. Find DFT/IDFT of given discrete time signal

4. Implementation of FFT of given sequence.
5. Design of FIR filter using windowing technique and verify the frequency response of the filter
6. Design of IIR filters for a given sequence and verify the frequency response of the filter

4. Laboratory Equipment/Software/Tools Required

1. Computers
2. MATLAB Software
3. CC Studio

5. Books and Materials

Text book:

1. John G. Proakis, Dimitris G. Manolakis (2007), Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, India.

Reference Books:

1. Andreas Antoniou (2008), Digital Signal Processing, Tata McGraw Hill, New Delhi.
2. M. H. Hayes (2007), Schaums Outlines of Digital Signal Processing, Tata McGraw Hill, India.
3. Robert J. Schilling, Sandra L. Harris (2007), Fundamentals of Digital Signal Processing using Matlab, Thomson Publications,India.
4. Dimitris G. Manolakis, Vinay Ingle (2011), Applied Digital Signal Processing, Cambridge University Press, Newyork

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III B.TECH II SEMESTER

COURSE STRUCTURE

A4455 - LOW POWER VLSI DESIGN

(PROFESSIONAL ELECTIVE - II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces various strategies and methodologies for designing low power circuit and high speed systems. It describes the many issues facing designers at architectural, logic, circuit and device levels and presents some of the techniques that have been proposed to overcome these difficulties. This course is a dynamic research area driven by battery–powered portable computing and wireless communications products. It has become critical to the continued progress of high–performance and reliable microelectronic systems. The course addresses the concepts, principles and techniques to reduce the power in VLSI systems design.

Course Pre/co requisites

1. CMOS VLSI Design (A4413)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4455.1. Analyze the physics of power dissipation in MOSFET and identify related limits.

A4455.2. Analyze the power estimation techniques using various approaches in low power circuit design.

A4455.3. Develop low voltage CMOS circuits using low power design techniques.

A4455.4. Analyze the various types of clocked logic styles

A4455.5. Design clocking styles for high speed VLSI design

3. Course Syllabus

PHYSICS OF POWER DISSIPATION IN CMOS: Introduction, sources of power dissipation, designing for low power. Physics of power dissipation in MOSFET devices-MIS structure, long channel and sub-micron MOSFET, Gate induced Drain leakage, Power dissipation in CMOS-Short circuit dissipation, dynamic dissipation, and load capacitance. Low power VLSI design limits-Principles of Low power design, hierarchy of limits, fundamental limits, material, device, circuit and system limits

POWER ESTIMATION IN CMOS CIRCUITS: Introduction, modeling of signals, signal probability calculations- signal probability using binary decision diagrams, probabilistic techniques for signal activity estimation- switching activity in combinational logic, switching activity in sequential circuits and an approximation method.
STATISTICAL TECHNIQUES: Estimating Average Power in Combinational and sequential circuits, Monte-carlobased estimation of glitching power, sensitivity analysis, power estimation using input vector compaction

SYNTHESIS FOR LOW POWER: Behavioral level transforms, Algorithm level transforms, power-constrained least squares optimization for adaptive and non-adaptive filters, circuit activity driven architectural transformations, architecture driven voltage scaling, power optimization using operation reduction and substitution, pre-computation based optimization logic level and circuit level optimization for low power

DESIGN AND TEST OF LOW - VOLTAGE CMOS CIRCUITS: Introduction, circuit design styles, leakage current in deep sub - micrometer transistors, device design issues, minimizing short channel effect, low voltage circuit design techniques using reverse Vgs,multiple threshold voltages, multiple supply voltages

LOW ENERGY COMPUTING USING ENERGY RECOVERY TECHNIQUES: Energy dissipation in transistor channel, using an RC model energy recovery circuit design, designs with partially reversible logic. Energy recovery in adiabatic logic and SRAM core.
SOFTWARE DESIGN FOR LOW POWER: Introduction, sources of software power dissipation, software power estimation and optimization

4. Books and Materials

Text Book:

1. Kaushik Roy, Sharat C. Prasad (2000), Low-Power CMOS VLSI Circuit Design, Wiley India, New Delhi.

Referencebooks:

1. Anantha P. Chandrakasan, Robert W. Brodersen (1998), Low - Power CMOS Design, IEEE Press, USA.
2. Christian Piguet (2006), Low-Power CMOS Circuits: Technology, Logic Design and CAD Tools, CRC Taylor& Francis, USA
3. Shin-ichi Minato (1995), Binary Decision Diagrams and Applications for VLSI CAD, The Springer Engineering and Computer International Series, USA.

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III B.TECH II SEMESTER

COURSE STRUCTURE

A4456 - REAL TIME SYSTEM DESIGN

(PROFESSIONAL ELECTIVE - II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Real Time Software Designers must be familiar with Computer Architecture and Organization, Operating Systems, Software related to embedded systems, Programming Languages(C, Assembly Language) and Compilation Techniques. This Course provides an overview of these techniques from the perspective of the real-time system designer. It covers techniques for Scheduling, Resource Access Control and Validation that are likely to be used in real-time computing and communication systems. It also provides the core elements for those who are building practical real time applications.

Course Pre/co requisites

1. Microprocessors and Microcontrollers (A4409)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4456.1. Compare and contrast a Real Time Operating System & other Operating System and also rectify the Real Time Design Issues

A4456.2. Build the applications to run in parallel either using Process or Threads.

A4456.3. Analyze a Practical Real Time System and its optimal core elements.

A4456.4. Identify the Scheduling Schemes for Packet Switching Networks and Protocols for the Broadcast Networks.

A4456.5. Survey on the Performance Analysis of different Real Time Systems which are available in market.

3. Course Syllabus

BASIC REAL-TIME CONCEPTS: Terminology, Real-Time System Design Issues, Example Real-Time Systems, Common Misconceptions, Brief History; Hard Vs Soft Real-Time Systems.

A REFERENCE MODEL OF REAL TIME SYSTEMS: Processors and Resources, Temporal Parameters of Real Time Work Load, Periodic Task Model Precedence Constraints and Data Dependency, Functional Parameters, Resource Parameters of Jobs and Parameters of Resources, Typical Real Time Applications

REAL-TIME KERNELS: Pseudo kernels, Interrupt-Driven Systems, Preemptive-Priority Systems, Hybrid Systems, The Task-Control Block Model, Theoretical Foundations of Real-Time Operating Systems.
INTERTASK COMMUNICATION AND SYNCHRONIZATION: Buffering Data, Time-Relative Buffering, Ring Buffers, Mailboxes, Queues, Critical Regions, Semaphores, Other Synchronization Mechanisms, Deadlock, Priority Inversion

REAL TIME SCHEDULING: Commonly used Approaches to Real Time Scheduling, Clock Driven Scheduling, Priority Driven Scheduling; Scheduling A periodic and Sporadic jobs in priority driven systems.
MEMORY MANAGEMENT: Process Stack Management , Run-Time Ring Buffer, Maximum Stack Size, Multiple-Stack Arrangements ,Memory Management in the Task-Control-Block Model ,Swapping, Overlays, Block or Page Management , Replacement Algorithms , Memory Locking Working Sets ,Real-Time Garbage Collection , Contiguous File Systems ,Building versus Buying Real-Time Operating Systems, Selecting Real-Time Kernels

REAL TIME COMMUNICATION: Model of Real Time communication, Priority based service disciplines for switched networks, Weighted Round Robin Service disciplines, Medium Access-Control protocols of Broadcast networks, internet and Resource Reservation Protocols, Real Time Protocol, Communication in Multicomputer Systems

CASE STUDIES: Case Studies of programming with RTOS- Case Study of Automatic Chocolate Vending m/c using µCOS RTOS, case study of sending application Layer byte Streams on a TCP/IP network, Case Study of an Embedded System for a smart card

4. Books and Materials

TEXT BOOK:

1. Liu, Jane W. S. (2009), *Real-Time Systems*, 8th edition, Pearson Education, India.
2. A. Phillip Laplante (2004)*, Real Time Systems Design and Analysis,* 3rd edition, John Wiley and Sons, India.

REFERENCE BOOKS:

1. Raj Kamal (2003), Embedded Systems Architecture, Programming & Design, Tata McGraw-Hill, New Delhi
2. C. M. Krishna, Kang G. Shin (2010), *Real Time Systems*, Tata McGraw-Hill, New Delhi
3. K. V. K. K. Prasad (2005), *Embedded / Real Time Systems*, Dreamtech Press, New Delhi

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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III B.TECH II SEMESTER

COURSE STRUCTURE

A4457 - IMAGE ANALYSIS AND VISUALIZATION

(PROFESSIONAL ELECTIVE - II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Visual information plays an important role in many aspects of our life. Much of this information is represented by digital images. Digital image processing is ubiquitous, with applications including television, tomography, photography, printing, robot perception, and remote sensing. It is an introductory course to the fundamentals of digital image processing. It emphasizes general principles of image processing, rather than specific applications. We expect to cover the following topics: image acquisition and display, colour representations, image sampling and quantization, point operations, linear image filtering and correlation, image transforms and sub-band decompositions, contrast and colour enhancement, image restoration, and image compression.

Course Pre/co requisites

1. CMOS VLSI Design

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4457.1. Describe image formation model

A4457.2. Apply the concepts of enhancement algorithms and restoration techniques to enhance the quality of image

A4457.3. Analyze the images by applying various transformation techniques.

A4457.4. Estimate the shape and the pattern of an image using segmentation techniques and colour image processing.

A4457.5. Identify a practical solution to common image processing problems by using compression algorithms

3. Course Syllabus

Theory

DIGITAL IMAGE FUNDAMENTALS: Fundamental Steps in Digital Image Processing, Components of an Image Processing System, A Simple Image Formation Model, Image Sampling and Quantization, Relationships Between Pixels, Imaging Geometry

IMAGE TRANSFORMS: 2-D Fourier Transform, Properties, FFT, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar transform, Slant transform, Hotelling transform

IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN: Introduction, Gray Level Transformations, Histogram Processing, Arithmetic and Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.
IMAGE ENHANCEMENT IN FREQUENCY-DOMAIN: Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering. Pseudo-colour Image Enhancement

IMAGE COMPRESSION: Fundamentals, Image Compression Models, Elements of information Theory, Error Free Compression, Lossy Compression.
IMAGE SEGMENTATION: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds

FEATURE EXTRACTION: Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors Whole-Image Features

4. Books and Materials

Text Book:

1. R. C. Gonzalez, R. E. Woods, Digital Image processing, 4th edition, Pearson education, New Delhi, India.

Reference Books:

1. K. Jain (1997), Fundamentals of Digital Image processing, Prentice Hall of India, New Delhi.
2. Rafael C. Gonzalez (2004), Digital Image processing using MATLAB, Richard E. Woods and Steven Low price Edition, Pearson Education Asia, India.
3. William K. Pratt, (2004), Digital Image Processing, 3rd edition, John Wiley & Sons, New Delhi, India.
4. Arthur R.Weeks, Jr.(1996), Fundamentals of Electronic Image Processing, SPIE Optical Engineering Press, New Delhi, India.

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III B.TECH II SEMESTER

COURSE STRUCTURE

A4458 - MICROWAVE ENGINEERING

(PROFESSIONAL ELECTIVE - II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The Course is intended to provide the foundation for microwave engineering to the UG students. The course will provide an overview of microwave applications in communications and in other areas. In particular, a detailed discussion on microwave frequency ranges and their importance in modern era. This course will also provide the analysis of microwave transmission lines like waveguides (rectangular), various microwave components like T-junctions, circulator, isolator etc. and different microwave sources like Klystron, Magnetron and Gunn diode are discussed in detail to enable the student to design microwave sub-systems and systems. Measurement of various parameters like power, frequency and attenuation will also be covered.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4458.1. Apply the knowledge of Electromagnetic and Basic Engineering Mathematics on Microwave components and sources

A4458.2. Apply the waveguide mode characteristics to measure the performance of microwave transmission lines and waveguide components

A4458.3. Analyze various microwave transmission lines, components, sources and validate their performance.

A4458.4. Design the end-to-end Microwave/ RF communication links

A4458.5. Evaluate the performance of microwave sources and components

3. Course Syllabus

Theory

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides, TE mode analysis, Expressions for Fields, Cut-off Frequencies,

Dominant and Degenerate Modes, Mode Characteristics, Phase and Group Velocities, Wavelengths and Impedance Relations Related Problems Rectangular Guide- Power Transmission. Impossibility of TEM mode. Related Problems.

WAVEGUIDE COMPONENTS AND APPLICATIONS: Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee, Hybrid Ring; Directional Couplers. Related Problems Ferrites– Composition and Characteristics, Faraday Rotation; Ferrite Components – Gyrator, Isolator, Circulator. Scattering Matrix– Significance, Formulation and Properties. S Matrix Calculations for –Magic Tee, Directional Coupler, Circulator and Isolator. Related Problems.

MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. **O-Type tubes**: Introduction and classification, HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), **M-Type Tubes:** Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron.

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Gunn Oscillation Modes. LSA mode, Introduction and Classification ofAvalanche Transit Time Diodes. Related Problems.

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement usingBolometers, Measurement of Attenuation, Frequency, measurement of low and High VSWR, Introduction to Network analyser, Related Problems.

4. Books and Materials

Text Book:

1. M. Kulkarni (2009), Micro Wave and Radar Engineering, 4thEdition Umesh Publications, New Delhi.

Reference Books:

1. Samuel Y. Liao (2000), Microwave Devices and Circuits, 3rd edition, Prentice Hall of India, New Delhi.
2. Herbert J. Reich, J. G. Skalnik, P. F. Ordung, H. L. Krauss (2004), Microwave Principles, CBS Publishers, New Delhi, India.
3. R. E. Collin (2002), Foundations for Microwave Engineering, 2nd edition, IEEE Press, John Wiley, India.
4. M. L. Sisodia, G. S. Raghuvanshi (1995), Microwave Circuits and Passive Devices, Wiley Eastern Ltd., New Age International Publishers Ltd.

III B.TECH II SEMESTER

COURSE STRUCTURE
A4020 - PRODUCT REALIZATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

The accelerating demand for rapid product design and manufacturing, calls for constant technological innovation. The art of launching latest technological concepts and creating better products for future is achieved by strong Engineering judgment. Current research in this area includes lean product development, integration of knowledge and learning into design through product realization and rapid prototyping. In a similar note an initiative is taken to further explore and implement concepts like product realization and concurrent engineering1 Design and manufacturing tasks are central to mechanical engineering as these experiences begin in the freshman year and last until a real world component is designed and manufactured at a senior level. This process introduces the students to the concept of problems having more than one valid solution and to methods for generating parametric solutions to problems 2. Thus, a curriculum that provides a base for future professional growth is highlighted and enhanced by launching a ”learning laboratory”, or “research laboratory”, with state-of-the-art rapid prototyping and experimental stress analysis devices 4.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4020.1. Interpret the specifications of product and solve it for Practical realization
A4020.2. Analyze the Costumers mindset and accordingly designing of the product.
A4020.3. Applying Gantt Charts to define timeline for Product Realization.
A4020.4. Conceptualize the terms called Product, Purchase, Production and Monitoring of products.
A4020.5. Communicate the process of converting an idea to physical Product

3. Course Syllabus

Practice

Module 1 **Introduction to Product Realization:**
Introduction to Product Realization, Need for Product Realization, Product realization process, Case Study of Product Realization for Global Opportunities

Module 2 **Planning of Product Realization:**
Plan and develop the processes needed for product realization, Defining Quality objectives and requirements, establish processes documents. Needs - verification, validation, monitoring inspection and test activities (inspection nodes) and criteria for product acceptance and record needed. Case study on timeline of Product realization planning (Gnatt Chart)

Module 3 **Customer-Related Processes:**
Product information Enquiries, contracts or order handling Customer feedback including customer complaints, A field survey

Module 4 **Design and Development:**
Review verification and validation of each design and development stages, Functional and performance requirements, Information for purchasing, production and service provisions, review and validation, Develop a Design model of the product.

Module 5 **Purchasing, Production and Service Provision:**
Purchasing information, Vendors evaluation and approval process, Verification of purchased product. Control of production, service provision, validation of processes for production and service provision, Identification and tractability, Customer property and Preservation of product.

Module 6 **Control of Monitoring and Measuring Equipment:**
Monitoring and measurements - Calibrated or verified, Adjusted or re-adjusted, Identified to determined the calibration status, Safeguarded from adjustment and Protection from change and deterioration

Module 7 **Regulatory Investigation & Identification:**
Various regulatory bodies, roles and responsibilities, model of comprehensive document for the body of information about an investigational product

4. Laboratory Equipment/Software/Tools Required

1. Introducing oneself to the steps of Product realization
2. Case Study to define the necessity
3. Group Formation Activity
4. Brainstorming Session on Product Realization in teams
5. Watching a videos on Planning of product realization in real time scenario from R Labs
6. Verification of the Product specifications which satisfies all the needs
7. Discussion with Customers about the product and the specifications
8. Discussion about the finished product and taking feedback.
9. Feedback Analysis and redesign if required.
10. Verification of redesigned product and market study.
11. Discussion on different Purchasing and Services for the product development.
12. Data from the customer for market and feedback of market is acquired.

13. Activity on Observation skills to know how to use one's observation skills in understanding the parameters
14. BrainstormingDeliberations on the initial observations and measuring of the product
15. Familiarization of the respective templates with the help of sample case study

5. Books and Materials

Text Books:

1. Mileta M Tomovic, Sowping Wang, Product Realization – A Comprehensive Approach, Spinger.
2. Stark, John, Product Life Cycle Management, 21st centaury Paradigm for Product Realisation 2011, Springer

Reference Books:

1. Verna J. Bowen, Lucy V. Fusco, The Competitive Edge Research Priorities for U.S. Manufacturing, National Academy of Sciences.
2. Renuka Thota, Suren Dwivedi, Implementation of product realization concepts in design and manufacturing courses, University of Louisiana-Lafayette

III B.TECH II SEMESTER

COURSE STRUCTURE
A4016 - INDIAN CONSTITUTION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	0	100	100

1. Course Description

Course Overview

This course enables the students to understand the constitution of India as the Supreme law of India. The student will also gain knowledge about the parliament of India and how it functions. This course will survey the basic structure and operative dimensions of the Indian constitution. It will explore various aspects of the Indian political and legal system from a historical perspective highlighting the various events that led to the making of the Indian constitution.

Course Pre/co-requisites

This course facilitates graduate students to know about importance of the Indian constitution and facilitates students to know about the fundamental rights of the citizens.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4016.1 Identify the important components of Indian Constitution.
A4016.2 Apply the fundamental rights in right way and become a more responsible citizen.
A4016.3 Illustrate the evolution of Indian Constitution.
A4016.4 Explain the basic structure of Indian Constitution.
A4016.5 Define the basic concepts democracy, liberty, equality, secular and justice.

3. Course Syllabus

Evolution of Indian constitution: Indian independence act 1947, formation of constituent assembly of India, committees of the constituent assembly, constitution of India drafting committee, brief study about Dr. *B. R. Ambedkar, time line of formation of the constitution of India.*

Structure of the constitution of India: Parts, schedules, appendices, constitution and government, constitution and judiciary.

Preamble to the constitution of India: Brief study about sovereignty, socialist, secularism, democracy, republic, justice (political justice, social justice, economic justice), liberty, equality, fraternity, unity & integrity.

Acts: Right to education act, right to information act, anti-defection law, Jan Lokpal bill.

Fundamental rights: Right to equality, right to freedom (freedom of speech and expression, right to practice any profession etc.), right against exploitation, right to freedom of religion, cultural & education rights, right to property, right to constitutional remedies.

4. Books and Materials

Text Books::

1. Dr. Durga das basu. Introduction to the constitution of India. 21st edition, Lexis Nexis books publication Ltd, 2013.

Reference Books::

1. Subhash C. Kashyap, Our Constitution, National Book Trust, New Delhi, 2011.
2. Arun K Thiruvengadam. The constitution of India. 1st edition, Hart publishing India, 2017.

Syllabi for IV Year I Semester

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IV B.TECH I SEMESTER

COURSE STRUCTURE

A4418 - INTERNET OF THINGS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

The course introduces you to advance concepts and design methodologies to design IoT systems and developing IoT applications programming languages and tools optimized for IoT domain. It also exposes participants to communication technologies and legacy protocols as well as newly developed IoT specific application and physical layer protocols. The course covers python languages in great detail with set of packages which makes it obvious choice as a leading IoT language.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4418.1. Identify the basic building blocks of IoT and its characteristics

A4418.2. Determine the most appropriate IoT Devices and Sensors based on Application

A4418.3. Utilize Python standard libraries for implementing various IoT Applications

A4418.4. Analyze the appropriate protocol for communication between Devices

3. Course Syllabus

Theory

Internet of Things: Introduction, Architecture and IoT Growth, Application Areas, Characteristics, Things in IoT,IoT Stack, Enabling Technologies, IoT Challenges, IoT Levels, Is Cyber Physical System same as IoT; WSN same as IoT;

Introduction to Python: Language features of Python, Data types& data structures, Control of flow, Functions, Modules, Packages, File Handling, Data/Time operations, Classes

Sensors and Their Interfacing: Interfacing: Gas Sensor Interfacing with Node MCU, Obstacle Sensor, Heartbeat Sensor, Ultrasonic Sound Sensor, Gyro Sensor, LDR Sensor, GPS, Colour Sensor, pH Sensor

Protocols for IoT-Messaging and Transport

Messaging protocols: MQTT, CoAP
Transport Protocols: Bluetooth Low Energy(BLE),Light Fidelity(Li-Fi)
Protocols for IoT- Addressing and Identification
Addressing: IPv4, IPv6
Identification: Uniform Resource Identifier (URI)

Cloud for IoT: IoT with Cloud-Challenges, Selection of Cloud Service Provider for IoT Applications, Fog Computing, Cloud Computing: Security Aspects, Case Study: How to use Adafruit Cloud?
Case Studies: Smart Cities and Smart Homes

PRACTICE

1. Write a Python program which accepts the radius of a circle from the user and compute the area.
2. Write a Python program that asks the user for seven numbers. Then print the total, the number of positive entries, the number entries equal to zero, and the number of negative entries.
3. Create a program that asks the user for a temperature in Fahrenheit, and then prints the temperature in Celsius. Search the internet for the correct calculation
4. Create a program that will ask the user for the information needed to find the area of a trapezoid, and then print the area
5. Write a single program in Python that will print the following:
   10
   11 12
   13 14 15
   16 17 18 19
   20 21 22 23 24
   25 26 27 28 29 30
   31 32 33 34 35 36 37
   38 39 40 41 42 43 44 45
   46 47 48 49 50 51 52 53 54
6. Write a Python program which accepts a sequence of comma-separated numbers from user and generate a list and a tuple with those numbers.
7. Write a Python program to calculate number of days between two dates
8. Write a Python code to swap the values
9. Gas Sensor Interfacing
10. Obstacle Sensor Interfacing
11. Ultrasonic Sensor Interfacing
12. LDR Sensor Interfacing
13. GPS Interfacing
14. pH Sensor Interfacing

4. Laboratory Equipment/Software/Tools Required

1. Python Software
2. Various Sensors
3. Microcontroller Boards
4. Cloud

5. Books and Materials

Text Books:

1. Shriram K Vasudevan,Abhishek S Nagarajan,RMD Sundaram:*Internet of Things*, Wiley Publishers,2019.
2. ArshdeepBahga and Vijay Madisetti: *Internet of Things,A Hands-on Approach*; University Press, 2016.

Reference Books:

1. Getting Started with Raspberry Pi:Matt Richardson & Shawn Wallace,O'Reilly (SPD),2014

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IV B.TECH I SEMESTER

COURSE STRUCTURE

A4419 - CELLULAR AND MOBILE COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	2	28	0	28	3	30	70	100

1. Course Description

Course Overview

This course is intended to stress the fundamentals of mobile communications engineering that are important to any mobile communication system. It introduces cellular mobile radio systems, performance criteria, design, operations and various generations of cellular systems. It covers various types of interferences in mobile radio environment. This course describes cell coverage for signal and traffic, signal reflections in various terrains, various cell sites and mobile antennas and their analysis. This course explains different frequency management and channel assignment techniques. This course also deals with handoff, dropped calls and cell splitting. It gives an overview of digital cellular networks like GSM, CDMA and next generation cellular technologies.

Course Pre/co requisites

1. Digital Communications (A4410)
2. Computer Communication Networks (A4453)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4419.1. Apply the concepts of cellular and mobile communications to increase the system capacity

A4419.2. Compare different methods for reducing the interference in a cellular communication system.

A4419.3. Analyze various mobile radio propagation models and antennas for cell site and mobile unit.

A4419.4. Categorize different channel assignment strategies and handoffs to achieve efficient spectrum utilization.

A4419.5. Examine the technical features of emerging cellular communication systems.

3. Course Syllabus

Theory

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, Why Cellular Mobile Telephone Systems, History Of 800MHz Spectrum Allocation, Trunking Efficiency, A Basic Cellular System, Performance Criteria, Uniqueness of Mobile Radio Environment, Operation of Cellular System.

ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN: General Description of The Problem, Concept of Frequency Channels, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni-directional Antenna System, Handoff Mechanism, Cell Splitting, Consideration of the Components of Cellular System.

INTERFERENCE: Co-Channel Interference, Exploring Co-Channel Interference areas in a system, Real Time Co-Channel Interference Measurement at mobile radio transceivers, Design of an Omni Directional Antenna System in the worst case, Design of a Directional Antenna System, Lowering the Antenna height, Umbrella Pattern Effect, Use of Parasitic Elements, Power Control, Diversity Receiver
NON CO-CHANNEL INTERFERENCE: Adjacent-channel interference, near-end-far-end interference, effect on near-end mobile units, cross talk, effects on coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell-site components, Interference between systems, UHF-TV Interference, long-distance interference.

CELL COVERAGE FOR SIGNAL AND TRAFFIC: General Introduction, Obtaining the Mobile Point-to-Point Model (Lee Model), Propagation over Water or Flat Open Area, Foliage Loss, Propagation in Near-in Distance, Long –Distance Propagation, Form of a Point-to-Point model, Merits of the point-to-point model.
CELL SITE AND MOBILE ANTENNAS: Antennas at Cell Site, Omni-directional Antennas, Directional Antennas for Interference Reduction, Unique Situations of Cell-Site Antennas, Mobile Antennas.
FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Frequency Management, Frequency – Spectrum Utilization, Set-up Channels, Channel Assignments to Cell Sites and Mobile Units, Fixed Channel Assignment, Adjacent Channel Assignment, Channel Sharing and Borrowing, Sectorization, Underlay-Overlay arrangement, Non fixed Channel Assignment Algorithms.
HANDOFF: Value of Implementing Handoffs, Why handoffs, Types of Handoff, Initiation of a Handoff, Delaying a Handoff, Forced Handoffs, Queuing of Handoffs, Power-Difference Handoffs, Mobile Assisted Handoff(MAHO) and Soft Handoff, Cell-Site Handoff, Intersystem Handoff.

DIGITAL CELLULAR NETWORKS: GSM- Architecture, Channels, Multiple-access scheme, Radio resource management, Mobility management, Communication management, Network management, North American TDMA-History, Architecture, CDMA.
NEXT GENERATION CELLULAR TECHNOLOGY: Introduction, 4G evolution, objectives of the projected 4G, Advantages of 4G network technology over 3G, Applications of 4G, 4G technologies, Smart antenna techniques, 4G software, Limitations of 4G, New technologies in cellular data networks.

Practice

1. Understand the Basic circuit of Mobile phone
2. Understand the concept of cellular frequency reuse, sectoring and handoff mechanism.
3. Analysis of relation between bit rate, symbol rate and chip rate.

4. Study of DSSS technique for CDMA, observe effect of variation of types of PN codes, chip rate, spreading factor, processing gain on performance.
5. Bit Error Rate Measurement of DSSS CDMA
6. Analyze the 3G Communication System
7. Analyze the AT commands of 4G LTE Smart Phone
8. Study and analyze the Buzzer in 4G LTE Smart Phone
9. Study and analyze the Vibrator in 4G LTE Smart Phone

4. Laboratory Equipment/Software/Tools Required

1. MATLAB/SIMULINK,
2. Scientek 2139 Kit,
3. Scientek 2131B kit

5. Books and Materials

Text Books:

1. William C. Y. Lee (2006), *Mobile Cellular Telecommunications*, 2nd edition, Tata McGraw Hill, India.
2. GottapuSasibhushana Rao (2012), *Mobile Cellular Communications*, Pearson education, India.

Reference Books:

1. Theodore S. Rappaport (2002), *Wireless Communications*, 2nd edition, Pearson education, India.
2. T.L.Singal (2010), *WirelessCommunication*, Springer International, McGraw Hill, New Delhi. India.
3. Erik Dahlman, Stefan Parkvall, and Johan Sköld (2011), *4G: LTE/LTE-Advanced for Mobile Broadband*, Elsevier.

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IV B.TECH I SEMESTER

COURSE STRUCTURE

A4459 - MIXED SIGNAL VLSI DESIGN

(PROFESSIONAL ELECTIVE - III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course deals with the analysis and design of analog CMOS integrated circuits. It emphasizes on fundamentals of analog design that students need at industry level. The course deals with the operation of various amplifiers and mixed signal circuits.

Course Pre/co requisites

1. Low Power VLSI Design (A4455)

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4459.1. Apply the small signal models of MOSFET based circuits to design CMOS amplifiers for a given specifications.

A4459.2. Analyze the operation of various CMOS amplifiers, OP-AMP, Current mirrors

A4459.3. Evaluate the performance metrics of various amplifiers.

A4459.4. Analyze the working of mixed mode circuits such as ADCs, DACs, PLL.

3. Course Syllabus

CMOS Amplifiers: Common source stage with diode connected load and current source load, CS stage with source degeneration, CG stage and Source Follower (Only Voltage Gain and Output impedance of circuits), Folded Cascode stage.

Current Mirrors: Basic circuit, PMOS and NMOS current mirrors, Cascode and Active current mirror circuits.

Differential Amplifiers: Basic Differential Pair, Common Mode Response, Differential Pair with MOS Loads.

Frequency Response of Amplifiers: Miller Effect, Association of poles with Nodes, Common source stage, Cascode stage, Differential Pair.

CMOS OP-AMPS: Single stage Op-Amps, Two- stage Op-Amps, Performance Parameters - Gain Boosting, Input Range Limitations, Slew Rate, PSRR, Noise.

Stability and Frequency Compensation: Multipole Systems, Phase Margin, Frequency Compensation, Compensation of Two-stage Op Amps.
Switched-Capacitor Circuits: Sampling Switches, Switched-Capacitor Amplifiers, Switched-Capacitor Integrator.
Phase-Locked Loops: Simple PLL, Charge-Pump PLLs, Nonideal Effects in PLLs, Applications.

Data Converter Fundamentals: Sample and Hold Circuits, Digital-to-Analog Converter Specifications, Analog -to-Digital Converter Specifications.
Data Converter Architectures: DAC Architectures- Resistor String, Charge Scaling and Pipeline types, ADC Architectures- Flash, Pipeline ADC, Successive Approximation ADC.

4. Books and Materials

Text Books:

1. Razavi B., Design of Analog CMOS Integrated Circuits, Mc Graw Hill, 2001.
2. Baker, Li, Boyce, CMOS: Circuits Design, Layout and Simulation, Prentice Hall India, 2000.

Reference Books:

1. Razavi B., Fundamentals of Microelectronics, Wiley student Edition2014.
2. Phillip E. Allen, Douglas R. Holbery, CMOS Analog Circuit Design, Oxford, 2004.

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IV B.TECH I SEMESTER

COURSE STRUCTURE

A4460 - ARTIFICIAL INTELLIGENCE WITH DEEP LEARNING

(PROFESSIONAL ELECTIVE - III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course will enable to acquire the knowledge on artificial intelligence and deep Learning concepts along with basics of Machine Learning. Essential concepts like knowledge representation, Intelligent Systems, and Intelligent Agents, Regularization for Deep Learning, Optimization for Deep Learning, Recurrent and Recursive Nets will be discussed.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4460.1. Understand the basic concepts of Artificial Intelligence and Machine Learning

A4460.2. Identify an efficient algorithm for Deep Models

A4460.3. Apply optimization strategies for large scale applications

A4460.4. Develop the relations among Artificial Intelligence, Machine Learning and Deep Learning

A4460.5. Analyze state of the art Deep Convolutional Neural Networks Structures

3. Course Syllabus

Artificial Intelligence:

Introduction to AI, Applications of AI, History of AI, Types of AI, Intelligent Systems, and Intelligent Agents:Agents and Environments, rationality, structure of agents, Problem Solving, Knowledge representation.

Machine Learning Principles:

Components of ML, Loss Function, Learning Algorithms, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning. Feature Learning: Dimensionality Reduction, PCA, LDA.

Deep Learning Review: Review of Deep Learning, Multi-layer Perceptron, Back propagation, Deep Feed forward Networks: Gradient-Based Learning,Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

Regularization for Deep Learning: Parameter Norm Penalties, Regularization and Under-Constrained Problems, Semi-Supervised Learning, Multi-Task Learning, Sparse Representations.

Optimization for Training Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Optimization Strategies and Meta-Algorithms.

Convolutional Networks: The Convolution Operation, Variants of the Basic Convolution Function, Efficient Convolution Algorithms, Unsupervised Features, Convolutional Networks and the History of Deep Learning.

Recurrent and Recursive Nets:

Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks.

Deep Convolutional Neural Networks Structures: AlexNet, VGGnet, GoogleLeNet, ResNet, DenseNet.

4. Books and Materials

Text Books:

1. Stuart J. Russell and Peter Norvig, (2010), Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson Education.
2. Ian Goodfellow, YoshuaBengio, Aaron Courville (2016), Deep Learning, the MIT Press, London.

Reference Books:

1. Artificial Intelligence, Shivani Goel, Pearson Education.
2. Artificial Intelligence and Expert systems – Patterson, Pearson Education.
3. EthernAlpaydin, Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005.
4. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

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IV B.TECH I SEMESTER

COURSE STRUCTURE

A4461 - DSP PROCESSORS AND ARCHITECTURES

(PROFESSIONAL ELECTIVE - III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

It gives the knowledge about the processing of digital signal and their application in the present communication world. It also gives knowledge about different transforms used to represent the signal in frequency domain for analysis and Design tools for DSP systems using MATLAB. It helps us to learn the process to implement DSP systems with accuracy and understand Architectures for programmable devices. Allow the students to study the detailed architecture of TMS 320C54XX, Implementation of BASIC DSP algorithms, FFT algorithms and interfacing memory and I/O peripherals to programmable DSP devices.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4461.1. Analyze the effects of quantization and aliasing in a real-time DSP system.

A4461.2. Apply the fundamentals of controllers to investigate existing TMS processors design.

A4461.3. Develop basic DSP algorithms using DSP processors

A4461.4. Integrate basic peripherals to DSP Processors.

3. Course Syllabus

INTORODUCTION TO DIGITAL SIGNAL PROCESING: Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors.

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address

Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.
IMPLEMENTATION OF FFT ALGORITHMS: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

4. Books and Materials

Text Books:

1. Avtar Singh and S. Srinivasan (2006), *Digital Signal Processing*, Thomson Publication, India.
2. Phil Lapsley Jeff Bier, Amit Shoham, Edward A.Lee (2010),*DSP Processor Fundamentals, Architectures & Features*, John Wiley & Sons, India.

Reference Books:

1. B. Venkata Ramani and M. Bhaskar(2004),*Digital Signal Processors, Architecture, Programming and Applications*, Tata McGraw-Hill, New Delhi.
2. Jonatham Stein(2005),*Digital Signal Processing*, John Wiley, India.
3. Emmaneul C Ifeachor, Barrie W Jrevis, *Digital Signal Processing*, Pearson Education.

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IV B.TECH I SEMESTER

COURSE STRUCTURE

A4462 - ADVANCED COMMUNICATIONS

(PROFESSIONAL ELECTIVE - III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces to the students to know the basic fundamentals of optical, microwave, satellite and radar Communications and its real time applications in the present and forthcoming days. The concepts of cellular telephone systems and satellite launching mechanism deals with transfer of information globally with the help of satellites and using GSM, LTE configurations. The radar range equation in its many forms is developed and applied to different situations. Radar transmitters, antennas, and receivers are covered. The fundamentals of radar target detection in presence of a noise background are discussed.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4462.1. Analyze the three types of optical fiber configurations: single-mode step index, multimode step index, and multimode graded index

A4462.2. Contrast frequency modulation with amplitude modulation microwave

A4462.3. Analyze the location of satellite using orbital mechanics and launching procedures. Classify different satellite subsystems and identify the impact of subsystems on communication services

A4462.4. Classify pulsed and continuous types of radars Doppler Effect and the concepts of continuous wave radars

A4462.5. Examine the various methods of MTI and tracking radar and how it is applicable to radar systems

3. Course Syllabus

Optical Fiber Transmission Media

Introduction, History of Optical Fiber Communications, Optical Fibers versus Metallic Cable Facilities, Electromagnetic Spectrum, Block Diagram of an Optical Fiber Communications System ,Optical Fiber

Types, Light Propagation , Optical Fiber Configurations, Optical Fiber Classifications, Losses in Optical Fiber Cables, Light Sources, Optical Sources, Light Detectors, Lasers, Optical Fiber System Link Budget

Microwave Radio Communications and System Gain

Introduction, Advantages and Disadvantages of Microwave Radio, Analog versus Digital Microwave, Frequency versus Amplitude Modulation, Frequency-Modulated Microwave Radio System, FM Microwave Radio Repeater, Diversity, Protection Switching Arrangements, FM Microwave Radio Stations, Microwave Repeater Station, Path Characteristics, Microwave Radio System Gain.

Cellular Telephone Systems

Introduction, First-Generation Analog Cellular Telephone, Personal Communications System, Second-Generation Cellular Telephone Systems, N-AMPS , Digital Cellular Telephone, Interim Standard 95 (IS-95), North American Cellular and PCS Summary, Global System for Mobile Communications, Personal Satellite Communications System, Overview of 4G, 5G Mobile networks.

Satellite Communications

Introduction, History of Satellites, Kepler's Laws, Satellite Orbits, Geosynchronous Satellites, Antenna Look Angles, Satellite Classifications, Spacing, and Frequency Allocation, Satellite Antenna Radiation Patterns: Footprints, Satellite System Link Models, Satellite System Parameters, Satellite System Link Equations, Link Budget, Applications of Satellite communications like GPS, VSAT Networks.

RADAR Systems: The Nature of Radar, Maximum unambiguous range, Radar waveforms, Simple form of Radar equation, Radar block diagram & Operation, Radar frequencies and applications, Related Problems.RADAR EQUATION: Prediction of Range performance, Minimum detectable signal, Receiver Noise & SNR, Integration of Radar pulses, PRF & Range Ambiguities, System losses, Related ProblemsMTI AND PULSE DOPPLER RADAR: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter.

4. Books and Materials

Text Books:

1. Wayne Tomasi(2014), *Advanced Electronic Communications Systems*, Sixth Edition, Pearson new International edition.
2. Merill I. Skolnik (2007), *Introduction to Radar Systems*, 2nd edition, Tata McGraw- Hill,India.

Reference Books:

1. Timothy Pratt (2003), *Satellite Communications*, 2nd edition, Wiley Publications, India.
2. M. Richharia (2003), *Satellite Communications*: Design Principles, 2nd edition, BS publications, India.
3. Dennis Roddy (2006), *Satellite Communications*, 2nd edition, Tata McGraw-Hill, India.
4. John. D. Kraus (2007), *Electromagnetics*, 6th edition, McGraw Hill, New Delhi.

SYLLABI FOR IV YEAR II SEMESTER

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IV B.TECH II SEMESTER

COURSE STRUNCTURE

A4463 - VLSI PHYSICAL DESIGN AUTOMATION

(PROFESSIONAL ELECTIVE - IV)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course will enable in comprehending the distinctive algorithms at the various levels of the VLSI Physical Design process and its importance in the optimization of Real Time IC fabrications.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4463.1. Identify the Physical Design algorithm and its influence in VLSI design technology

A4463.2. Distinguish the large mapping problem that are bifurcated, including logic optimization with partitioning, placement and routing of ICs.

A4463.3. Apply the design algorithms to meet the critical design parameters at the different level of VLSI physical design process.

A4463.4. Analyze the various design constraints in Physical design automation of VLSI circuits.

A4463.5. Evaluate the performance of Physical design algorithms.

3. Course Syllabus

VLSI Physical Design Automation: VLSI Design Cycle, Physical Design Cycle

Graph Search Algorithms: Terminology, Data structures for Representation of Graphs, Breadth First Search, Depth First Search, Topological Sort, Spanning Tree Algorithm – Prim's Algorithm

Shortest Path Algorithms: Dijkstra's Algorithm for single pair Shortest path, Floyd-Warshall Algorithm for All pair Shortest path.

High-level Synthesis: Hardware Models for High-Level Synthesis, Allocation, Assignment and Scheduling - ASAP Scheduling.

Compaction: Problem Formulation, Longest Path Algorithm for DAGs – without cycles and with cycles, Liao-Wong Algorithm, Bellman-Ford Algorithm.

Partitioning: Kernighan-Lin Partitioning Algorithm, Fiduccia- Mattheyses Algorithm.
Floor planning: Floor plan Representation, Shape Functions, Floor plan Sizing, Stockmeyer algorithm for floor planning.

Placement: Circuit Representation, Wire-length Estimation, Placement Algorithms – Simulated annealing, Constructive Placement, Iterative Improvement.

Global Routing: Maze Routing Algorithm – Lee's Algorithm, Line-Probe algorithm, Shortest Path Based Algorithm.
Local Routing: Area Routing, Channel Routing – Channel Routing Models, Vertical and Horizontal Constraint Graph, Left-edge Algorithm, Robust Channel Routing Algorithm.

4. Books and Materials

Text Books:

1. Gerez,Sabih H (2006), *Algorithms for VLSI Design Automation*, John Wiley & Sons.
2. Sherwani, Naveed A (1999), *Algorithms for VLSI Physical Design Automation*, Kluwer Academic Publishers.

Reference Books:

1. Sarrafzadeh, M. and Wong, C.K, "*An Introduction to VLSI Physical Design*", 4th Edition, Mc Graw-Hill
2. Wolf. W, "*Modern VLSI Design System on Silicon*", 2nd Ed., Pearson Education.
3. Dreschler, "*Evolutionary Algorithms for VLSI CAD*", 3rd Edition, Springer
4. Trimberger, Stephen M., "*An Introduction to CAD for VLSI*", Springer Science & Business Media, 1987.
5. Sadiq M. Sait and H. Youssef, "*VLSI Physical Design Automation: Theory and Practice*", World Scientific, 1999.
6. Cormen, Thomas H., Charles E. Leiserson, and Ronald L. Rivest. "*Introduction to Algorithms*." The MIT Press, 3rd edition, 2009.

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IV B.TECH II SEMESTER

COURSE STRUNCTURE

A4464 - EMBEDDED NETWORKING

(PROFESSIONAL ELECTIVE - IV)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course covers the protocols and technologies available for networking the embedded systems. This course will help the students to work on real time challenges in the area of networked embedded systems.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4464.1. Compare the various serial and parallel communication protocol.

A4464.2. Implement the concepts of USB & CAN bus.

A4464.3. Apply the basics of Ethernet communication to implement network of Embedded Systems.

A4464.4. Explain the concepts of Embedded Ethernet

A4464.5. Identify the need for wireless protocols to indulge in Real world interfacing.

3. Course Syllabus

EMBEDDED COMMUNICATION PROTOCOLS: Introduction, Serial/Parallel communication: Serial communication protocols -RS232 standard – RS485, – Synchronous Serial Protocols: Serial Peripheral Interface (SPI), Inter Integrated Circuits (I2C), PC Parallel port programming, ISA/PCI Bus protocols, Fire wire.

USB AND CAN BUS: USB bus: Introduction – Speed Identification on the bus – USB States, USB bus communication: Packets –Data flow types, A simple application with USB: Inkjet printer, CAN Bus:– Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing –CAN Interface –A simple application with CAN: Telephone exchange.

ETHERNET BASICS: Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables, Connections and network speed – Design choices: Selecting components –Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol.

EMBEDDED ETHERNET: Exchanging messages using UDP and TCP, Serving web pages with Dynamic Data, Serving web pages that respond to user Input, Email for Embedded Systems, Using FTP, Keeping Devices and Network secure.

WIRELESS EMBEDDED NETWORKING: Wireless sensor networks: Introduction – Applications – Network Topology – Localization –Time Synchronization, Energy efficient MAC protocols: SMAC, Energy efficient and robust routing, Data Centric routing.

4. Books and Materials

Text Books:

1. GlafP.Feiffer, Andrew Ayre and Christian Keyold, "Embedded networking with CAN andCAN open", Embedded System Academy
2. Bhaskar Krishnamachari, 'Networking wireless sensors', Cambridge press 2005.

Reference Books:

1. Jan Axelson, 'Parallel Port Complete', Penram publications
2. A.L.Crouch, "Design Test for Digital IC's and Embedded Core Systems", Prentice Hall International, 2002.
3. Frank Vahid, Givargis 'Embedded Systems Design: A Unified Hardware/SoftwareIntroduction', Wiley Publications.
4. Herma K., "Real Time Systems – Design for distributed Embedded Applications", Kluwer Academic, 1997.
5. Jan Axelson 'Embedded Ethernet and Internet Complete', Penram publications.

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IV B.TECH II SEMESTER

COURSE STRUNCTURE

A4465 - BIO MEDICAL INSTRUMENTATION

(PROFESSIONAL ELECTIVE - IV)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course is designed to give the basic concepts of Instrumentation involved in medical field and human physiology. Biomedical Instrumentation is application of technology for Medical field. During the course, students will explore Electro- physiological measurements, medical imaging etc. The course will make the students understand the devices used in diagnosing the diseases.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4465.1. Analyze the physiology of biomedical system.

A4465.2. Measure biomedical and physiological information like ECG,EEG,EMG and ERG

A4465.3. Measure non-electrical biomedical parameters

A4465.4. Analyze the operation of various types of imaging techniques and operation of assisting and therapeutic equipment

3. Course Syllabus

Physiology and transducers: Cell and its structure, Resting and Action Potential, Nervous system: Functional organization of the nervous system, Structure of nervous system, neurons, synapse, transmitters and neural communication, Cardiovascular system, respiratory system, Basic components of a biomedical system, Transducers, selection criteria, Piezo-electric, ultrasonic transducers, Fiber optic temperature sensors.

Electro – Physiological measurements: Electrodes: Limb electrodes, floating electrodes, pre-gelled disposable electrodes, Micro, needle and surface electrodes, Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers, Isolation amplifier. ECG, EEG, EMG, ERG, Lead systems and recording methods, Typical waveforms. Electrical safety in medical environment: shock hazards, leakage current-Instruments for checking safety parameters of biomedical equipment

Non-electrical parameter measurements: Measurement of blood pressure, Cardiac output, Heart rate, Heart sound, Pulmonary function measurements, spirometer, Photo Plethysmography, Body Plethysmography, Blood Gas analyzers: pH of blood, measurement of blood pCO2, pO2, finger-tip oximeter, ESR, GSR, measurements.

Medical Imaging: Radiographic and fluoroscopic techniques, X rays, Computer tomography, MRI, Ultrasonography, Endoscopy, Different types of biotelemetry systems and patientmonitoring

Assisting and therapeutic equipment's: Pacemakers, Defibrillators, Ventilators, Nerve and muscle stimulators, Diathermy, Heart Lung machine, Audio meters, Dialyzers, Lithotripsy.

4. Books and Materials

Text Books:

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd.,2003.
2. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003

Reference Books:

1. LeslieCromwell,FredJ.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 /PHI.
2. J.Webster, 'Medical Instrumentation', John Wiley & Sons,1995.
3. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley

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IV B.TECH II SEMESTER

COURSE STRUNCTURE

A4466 - WIRELESS COMMUNICATIONS AND NETWORKS

(PROFESSIONAL ELECTIVE - IV)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Wireless communications and networks have become ubiquitous technologies in the past couple of decades. The objective of this course is to give an introduction to the fundamentals of the wireless communications systems, the wireless network architectures, protocols, and applications. This course covers the basic principles of wireless communications and wireless network architectures. Topics of study include an overview of wireless communication systems, spread-spectrum modulation for wireless systems, Wireless Application Protocol, 4G and 5G technologies, multiple access techniques, and wireless networking standards (e.g., 2.5G, 3G, 4G, 5G, IEEE 802.11, 802.15 and IEEE 802.16).

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4466.1. Apply the knowledge of various systems, techniques and technologies for effective wireless communication.

A4466.2. Analyze the different types of protocols and standards for the enhancement (development) of wireless networking.

A4466.3. Make use of various design considerations to utilize the spectrum effectively.

A4466.4. Identify the ways for data transfer to achieve higher data rates in wireless networks.

3. Course Syllabus

INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS: Evolution of mobile radio communications, examples of wireless communication systems-paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems.

MODERN WIRELESS COMMUNICATION SYSTEMS: Historical Trend of Wireless Communications, Evolution of LTE Technology to Beyond 4G,5G Roadmap,10 Pillars of 5G.

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction, FDMA, TDMA, spread spectrum multiple access, FH-CDMA, DS-CDMA, SDMA, packet radio, packet radio protocols, CSMA protocols, reservation protocols, capacity of cellular systems.

RADIO PROPAGATION AND PROPAGATION PATH-LOSS MODELS: Introduction, Free-Space Attenuation, Attenuation over Reflecting Surface, Effect of Earth's Curvature, Radio Wave Propagation, Characteristics of a Wireless Channel: Multipath Delay Spread, Coherence Bandwidth, and Coherence Time, Signal Fading Statistics: Rician Distribution, Rayleigh Distribution, Lognormal Distribution, Propagation Path-Loss Models: Okumura/Hata Model, Indoor Path-Loss Models, Fade Margin, Link Margin.

WIRELESS COMMUNICATION SYSTEMS AND TECHNOLOGIES: Introduction, Features and challenges, applications, 4G technologies: Multicarrier modulation, smart antenna techniques, OFDM – MIMO systems, Adaptive modulation and coding with time slot scheduler, BLAST system, SDR and cognitive radio.
Wireless Application Protocol: Introduction, WAP Programming Model, WAP Architecture, WAP Advantages and Disadvantages, Applications of WAP.

WIRELESS NETWORKS: Introduction to wireless networks, advantages and disadvantages of wireless local area networks, WLAN topologies, WLAN standard IEEE 802.11, IEEE 802.11 medium access control, comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, wireless PANs, Hipper LAN 2, WLL.

4. Books and Materials

Text Books:

1. Theodore S. Rappaport (2002), Wireless Communications - Principles Practice, 2nd edition, Prentice Hall of India, New Delhi.
2. Vijay K Garg (2010), Wireless Communication and Networking, Morgan Kaufmann Publishers.
3. Jonathan Rodriguez (2015), Fundamentals Of 5G Mobile Networks, John Wiley &Sons, Ltd

Reference Books:

1. William Stallings (2009), Wireless Communications and Networks, 2nd edition, Pearson Education, India.
2. Andrea Goldsmith (2005), Wireless Communications, Cambridge University Press.
3. Andreas F. Molisch (2006), Wireless Communications, Wiley – India, New Delhi

IV B.TECH II SEMESTER

COURSE STRUNCTURE

A4026 - MANAGEMENT SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Description

Course Overview

In this course, students will learn the fundamental concepts and contributions of Management. It also explains Inventory control techniques, Human Resource Practices, Quality control techniques and Project Management which plays a vital role in the organization.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4026.1. Explain and infer the concepts and aspects of management

A4026.2. Analyze the different organizational structures, plant layouts, work study tools for enhancement of productivity in an organization

A4026.3. Apply Inventory control and statistical quality control techniques for better management.

A4026.4. Use Human resource management techniques for better people management.

A4026.5. Apply the project management techniques to decide the optimum time and cost for completion of a project.

3. Course Syllabus

INTRODUCTION: Management - Definition, Nature, Importance of management, Functions of Management - Taylor's scientific management theory, Fayol's principles of management, Contribution of Elton mayo, Maslow, Herzberg, Douglas MC Gregor. Basic concepts of Organisation Authority, Responsibility, Delegation of Authority, Span of control, Departmentation and Decentralization - Organisation structures (Line organization, Line and staff organization, Functional organization, Committee organization, Matrix organization)

OPERATIONS MANAGEMENT: Plant location, Factors influencing location, Principles and types of plant layouts - Methods of production (job, batch and mass production), Work study - Basic procedure involved in method study and Work measurement.

QUALITY CONTROL AND MATERIALS MANAGEMENT: Statistical quality control – Meaning- Variables and attributes - X chart, R Chart, C Chart, P Chart, (simple Problems) Acceptance sampling, Sampling plans, Deming's contribution to quality. Materials management – objectives, Need for inventory control, Purchase procedure, Store records, EOQ, ABC analysis, Stock levels.

HUMAN RESOURCE MANAGEMENT (HRM): Concepts of HRM, Basic functions of HR manager: Man power planning, Recruitment, Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfers, Separation, performance appraisal, Job evaluation and Merit rating.

PROJECT MANAGEMENT: Early techniques in project management - Network analysis: Programme evaluation and review technique (PERT), Critical path method (CPM), Identifying critical path, Probability of completing project within given time, Project cost analysis, project crashing (simple problems).

4. Books and Materials

Text Books:

1. Koontz &weihrich – Essentials of management, TMH, 8th edition, 2010 .
2. O.P. Khana, Industrial engineering and Management, Dhanpat rai publication.

Reference Books:

1. Dr.A.R.Aryasri, Management Science, TMH, 4th edition, 2009.
2. Stoner,Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004.
3. L.S.Srinath, PERT & CPM , 3rd edition East-West press pvt. ltd.-New Delhi.

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OPEN ELECTIVE

COURSE STRUCTURE

A4131 - PROJECT PLANNING AND MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course will provide a general introduction to project management. This course covers key components of project management including project integration, project scope management, project time and cost management, quality management, human resource considerations, communications, and procurement management. Understand network techniques for Project planning, scheduling and Execution Control with limited resources.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4131. 1 Identify project characteristics and various phases of a project.
A4131. 2 Explain project organization, staffing and feasibility of projects.
A4131. 3 Apply the techniques of Project planning, scheduling and Execution Control.
A4131. 4 Analyse the role of stakeholders.
A4131. 5 Evaluate Resources, Budget, Claims and Disputes.

3. Course Syllabus

Project Management: Overview of Project Management, Concepts and Definitions. Project manager and his responsibilities. Types of projects, Various stages of projects, Organizational structures used in project management. Management Functions and staffing.
Project Planning: Time planning, Contents of Project plan, planning process, Work breakdown structure, process mapping. Project Budgeting: Financial Projections, time value of money, cost of capital, capital investment decisions.
Scheduling Techniques: Bar Charts, CPM & PERT: Time estimate- Optimistic time estimate, Most likely time estimate, Pessimistic time estimate & Expected time. Project Scheduling, Network Analysis, Cost-Time Analysis in Network Planning, Float - Total float, free float.
Monitoring and Controlling: Plan monitor control cycle, data collection and reporting, Project control. Working with stakeholders.

Conflict Management: claims and Disputes- Source of claim, Claim Management, Dispute resolution, Arbitration and its advantages, Project closure.

4. Books and Materials

Text Books:

1. Punmia B.C., Khandelwal K.K., Project *planning and control with PERT and CPM*, Fourth Edition, Laxmi Publications, New Delhi, 2016.

Reference Books:

1. Stephen A. Robbins, David A. Decenzo & Mary Coulter,*Fundamentals of Management* 7th Edition, Pearson Education, 2011.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous Institute, Affiliated to JNTUH

OPEN ELECTIVE

COURSE STRUCTURE

A4132 – ENVIRONMENTAL POLLUTION AND MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course has been designed to improve the understanding of the students about different pollution control strategies and the skills of application of remediation techniques to combat pollution in three environmental compartments i.e. air, water and soil. The course will also be dealing about the sources of pollution in air, soil, water, and noise and the impacts these sources on the environment and health. In addition, the students will be given the knowledge to develop the particular skills required in pollution related structured research and environmental management.

Course Pre/ Co-requisites

A4014 - Environmental Science

2.Course Outcomes (COs)

After the completion of the course, the student will be able to:
A4132.1. Identify water pollution sources, types and treatment methods.
A4132.2. Apply knowledge on Prevention and control of air pollution.
A4132.3. Inspect sources, effects and mitigation methods of noise pollution.
A4132.4. Examine soil pollution sources, effects and control measures.
A4132.5. Formulate Environmental management plan to minimize environmental pollution.

3. Course Syllabus

Water pollution: Water Pollution - Introduction - Sources and types of water pollutants Physical, Chemical and Biological. Ground water - Surface water - lake water - seawater. Effects of water pollution. Water Quality standards (drinking and industrial) - water treatment - physical, chemical and biological. Water Pollution Prevention and Control Act, 1974.

Air pollution: Structure and composition of atmosphere – classification, sources and effects of air pollution – Acid rain –green house effect – global warming – Ozone depletion, Prevention and control of air pollution particulate control – settling chamber, scrubber, bag filter, cyclones electrostatic precipitators. Gaseous emission control methods. Air pollution prevention and control Act 1981.

Noise Pollution: Noise Pollution Basics of acoustics- propagation of indoor and outdoor sound- noise profiling effects of noise – measurement, index and mitigation methods- health effects of noise-

Vibration and its Effects, Whole body vibration problems in opencast mines-ground vibration and Air blast. Green Belt Development--Principles and design considerations, Industrial Noise Pollution Control methods.

Soil Pollution: Sources - solid waste disposal and their effects - pesticides - types and effect of pollutants on Plants - animals and human beings - biomagnifications - fertilizers and its Effect of pollutants on plants - animals and human beings - soil pollution Control measures - soil microbes and function - biofertilizer.

Environmental management: Environmental impact assessment and statement; Government strategies in pollution control: subsides, polluter pays principle and regulations; Government Agencies and Programs – The Tiwari committee – creation of NCEPC, Department of Environment & Forest – Function of State Pollution Control Board. Sources of environmental information and regulations; Sustainable development and environmental protection.

4. Books And Materials

Text Books:

1. Prof. Y. Anjaneyulu, "Air Pollution and Control Technologies", Allied publishers, 2002.
2. M. N. Rao, H. V. N. Rao, “Air pollution”, Tata McGraw Hill Education, New Delhi, India, 2017.

Reference Books:

1. R. K. Trivedy, P. K. Goel, “Introduction to Air pollution”, ABD Publications, New Delhi, India, 2003.
2. Wark, Warner, “Air pollution its origin and control”, Addison-Wesley, New York, 1998.
3. K.V.S.G. Murali Krishna, “Air Pollution and Control”, USP, India, 2017.

OPEN ELECTIVE

COURSE STRUCTURE

A4133 – DISASTER MANAGEMENT (OPEN ELECTIVE-III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course has been framed with an intention to provide a general concepts in the dimensions of disasters caused by nature beyond human control as well as the disasters and environmental hazards induced by human activities with emphasis on Natural disaster, Man-made disaster, vulnerability and risks of disasters, Disaster Management Mechanism, Capacity Building and disaster coping Strategies and Disaster management planning.

Course Pre/co requisites

A4014- Environmental science

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4133. 1. Identify concepts, hazards and vulnerabilities of different types of disasters.
A4133. 2. Examine the components of disaster management mechanism.
A4133. 3. Select suitable capacity building frame work for disaster management
A4133. 4 Interpret various disaster coping strategies
A4133. 5. Develop Strategies for disaster management planning

3. Course Syllabus

CONCEPT- HAZARDS - VULNERABILITIES OF DISASTERS: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards.

DISASTER MANAGEMENT MECHANISM: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief.

CAPACITY BUILDING: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels.

COPING WITH DISASTER: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

DISASTER MANAGEMENT PLANNING: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India -Organizational structure for disaster management in India - Preparation of state and district disaster management plans.

4. Books And Materials:

Text Books:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2017

Reference Books:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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OPEN ELECTIVE

COURSE STRUCTURE

A4231 – TRANSDUCERS AND MEASUREMENTS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an overall understanding of the elements and processes, including sources of errors, and digitally acquiring these measurements. Along with an overview of instrumentation principles, the physical principles and electrical characteristics for several common instrument transducers are studied. The electronic signal conditioning circuits required converting the electrical changes in the transducers to signal which can be interpreted accurately by a microprocessor or an embedded controller are analyzed and designed effectively. This course also gives an integration of hardware and software in designing computer controlled processes and/or systems with the aid of sensors, transducers data acquisition board, and instrument control.

Course Pre/co requisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4231.1. Aware the basic concepts of measurement parameters as well as instrument standards, characteristics and errors.

A4231.2. Construct and design various measuring devices like voltmeters, Ammeters, Ohmmeters, analog, digital multi-meters and analyze different types of cathode ray oscilloscopes.

A4231.3. Design different bridge networks and analyze balanced condition for finding out values of resistance, capacitance and inductance.

A4231.4. Analyze different physical parameters like pressure, force, velocity, acceleration, sound, torque, strain and stress etc. using non-electrical transducers.

A4231.5. Apply the principles and practice for instrument design and develop for real world problems.

3. Course Syllabus

CHARACTERSTICS OF INSTRUMENTS: Block schematic of measuring system, Performance characteristics of instruments-static and dynamic characteristics, Errors in measurement.

MEASURING INSTRUMENTS: DC voltmeters- multi-range, range extension, DC Ammeter- multi range, range extension, ohm-meters-series type and shunt type, AC Voltmeter.

DIGITAL VOLTMETERS: Dual slope and Successive Approximation type DVM.

TRANSDUCERS-I: Introduction, classification, strain gauges, LVDT, Piezo electric transducers, OP-AMP applications in measurement and transducer circuits, instrumentation amplifier, thermometers, thermocouples, thermistors, sensistors.

TRANSDUCERS-II: Measurement of non electrical quantities- displacement, pressure, torque, vibration, pH, sound, velocity, humidity, speed, analog and digital data acquisition systems, programmable logic controllers and their industrial applications.

DC and AC BRIDGES: Measurement of resistance Wheat's stone bridge, Kelvin's double bridge, measurement of Inductance using Maxwell's inductance bridge, Anderson's bridge, Hay's bridge, measurement of capacitance using Schering bridge.

CATHODE RAY OSCILLOSCOPE (CRO): Introduction to CRT, vertical amplifiers, horizontal deflection system, simple CRO, measurement of phase and frequency (lissajous patterns).

4. Books and Materials

Text Books:

1. A. K. Sawhney (2007), Electrical and Electronic Measurements and Instrumentation, 18th Edition, Dhanpat Rai & Co, New Delhi.
2. H.S.Kalsi, Electronic Instrumentation, 3rd edition, Tata McGraw-Hill Education.

Reference Books:

1. D. Helfrick, W.D. Cooper (2002), Modern Electronic Instrumentation and Measurement Techniques, 5th edition, Prentice Hall of India, New Delhi.
2. David A. Bell (2003), Electronic Instrumentation & Measurements, 2nd edition, Prentice Hall of India, New Delhi.

OPEN ELECTIVE

COURSE STRUCTURE

A4232 – SOLAR ENERGY AND APPLICATIONS (OPEN ELECTIVES-II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This is an engineering introduction to Solar energy technologies and potentials. The course aims to introduce a general engineering/science audience to the basic concepts of solar energy. The concepts of Photo Voltaic cells and their properties will be explained. Applications of solar cells will be explained in detail also the environmental issues of solar systems will be explained.

Course Pre/co requisites

The course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4232.1 Compare the present and future available electrical power from solar energy in the world based on the knowledge of global solar horizontal irradiation.

A4232.2 Assimilate and acquire the skills for design and engineering of solar thermal and solar photovoltaic technology and systems.

A4232.3 Identify simple to complex problems involved in solar thermal energy conversion technique used in the liquid based solar heating and cooling systems for buildings/societal needs.

A4232.4 Examine a solar PV(Photo Voltaic) system components and their function by utilizing the previous literature knowledge on different Photovoltaic solar cells like crystalline, Multi-Crystalline, Amorphous and thin film.

A4232.5 Analyze the techno economics interaction of developments in the solar energy systems

3. Course Syllabus

PRINC PLES OF SOLAR RADIATION: Role and potential of solar energy, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and Sun shine, solar radiation data.

SOLAR ENERGY COLLECTORS: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

STORAGE AND APPLICATIONS: Different methods of solar energy storage, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating /cooling technique, solar distillation and drying.

PHOTO VOLTAICS (PV): Fundamentals of solar cells, types of solar cells, absorption of photons, excitations and photo emission of electrons.
PV CELL PROPERTIES: Solar cell properties and design, p-n junction photodiodes, depletion region, electrostatic field across the depletion layer, electron and holes transports, device physics, charge carrier generation, recombination and other losses, I-V characteristics, output power.

SOLAR CELL APPLICATIONS: PV cell interconnection, module structure and module fabrication, Equivalent circuits, load matching, efficiency, fill factor and optimization for maximum power, Design of stand-alone PV systems, system sizing, device structures, device construction, DC to AC conversion, inverters.

COST ANALYSIS AND ENVIRONMENTAL ISSUES: Cost analysis and pay back calculations for different types of solar panels and collectors, installation and operating costs, Environmental and safety issues, protection systems, performance monitoring.

4. Books And Materials

Text Books:

1. G. D. Rai (2009), Non-Conventional Energy Sources, 4th Edition, Khanna Publishers, New Delhi.
2. Martin A. Green (2008), Solar Cells: Operating Principles, Technology and system Applications, 1st Edition, Prentice Hall, New Delhi.

Reference Books:

1. B. H. Khan (2016)- Non Conventional Energy Resources-3rd Edition, McGraw Hill Education (India) Private Limited.
2. Sukatme (2008), Solar Energy, 3rd Edition, McGraw Hill Companies, New Delhi.
3. D. Yogi gosuami, Frank Kreith, Jan F. Kreider (2000), Principles of Solar Engineering, 3rd Edition, Taylor & Francis, USA.

OPEN ELECTIVE

COURSE STRUCTURE
A4233 – ENERGY MANAGEMENT AND AUDIT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Energy management can help industry control its operating costs. Energy management is also important for reducing local, regional and global emissions and can help mitigate the problem of global warming. This course will help industry professionals acquire the skills and techniques required to implement energy management. This course will also benefit researchers and students who are interested in working on energy management. In the context of the Energy Conservation Act 2001, the Bureau of Energy Efficiency has emphasised the importance of Energy Managers and Certified Energy Auditors. This course is designed to provide the background required for engineers to meet this role.

Course Pre/co requisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4233.1 Analyze the influence of energy availability on the development of Industries and various other organizations.
A4233.2 Discuss the concepts and technologies used for energy conservation.
A4233.3 Develop methods for evaluating worth of project.
A4233.4 Investigate the schemes for demand side management.
A4233.5 Evaluate the VAR requirements for effective voltage control.

3. Course Syllabus

ELECTRICAL ENERGY AND SAFETY AUDIT: Overview of Electricity Act – Energy conservation act – Electrical energy audit – Types – Tools – Tariff – Load factor improvement – Power factor correction – Power demand control and shifting – Electrical safety Auditing.

ENERGY CONSERVATION IN ELECTRIC MOTORS: Motors efficiency – Motor selection – Factors affecting motor performance – Efficiency at low load – Rewound motors – Variable speed drives – Load reduction – High efficiency motors – Energy savings in transformers – Case studies.

ELECTRICAL ENERGY CONSERVATION IN DRIVEN EQUIPMENTS: Input electrical energy requirements in pumps, fans and compressors – Load factor estimation in the equipment – Energy conservation potential.

ENERGY CONSERVATION IN INDUSTRIAL LIGHTING: Concept of lighting systems – Choice of lighting – Different lighting technologies – Energy saving – Control of lighting – Lighting standards and requirements – Light meter audit – Methods to reduce costs.

ENERGY MANAGEMENT: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting – Energy manager, Qualities and functions.

4. Books and Materials

Text Books:

1. W. R. Murphy, G. McKay (2008), *Energy Management,* 1st Edition*,* B.S. Publications, New Delhi.
2. Tripathy S. C., "Electric Energy Utilization and conservation", Tata McGraw Hill.
3. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.

Reference Books:

1. B. Smith (2007), *Energy Management Principles*, 1st Edition, Pergamon Press, Inc., England.
2. Energy Management Handbook, Edited by W.C.Turner, Wiley, New York, 1982.
3. IEEE Bronze Book, 'Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities, IEEE Press.

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OPEN ELECTIVE

COURSE STRUCTURE

A4331 - BASIC MECHANICAL ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview:

This course is designed to lay emphasis on the fundamental principles of Thermodynamics, Fluid Mechanics, Hydraulic Machines and heat transfer and to equip the students with the knowledge and skills to solve mechanical engineering problems efficiently.

Course Pre/co requisites

A4003 - Semiconductor Physics
A4001 - Linear Algebra and Ordinary Differential Equations

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4331.1. Develop the general energy equations for thermal systems by laws of thermodynamics.
A4331.2. Compare types of fluids, fluid flows, pressure and flow measuring devices, losses in pipes, laminar and turbulent boundary layer concepts.
A4331.3. Evaluate design parameters of hydraulic turbines at given efficiency and discharge
A4331.4. Analyze an expression for force, workdone and efficiency of vane, turbines and pumps.
A4331.5. Apply the principles of conduction, convection and radiation heat transfer to analyze natural phenomena.

3. Course Syllabus

BASIC THERMODYNAMIC CONCEPTS: System, surroundings, universe, Intensive and Extensive Properties, Macroscopic and Microscopic Approach, Force, Pressure, Energy, Work, Power, Heat, Temperature, Specific Heat Capacity, Change of State, Path, Process, Cycle, Internal Energy, Enthalpy, Statements of Zeroth and First Laws of Thermodynamics**.**
FUELS AND COMBUSTION: Types of Fuels and their Characteristics, Combustion and Combustion Products of Fossil Fuels, Environmental Effects of Fossil Fuel Combustion, Bio-fuels, Comparison of Bio-fuels with Petroleum Fuels in Terms of Calorific Value and Emission.

ENERGY RESOURCE UTILIZATION:

Classification of Energy Resources, Non-Renewable Energy - Principles of Generating Electricity by Steam, Gas and Nuclear Power Plants; Renewable Energy - Utilization of Hydro, Solar, Wind, Geothermal and Biomass Energies**.**

ENGINEERING MATERIALS AND MACHINING PROCESSES:

Classification of Materials, Types and Applications of Ferrous & Non-Ferrous Metals, Alloys and Composites; Principles of Metal Joining Processes -Riveting, Bolting, Soldering, Brazing, and Welding, Principles of Metal Cutting Processes - Turning, Drilling, Milling, Boring, Shaping, Slotting Broaching and Sawing

POWER TRANSMISSION DRIVES:

Types of Power Transmission, Belt Drives - Open and Crossed Belt, Flat and V-Belt, Stepped Pulley; Gear Drives – Spur, Helical and Bevel Gears, Rack and Pinion, Worm Gear; Gear Trains – Simple and Compound; Chain Drives, Rope Drives, Advantages and Disadvantages of Chain Drive Over Belt or Rope Drive.

4. Books and Materials

Text Book(s)

1. B S Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. B V Ramana, *Engineering Mathematics*, 23rd Reprint, Tata Mc Graw Hill Education Private Limited, New Delhi, 2015.

Reference Book(s)

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, Laxmi Publications, 2010.
3. D. Poole, *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole, 2005.

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OPEN ELECTIVE

COURSE STRUCTURE
A4332 - INTRODUCTION TO 3D PRINTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

3D printing is an additive manufacturing process whereby objects are built up from plastic filament, liquid resin, layers of powder, or even bio-compatible and edible materials. Desktop 3D printing is today's printing press, putting rapid prototyping, customizable products, and individualized medical appliances in reach of the general public. Literacy in basic 3D modeling and manufacturing is an essential skill for future STEM success in this country. In this course students will learn how to be "makers" by using various types of 3D modeling software and imaging equipment, printing actual physical objects that they have designed and modeled themselves, and participating in educational outreach in the institute and the community

Course Pre/co requisites

- AutoCAD and Manufacturing Process

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to

A4332.1. Understand the fundamental concepts of Additive Manufacturing (i.e. Rapid Prototyping) and 3-D printing, its advantages and limitations.

A4332.2. Apply engineering knowledge, techniques, skills and modern tools to analyze problems in 3D PRINTING .

A4332.3. Appraise additive manufacturing through 3d printing.

A4332.4. Solve Complex manufacturing problems for significant technological and societal development

A4332.5. Analyze, design and evaluate engineering products using the knowledge of mathematics, science, engineering and IT tools.

3. Course Syllabus

INTRODUCTION TO 3D PRINTING: Fundamental of 3D printing, Need for 3D printing Generic 3d printing process, Distinction between 3D printing and CNC, Classification of 3D printing Processes, Steps in 3D printing process, Advantages of 3D printing, standards for 3D printing, Major Applications. **VAT PHOTO POLYMERIZATION 3D PRINTING PROCESSES:** Stereo lithography (SL), Materials, SL resin curing process, Process Benefits and Drawbacks, Applications of Photo polymerization Processes

MATERIAL JETTING 3D PRINTING PROCESSES:- Binder Jetting 3D PRINTING Processes: Evolution of Printing as a 3D printing Process, Materials, Process Benefits and Drawbacks, Applications of Material Jetting Processes.

BINDER JETTING 3D PRINTING PROCESSES: Materials, Process Benefits and Drawbacks, Research achievements in printing deposition, Technical challenges in printing, Applications of Binder Jetting Processes

EXTRUSION-BASED 3D PRINTING PROCESSES: Fused Deposition Modeling (FDM), Principles, Materials, Plotting and path control, Bio-Extrusion, Process Benefits and Drawbacks, Applications of Extrusion-Based Processes.

POWDER BED FUSION 3D PRINTING PROCESSES: Selective laser Sintering (SLS), Materials, Powder fusion mechanism, SLS Metal and ceramic part creation, Electron Beam melting (EBM), Process Benefits and Drawbacks, Applications of Powder Bed Fusion Processes.

DIRECTED ENERGY DEPOSITION 3D PRINTING PROCESSES: Process Description, Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Electron Beam Based Metal Deposition, Benefits and drawbacks, Applications of Directed Energy Deposition Processes.

Wire arc based additive manufacturing methods, Advantages and disadvantages, comparison with conventional 3D printing and WAAM.

POST PROCESSING OF 3D PRINTING PARTS: Support Material Removal, Surface Texture Improvement, Accuracy Improvement, Aesthetic Improvement, Preparation for use as a Pattern, Property Enhancements using Non-thermal and Thermal Techniques.

Inspection of 3D printing parts: Different destructive and non-Destructive testing of 3D printing parts, acceptance standards for 3D printing parts

3D PRINTING APPLICATIONS: Functional models, Pattern for investment and vacuum casting, Medical models, art models, Engineering analysis models, Rapid tooling, new materials development, Bi-metallic parts, Re-manufacturing. Application examples for Aerospace, defense, automobile, Bio-medical and general engineering industries

Software Package: FUSION 360 and CATIA

4. Books And Materials

Text Books:

1. Ian Gibson, David W Rosen, Brent Stucker (2015) “Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing”, 2nd Edition, Springer.
2. Ali K. Kamrani, EmandAbouel Nasr (2006) “Rapid Prototyping: Theory & Practice”, Springer

Reference Books:

1. D.T. Pham, S.S. Dimov (2001) “Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling”, Springer.
2. Rafiq Noorani (2006) “Rapid Prototyping: Principles and Applications in Manufacturing”, John Wiley & Sons.

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OPEN ELECTIVE

COURSE STRUCTURE

A4333 - FUNDAMENTALS OF ROBOTICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces students to the basics, types and elements of robots. The course exposes students to the theoretical concepts of robot kinematics. Path planning and trajectory planning concepts gives the perception on control of robotics. The concepts on actuators and sensors gives clear understanding and design ability for mobility systems. It gives an overview on application of robotics in manufacturing industry.

Course Pre/co requisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to

A4333.1. Understand the basic concepts and components of a robotic system.
A4333.2. Identify the use of actuators and sensors for designing robot mobility system.
A4333.3. Solve transformation problems to describe the robot position and orientation of robot.
A4333.4. Apply the concepts of robot work cell design and control.
A4333.5. Select appropriate robots for various applications suitable to modern manufacturing systems.

3. Course Syllabus

Introduction to Robotics, Classification of Robots, Advantages and Disadvantages of Robots, Degree of freedom, joints, Robot coordinates, Robot workspace, Robot characteristics, Robot Components, types of robot arms, end effectors, grippers.

Actuators:Characteristics of Actuating Systems, Comparison of Actuating Systems, Hydraulic and Pneumatic Devices, Electric Motors in Robotics.
Sensors: Sensor Characteristics, Position Sensors, Velocity Sensors, Acceleration Sensors, Touch and Tactile Sensors, Proximity Sensors, Range Finder.

Manipulator Kinematics:Specifications of matrices, Homogeneous Transformation, D-H notation, joint coordinates and world coordinates, Forward and inverse kinematics, Simple problems.

Path Planning:Trajectory planning and avoidance of obstacles, Path planning, introduction to robot programming.

Robot Work Cell Design and Control:Robot Cell Layouts, Multiple Robots and Machine Interface, Some Consideration in Work Cell Design, Interlocks, Error Detection and Recovery, Robot Cycle Time Analysis.

Robotic Applications:Robots in manufacturing and non- manufacturing applications, Health Service, Intelligent Home Applications, Military Applications, Space Application, Entertainment robots, Service robots, Domestic or household robots.

4. Books and Materials

Text Books:

1. Richard D. Klafter (2010), Robotic Engineering, 2nd edition, Prentice Hall of India, New Delhi.
2. M.P. Groover (2010), Industrial Robotics, 3rd edition, Pearson Education, New Delhi.

Reference Books:

1. R.K. Mittal, I.J. Nagrath (2012), Robotics and Control, 1st edition, Tata Mc Graw Hill, New Delhi.
2. P. Coiffet, M. Chaironze (2010), An Introduction to Robot Technology, 3rd edition, Kogam Page Ltd., London.
3. Ganesh S. Hegde (2015), A Textbook of Industrial Robotics, 2nd edition, University Science Press.
4. K.S. Fu (2010), Robotics, 1st edition, Tata Mc Graw Hill, New Delhi.

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OPEN ELECTIVE

COURSE STRUCTURE

A4431 - FUNDAMENTALS OF IoT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course introduces you to advance concepts and design methodologies to design IoT systems and developing IoT applications programming languages and tools optimized for IoT domain. It also exposes participants to communication technologies and legacy protocols as well as newly developed IoT specific application and physical layer protocols. The course covers python languages in great detail with set of packages which makes it obvious choice as a leading IoT language.

Course Pre/Co Requisites

The course has no specific prerequisite and co-requisite.

2. COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

A4431.1. Identify the basic building blocks of IoT and its characteristics

A4431.2. Choose the application-layer protocols and web services architectures for a seamless integration of various components within an IoT ecosystem

A4431.3. Utilize Python standard libraries for implementing various IoT Applications

A4431.4. Examine the communication between a machine or a device with a remote system

A4431.5. Analyze cloud infrastructure, services, APIs and architectures of commercial and industrial cloud platforms

3. Course Syllabus

INTRODUCTION TO INTERNET OF THINGS: Introduction, Physical Design of IoT, Logical Design of IoT, IoT enabled Technologies, IoT Levels and Templates, IoT Platforms Design Methodology.

INTRODUCTION TO PYTHON: Language features of Python, Data types& data structures, Control of flow, Functions, Modules, Packages, File Handling, Data/Time operations, Classes, Python packages of interest for IoT(JSON,XML)

IoT AND M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, **IoT System Management with NETCONF- YANG**-Need for IoT Systems Management, SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

IoT PHYSICAL DEVICES AND ENDPOINTS: Introduction to IoT Device, Exemplary Device: Raspberry Pi, Components of Raspberry Pi Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming – Raspberry Pi with Python

I0T PHYSICAL SERVERS AND CLOUD OFFERINGS: Introduction to Cloud Storage models and communication APIs,WAMP – AutoBahn for IoT, Xively Cloud for IoT, Python web application framework-Django, Designing a RESTful web API

4. Books and Materials

Text Book:

1. ArshdeepBahga and Vijay Madisetti: *Internet of Things,A Hands-on Approach*; University Press, 2016.

Reference Books:

1. Getting Started with Raspberry Pi:Matt Richardson & Shawn Wallace,O'Reilly (SPD),2014.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous Institute, Affiliated to JNTUH

OPEN ELECTIVE

COURSE STRUCTURE

A4432 - PRINCIPLES OF ANALOG AND DIGITAL COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is useful to understand the basics of Signals, Systems, Random Variables and Communication. The course presents and integrates the basic concepts for both continuous-time and discrete signals and systems. This course provides a foundation in the theory and applications of random variables stochastic processes and an understanding of the mathematical techniques elating to random processes in the areas of signal processing, detection & estimation theory and communications. it gives the basics of Analog and Digital Communication and also gives the background required for advanced study on the course. This is accomplished by providing overviews of the necessary background in signal, system, probability, and random process theory required for the analog and digital communications. It gives more emphasis on stressing fundamental concepts. The topics in the course, more than enough to students needs.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4432.1. Analyze linear and non - linear modulators and demodulators in time as well as frequency domain.

A4432.2. Design a linear and non linear modulators and demodulators for the analog signals

A4432.3. Outline the basic concepts of digital communications with an insight into practical applications and Differentiate between PCM and DM and identify the applications of these modulation schemes in base band transmission

A4432.4. Estimate a overall digital communication system for the improvement of the system performance.

A4432.5. Analyze the performance of a digital communication system by introducing various spread spectrum modulation techniques.

3. Course Syllabus

Introduction to communication system, need for modulation, Types of modulation techniques: AM, FM, PM, Generation and detection. Radio Transmitters,Radio Receivers AM,FM Comparison of Radio transmitters and receivers.

Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Figure of Merit, Threshold Improvement in Discriminators.

Analog-to-Digital Conversion: Pulse modulation Techniques, Sampling Process, PAM,PWM and PPM. Time Division Multiplexing, Digital Modulation Techniques: Pulse Code Modulation, Companding, Differential Pulse Code Modulation, Delta Modulation, Noise in Pulse-Code Modulation Systems.

Binary Amplitude Shift-Keying, Frequency Shift-Keying, Phase-Shift Keying, Differential Phase-Shift Keying, Quadrature Phase-Shift Keying (QPSK), Comparison of BASK, BFSK and BPSK, Minimum Shift Keying (MSK), Duo binary Encoding.

Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

4. Books and Materials

Text Book:

1. Principles of Communications By Taub and Schilling

Reference Books:

1. Communication Systems, Simon Haykins (2nd Edition).
2. Analog and Digital Communication Systems by Martin S. Roden, 3rd edition, Prentice Hall, 1994.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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OPEN ELECTIVE

COURSE STRUCTURE

A4433 - INTRODUCTION TO SIGNAL PROCESSING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Signal Processing is an introductory course essentially attempts to cover classification, representation of signals and analysis in time domain and frequency domain of systems. It is a foundation course to advanced courses like Communication Systems, Image and Speech Processing in their undergraduate program. This course provides coherent and comprehensive coverage of signal processing.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4433.1. Understand mathematical description of signals and representation of systems
A4433.2. Identify the spectrum of continuous-time periodic and non-periodic signals
A4433.3. Apply various transforms to analyze continuous and discrete-time systems
A4433.4. Analyze digital systems using various transform techniques
A4433.5. Design and implement FIR and IIR filters for given specifications

3. Course Syllabus

CLASSIFICATION OF SIGNALS: Continuous time (CT) and Discrete time (DT) signals, elementary signals- Unit, Step, Impulse, ramp signals, singularity functions and operations on signals.
SIGNAL TRANSMISSION THROUGH LTI SYSTEMS: Classification of systems, discrete time LTI systems and continuous time LTI systems, properties of LTI system, Convolution

FOURIER TRANSFORM (FT): Fourier series, convergence of Fourier series, Fourier transform (FT), Fourier transform of standard signals, Hilbert transform and its properties
LAPLACE TRANSFORM (LT): The Laplace transform (LT), The Region of convergence (ROC) for Laplace transforms, Properties of Laplace transforms, some Laplace transform pairs, Inverse Laplace transforms

SAMPLING: Sampling of continuous time signals, sampling theorem, reconstruction of signal from its samples, the effect of under sampling- aliasing, practical aspects of sampling.

Z - TRANSFORMS: The Z - Transform, The Region of Convergence (ROC) for Z - transform and its properties, properties of Z –transform

DISCRETE FOURIER TRANSFORM: Frequency domain representation of discrete time signals & Systems, Discrete Fourier transforms: Frequency domain sampling, Relationship of DFT to other transforms, Properties of DFT

FIR & IIR FILTERS: Design of linear phase FIR Digital Filters using Windows, IIR filter design (Butter worth) by suitable mapping technique, comparison of IIR & FIR filters

4. Books And Materials

Text Books:

1. Oppenheim A. V, Willisky (2009), Signals and Systems, 2nd edition, Prentice Hall of India, India.
2. John G. Proakis, Dimitris G. Manolakis (2007), Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, India.

Reference Books:

1. Anand Kumar, Signals and Systems, PHI Learning Pvt. Ltd.
2. B. P. Lathi (2001), Signals, Systems & Communications, BS Publications, New Delhi.
3. M. H. Hayes (2007), Schaums Outlines of Digital Signal Processing, Tata McGraw Hill, India.
4. Dimitris G. Manolakis, Vinay Ingle (2011), Applied Digital Signal Processing, Cambridge University Press, Newyork.

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OPEN ELECTIVE

COURSE STRUCTURE

A4531 – FUNDAMENTALS OF JAVA

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides OOP concepts using Java. The course focuses on different aspect of core Java Environment suitable to write efficient, maintainable, and portable code. It also ignites Object Oriented thinking and explores with the evolution of Java and its basics. It provides strong foundation on Inheritance, Packages, and Interfaces and also illustrates Exception Handling and Multithreaded mechanisms. In depth knowledge to implement Collection frameworks. Emphasis on AWT concepts used for GUI applications is given with event handling. The course plays a vital role in developing front-end interface for Mini and Major Projects.

Course Pre/ co-requisites

- Programming for Problem Solving (A4501)

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4531.1. Understand the principles of Object Oriented Programming to model real world problem.

A4531.2. Use various constructs / concepts to write programs in OOP paradigm.

A4531.3. Analyze the applications for Handling Exceptions and Multithreading in Java runtime environment.

A4531.4. Implement Collection Frameworks to retrieve and process data efficiently.

A4531.5. Build GUI applications using AWT for Interactive applications.

3. Course Syllabus

Introduction to OOP: Evolution of Java, OOP principles, Java Buzzwords, Implementing Java program, JVM, Data Types, Variables, Type conversions and Casting, Operators, Control statements, Arrays**.**CLASS, METHODS, OBJECTS AND CONSTRUCTORS- Classes, Objects, Methods, Constructors, this keyword, Overloading Methods and Constructors, Argument passing, Exploring String class.

Inheritance, Interfaces and Packages:INHERITANCE: Inheritance Basics, Using super, Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract classes, final keyword. PACKAGES

AND INTERFACES: Defining a Package, Finding Packages and CLASSPATH, Access Protection, Importing Packages, Defining and Implementing interfaces, Extending interfaces.

Exception Handling and Multithreading: EXCEPTION HANDLING-Exception Handling Fundamentals, Exception Types, Using try catch, throw throws and finally keywords, Built-in Exceptions, Creating own exception subclasses. MULTITHREADING- Life cycle of a thread, creating threads, thread priorities, Synchronizing threads, Interthread Communication.

Collections and Event Handling:COLLECTIONS FRAMEWORK-Collection classes- ArrayList, LinkedList, HashSet, and TreeSet. EVENT HANDLING-Delegation Event Model, Event Sources, Event Classes, Event Listener Interfaces, Handling Mouse and Keyboard Events, Adapter classes.

AWT: AWT Hierarchy, AWT controls – Label, Button, TextField, TextArea , Checkbox , CheckboxGroup List and Choice. Layout Managers: FlowLayout, BorderLayout, GridLayout, and CardLayout. Limitations of AWT.

4. Books and Materials

Text Books:

1. Herbert Schildt (2011), Java: The Complete Reference, 8th Edition, Tata McGraw-Hill Education, New Delhi.

Reference Books:

1. Michael Ernest (2013), Java SE 7 Programming Essentials, John Wiley & Sons Inc.
2. Y. Daniel Liang (2014), Introduction to Java Programming, Comprehensive Version, 10thEdition, Pearson Education, India.
3. Kathy Sierra, Bert Bates (2014), OCA/OCP Java SE 7 Programmer I & II Study Guide (Exams 1Z0-803 & 1Z0-804), 1st Edition, McGraw-Hill Education Publisher, USA.
4. T. Budd (2010), An Introduction to Object Oriented Programming, 3rd Edition, Pearson Education, India.

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OPEN ELECTIVE

COURSE STRUCTURE

A4532 – OPERATION RESEARCH

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. COURSE DESCRIPTION

Course Overview

Operation Research facilitates the comparison of every possible alternative (courses of action or acts) to Know the potential outcomes, permits examination of the sensitivity of the solution to changes or errors in numerical values, and encourage rational decision-making based on the best available approaches or Techniques.

Course Pre/co requisites

- A4001- Linear Algebra and Ordinary Differential Equations
- A4012- Probability and Statistics.

2. COURSE OUTCOMES (COS)

After the completion of the course, the student will be able to:

A4532.1. Explain the Operations Research features, models, applications and methods such as linear programming, transportation, sequencing, assignment, replacement, games theory.

A4532.2. Build mathematical models for finding optimum solutions for various real world problems and case studies.

A4532.3. Evaluate various alternatives available to aid in decision making situations.

A4532.4. Choose the best strategies to maximize the profit in the presence of a competitor

A4532.5. Devise operating policies for the efficient and effective management of men, materials and machines, production, distribution and service systems.

3. COURSE SYLLABUS

Theory

INTRODUCTION TO OPERATIONS RESEARCH: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem, Formulation and Graphical solution of Linear Programming Problem. Simple Method, Artificial variables Techniques, big -M method.

TRANSPORTATION PROBLEM: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions, North-West corner rule, least cost method and Vogel's approximation method. Optimality test – MODI method. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem.

SEQUENCING MODELS: Solution of Sequencing Problem, Processing n Jobs through two machines, Processing n Jobs through three machines, Processing two Jobs through m machines, Processing n Jobs through m Machines.

QUEUING THEORY: Introduction, Single Channel, Poisson arrivals, exponential service times with infinite population and finite population models

REPLACEMENT MODELS and GAME THEORY: Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value, Replacement of items that fail suddenly, individual replacement policy, group replacement policy. GAME THEORY: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.

4. BOOKS AND MATERIALS

Text Books:

1. S.D. Sharma (2010), Operations Research – Theory and Applications, 15th edition, Kedar Nath Ram Nath, , India.
2. Frederick S Hillier; Gerald J Lieberman (2015), Introduction to Operations Research,10th Edition, McGraw-Hill , New York

Reference Books:

1. Hamdy Abdelaziz Taha (2015), Operations Research: an Introduction, 9 th edition, Pearson, Boston
2. Prem Kumar Gupta & D S Hira (2015), Operations Research, Revised edition, S. Chand Publishing, New Delhi, India.
3. P Shankara Iyer (2008), Operations Research 1st Edition, Tata McGraw Hill, Publishing Company, New Delhi, India.
4. S Kalavathi (2012), Operations Research, 4th Edition, Vikas Publication.

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OPEN ELECTIVE

COURSE STRUCTURE

A4533 – FUNDAMENTALS OF DBMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the core principles and techniques required in the design and implementation of database systems. This course focus on relational database management systems, including database design theory: E-R modeling, data definition and manipulation languages, database security and administration. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control, Recovery and various types of databases like distributed database, and intelligent database, Client/Server.

Course Pre/co requisites

A4531- Object oriented Programming

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4533.1: Understand design and implementation of a database for a given problem domain.
A4533.2: Construct Queries in Relational algebra, relational calculus and SQL.
A4533.3: Apply Normalization techniques to reduce data redundancy in data base.
A4533.4: Analyze various transaction control and recovery methods to keep data base consistent

3. Course Syllabus

INTRODUCTION: History of database systems, introduction to database management systems, database system applications, database systems versus file systems, view of data, data models, database languages- DDL & DML commands and examples of basic SQL queries, database users and administrators, transaction management.

SQL: Overview, the form of a basic SQL query, union, intersect and except operators, nested queries, aggregate operators, null values, complex integrity constraints in SQL, cursors, triggers

SCHEMA REFINEMENT AND NORMAL FORMS: Functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, other kinds of dependencies: 4NF, 5NF.

TRANSACTIONS MANAGEMENT: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Anomalies due to interleaved execution of transactions, serializability, recoverability.

CONCURRENCY CONTROL AND RECOVERY SYSTEM: Concurrency control - lock based protocols, timestamp based protocols, validation based protocols, deadlock handling.

4. Books and Materials

Text Books

1. Raghurama Krishnan, Johannes Gehrke (2007), Database Management Systems, 3rd Edition, Tata McGraw-Hill, New Delhi, India.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2010), Database System Concepts, 6th Edition, McGraw- Hill, New Delhi, India.

Reference Books

1. ElmasriNavate (2014), Fundamentals of Database Systems, Pearson Education, India
2. C. J. Date, A. Kannan and S. Swamynathan(2009),*An Introduction to Database Systems,*3rd Edition,Pearson Education, India.

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OPEN ELECTIVE

COURSE STRUCTURE

A4534 – FUNDAMENTALS OF OPERATING SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Operating Systems is a graduate-level introductory course that teaches the basic concepts in operating systems like abstractions, mechanisms, and their implementations. This course also deals with Process Management & Synchronization, Inter process communication, Memory Management, Virtual Memory, File & Disk Management and Deadlock handling methods.

Course Pre/co requisites

A4505- Digital Design and Computer Organization

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4534.1. Understand the various services provided by the operating system.
A4534.2. Analyze the concepts of Process management and Synchronization in a multi processing system.
A4534.3. Apply the Memory management techniques for efficient usage.
A4534.4. Use File and Disk management schemes for effective storage management.
A4534.5. Demonstrate Deadlock Handling Methods to allocate resources among processes.

3. Course Syllabus

OPERATING SYSTEMS OVERVIEW: Definition, Operating System Types, Operating System operations, Operating system services, System calls and System Programs, Distributed Systems, Special Purpose Systems.

PROCESS MANAGEMENT: Process concepts- Process, Process State Diagram, PCB and Operations on processes, IPC- Pipes, Message Passing and Shared Memory. Process Scheduling- Scheduling Criteria, Scheduler Types and Scheduling Algorithms. PROCESS SYNCHRONIZATION-Concept of Synchronization, Critical section problem, Peterson's solution, Semaphores, Classic problems of Synchronization-The Bounded Buffer Problem, The Readers –Writers Problem, Dining - Philosophers Problem.

MEMORY MANAGEMENT: Introduction to Memory Management, Swapping, Contiguous Memory Allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, Page-replacement algorithms, allocation of frames, thrashing.

FILE SYSTEM AND MASS STORAGE STRUCTURE: Concept of a file – File Attributes, File Types, Access Methods, Directory Structure, File System structure, File System Implementation, directory implementation, File Allocation methods, and Free-Space management. MASS-STORAGE STRUCTURE: Introduction to Magnetic Disks, Disk Structures, Disk Scheduling, Swap Space Management, RAID Structure- Levels and Purpose.

DEADLOCKS: System Model, Deadlock Characterization, Deadlock Prevention, Avoidance, Detection and recovery from deadlock.

4. Books and Materials

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2009), *Operating System Concepts*, 8th Edition, Wiley India Private Limited, New Delhi.
2. Dhananjay M. Dhamdhere (2009), Operating Systems, A Concept-Based Approach, 3rd Edition, McGraw Hill, New Delhi.

Reference Books:

1. William Stallings (2006), *Operating Systems, Internals and Design Principles*, 5th Edition, Pearson Education, India.
2. Achyuth S Godbole, Atul Kahate (2017),Operating Systems, 3rd Edition, McGraw Hill, New Delhi.

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OPEN ELECTIVE

COURSE STRUCTURE

A4631 - PRINCIPLES OF SOFTWARE ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course acts as a foundation in the field of software engineering and is aimed at helping students develop an understanding of how software systems are developed from scratch, by guiding them through the development process, adopting the fundamental principles of system development. The course will orient the students to the different software process models, software requirements engineering process, systems analysis and design as a problem-solving activity, with focus on quality.

Course Pre/ Co-requisites:

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4631.1. Understand metrics in the process and project domains.

A4631.2. Identify the right process model to develop the right software system.

A4631.3. Gather requirements and analyze them scientifically in order to develop the right product, besides authoring software requirements documents.

A4631.4. Apply testing strategies for application being developed.

A4631.5. Propose design as per functional and non-functional requirements using design principles.

3. Course Syllabus

INTRODUCTION TO SOFTWARE ENGINEERING: The Evolving nature of software engineering, Changing nature of software engineering, Software engineering Layers, The Software Processes, Software Myths.

PROCESS MODELS:A Generic Process Model, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Spiral Model, the Unified Process, Personal and Team Process Models, the Capability Maturity Model Integration (CMMI).

REQUIREMENTS ENGINEERING: Functional and Non-Functional Requirements, The Software requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

SYSTEM MODELING: Context Models, Interaction Models, Structural Models, Behavioural Model, Model-Driven Engineering.

DESIGN CONCEPTS: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles.

DESIGN AND IMPLEMENTATION: The Object Oriented Design with UML, Design Patterns, Implementation Issues, Open Source Development.
USER INTERFACE DESIGN: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.
SOFTWARE TESTING STRATEGIES: A Strategic approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing.

PRODUCT METRICS:A Framework for Product Metrics, Metrics for the Requirements Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing.
PROCESS AND PROJECT METRICS: Metrics in the Process and Project Domains, Software Measurements, Metrics for Software Quality.
RISK MANAGEMENT: Risk versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinements, Risk Mitigation Monitoring and Management (RMMM), The RMMM Plan.

QUALITY MANAGEMENT: Quality Concepts, Software Quality, Software Quality Dilemma, Achieving Software Quality. Review Techniques, Reviews: A Formal spectrum, Informal Reviews, Formal Technical Reviews.
SOFTWARE QUALITY ASSURANCE: Background Issues, Elements of Software Quality Assurance, Tasks, Goals and Metrics, Software Reliability, the ISO 9000 Quality Standards.

4. Books And Materials

Text Book (S)

1. Roger S. Pressman (2011), Software Engineering, A Practitioner's approach, 7th edition, McGraw Hill International Edition, New Delhi.
2. Sommerville (2001), Software Engineering, 9th edition, Pearson education, India.

Reference Books:

1. K. K. Agarval, Yogesh Singh (2007), Software Engineering, 3rd edition, New Age International Publishers, India.
2. Lames F. Peters, WitoldPedrycz(2000), Software Engineering an Engineering approach, John Wiely& Sons, New Delhi, India.
3. Shely Cashman Rosenblatt (2006), Systems Analysis and Design, 6th edition, Thomson Publications, India.

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OPEN ELECTIVE

COURSE STRUCTURE

A4632 - E-COMMERCE TRENDS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The tremendous growth of the Internet and World Wide Web is having great impact on businesses, governments and individuals throughout the world. In this course, we will attempt to understand the phenomena, technological, economic and social, behind these rapid changes, and how organizations successfully conduct Internet-based activities. We will also study some of the technology of the Internet. This course provides an overview of e-commerce from both technological and managerial perspectives. It introduces e-commerce frameworks, and technological foundations; and examines basic concepts such as strategic formulation for e-commerce enterprises, management of their capital structures and public policy. It is particularly important that the student place a great deal of emphasis in understanding the different E-Commerce system design principles.

Course Pre/co requisites:

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4632.1. Illustrate the components and roles of the E-Commerce environment.

A4632.2. Understand legal and ethical issues related to E-Commerce and web marketing approaches.

A4632.3. Identify how to sell products and services on the web as well as to meet the needs of web site Visitors.

A4632.4. Analyze e-commerce payment systems.

3. Course Syllabus

INTRODUCTION TO E-BUSINESS AND E-COMMERCE: What is the difference between e-commerce and e-business, Anatomy of E-Commerce applications, E-Business risks and barriers to business adoption, Management responses to E-Commerce and E-Business, Electronic Commerce-Frame work.

E-COMMERCE FUNDAMENTALS- Location of trading in the marketplace, Business models for ecommerce, Focus on auction business models, Focus on Internet start-up companies.

E-BUSINESS INFRASTRUCTURE- Introduction, Internet technology, Web technology, Internet-access software applications, Managing e-business infrastructure, Focus on web services, SaaS and service oriented Architecture (SOA), Focus on mobile commerce.

E-ENVIRONMENT- Social and legal factors, Environmental and green issues related to Internet Usage, Focus on e-commerce and globalization, Political factors.

E-BUSINESS STRATEGY- What is e-business strategy, Strategic analysis, Strategic objectives, Strategy definition, Strategy implementation, Focus on information systems strategy and e-business strategy.
E-SECURITY - Securing the Business on Internet- Security Policy, Procedures and Practices, Transaction Security, Cryptology, Digital Signatures, Security Protocols for Web Commerce.

SUPPLY CHAIN MANAGEMENT- What is supply chain management? Focus on the value chain, Using e- business to restructure the supply chain, Supply chain management implementation
E-PROCUREMENT- What is e-procurement, Drivers of e-procurement, Focus on estimating eprocurement cost, implementing e-procurement.

E-MARKETING- What is e-marketing? E-marketing planning, Situation analysis, Objective setting, Strategy, Tactics, Focus on online branding.
CUSTOMER RELATIONSHIP MANAGEMENT- What is e-CRM and its applications, online buying process, focus on marketing communications for customer Acquisition, Customer retention management and Technology solutions for CRM.

4. Books And Materials

Text Book (S)

1. *E-Business and E-Commerce Management, strategy, Implementation and practice*, Dave Chaffey, Fourth Edition, Prentice Hall

Reference Books:

1. *Frontiers of electronic commerce* – Kalakata, Whinston,Pearson.
2. Bharat Bhaskar: *Electronic Commerce*,Tata Mc-Graw-Hill, New Delhi, 2003
3. *E-Commerce — Business, Technology, Society*, Kenneth C.Taudon, Carol Guyerico Traver.
4. *Electronic Commerce* Gary,P.Schneider — Thomson
5. *E-Commerce fundamentals and applications,* Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth - 215 - Chang, JohnWiley.
6. *E-Commerce*, S.Jaiswal –Galgotia.
7. *E-Commerce*, Efrain Turbon, Jae Lee, David King, H.Michael Chang.

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OPEN ELECTIVE

COURSE STRUCTURE

A4633 - FUNDAMENTAL OF CYBER SECURITY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course drawing upon a wealth of experience from academia, industry, and government service, Cyber Security details and dissects, in current organizational cyber security policy issues on a global scale—taking great care to educate students on the history and current approaches to the security of cyberspace. It includes thorough descriptions—as well as the pros and cons—of an excess of issues, and document policy alternatives for the sake of clarity with respect to policy alone. It also delves into organizational implementation issues, and equips students with descriptions of the positive and negative impact of specific policy choices.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4633.1. Understand how to protect them self and ultimately society from cyber-attacks by studying various case studies.

A4633.2. Summarize different government cyber laws and cyber-forensics techniques.

A4633.3. Apply different techniques to classify different types of cybercrimes

A4633.4. Analyze cyber-attacks on different online web applications

A4633.5. Apply various investigating methods on the new cases using previous case studies

3. Course Syllabus

INTRODUCTION: Cyber Security, Cyber Security policy, Domain of Cyber Security Policy, Laws and Regulations, Enterprise Policy, Technology Operations, Technology Configuration, Strategy Versus Policy,

CYBER SECURITY EVOLUTION: Productivity, Internet, E-commerce, Counter Measures and Challenges.

CYBER SECURITY OBJECTIVES AND GUIDANCE: Cyber Security Metrics, Security Management Goals, Counting Vulnerabilities, Security Frameworks, E-Commerce Systems, Industrial Control Systems, Personal Mobile Devices, Security Policy Objectives.

GUIDANCE FOR DECISION MAKERS: Tone at the Top, Policy as a Project, Cyber Security Management, Arriving at Goals, Cyber Security Documentation.

THE CATALOG APPROACH: Catalog Format, Cyber Security Policy Taxonomy.

CYBER SECURITY POLICY CATALOG: Cyber Governance Issues, Net Neutrality, Internet Names and Numbers, Copyright and Trademarks, Email and Messaging, Cyber User Issues, Malvertising, Impersonation, Appropriate Use, Cyber Crime, Geolocation, Privacy, Cyber Conflict Issues, Intellectual property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare.

CYBER MANGEMENT ISSUES: Fiduciary Responsibility, Risk Management, Professional Certification, Supply Chain, Security Principles, Research and Development, Cyber Infrastructure Issue, Banking and finance, Health care, Industrial Control systems.
CASE STUDY: A Government's Approach to Cyber Security Policy

4. Books And Materials

Text Books:

1. Jennifer L. Bayuk , J. Healey , P. Rohmeyer , Marcus Sachs , Jeffrey Schmidt , Joseph Weiss " Cyber Security Policy Guidebook" John Wiley & Sons 2012.

Reference Books:

1. Richard A. Clarke, Robert Knake" Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010.
2. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011
3. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
4. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley.
5. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011

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OPEN ELECTIVE

COURSE STRUCTURE

A4031 - NUMERICAL TECHNIQUES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Solution of Algebraic, Transcendental Equations and System of Linear Equations, Interpolation, Numerical Differentiation and Integration, Curve fitting, Numerical solutions of Ordinary and Partial differential equations. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co requisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4031. 1. Apply appropriate Numerical method to find a root of an equation.

A4031. 2. Make use of interpolation to find approximate values of the function at intermediate points.

A4031. 3. Evaluate definite integral using appropriate Numerical methods.

A4031. 4. Construct curve of best fit for the bivariate data using method of least squares.

A4031. 5. Determine approximate solution of ordinary and partial differential equations.

3. Course Syllabus

Solution of Algebraic, Transcendental Equations and System of Linear Equations: Bisection method, Regula-Falsi method, Iteration method, Newton-Raphson method. Iterative methods of solution of system of equations: Jacobi's iteration method, Gauss-Seidel iteration method.

Interpolation: Finite differences: Forward, Backward and Central differences, Other difference operators and relations between them, Differences of a polynomial, Missing terms, Newton's interpolation formulae, Central difference interpolation formulae: Gauss's forward and backward interpolation formulae, Interpolation with unequal intervals: Lagrange's interpolation formula.

Numerical Differentiation, Integration and Curve fitting: Numerical differentiation: Derivatives using Newton's interpolation formulae. Numerical integration: Newton-cotes quadrature formula, Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule. Curve Fitting: Method of least squares**,** Fitting a straight line, Second degree parabola and Non-linear curves of the form $y = ae^{bx}$, $y = ab^{x}$, $y = ax^{b}$ by the method of least squares.

Numerical Solution of Ordinary Differential Equations of First Order: Taylor's series method, Picard's method, Euler's and modified Euler's Method, Runge-Kutta method of fourth order, Predictor and Corrector methods: Milne's method, Adams-Bashforth-Moulton method.

Numerical Solution of Partial Differential Equations: Finite difference approximations to partial derivatives, Elliptic equations: Solution of Laplace equation by Liebmann's iteration process, Parabolic equations: Solution of one dimensional Heat equation by Schmidt explicit method and Crank-Nicolson implicit method.

4. Books And Materials

Text Book:

1. M.K. Jain, S.R.K Iyengar and R.K.Jain, *Numerical Methods for Scientific and Engineering Computation*, 5th Edition, New Age International Publishers, New Delhi, 2007.

Reference Books:

1. B.S.Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. B.V. Ramana, *Higher Engineering Mathematics*, 23rd Reprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.

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COURSE STRUCTURE

A4032 – MATHEMATICAL PROGRAMMING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course deals with more advanced engineering mathematical topics which provide students to impart knowledge about various tools in Mathematical Programming to apply and solve real life problems in Engineering. The topics covered are Linear programming problem, Formulation and Graphical solution of Linear programming problem, Simplex method, Big -M method, Two-phase simplex method, Dual simplex method, Degeneracy in simplex and unbound solutions, Transportation problem, Assignment model, Replacement models and Sequencing models. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4032.1.Identify LPP and express in mathematical form to solve by graphical or simplex method
A4032.2.Apply artificial variable techniques to obtain the optimal solution of an LPP
A4032.3.Interpret various methods under transportation model toget optimal results
A4032.4.Solve travelling salesmen problem using Hungarian method
A4032.5.Develop various replacement and sequencing models toarrive at an optimal decision

3. Course Syllabus

Introduction to Operations Research Basic definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem, Formulation and Graphical solution of Linear Programming Problem Simplex method

Artificial Variables Techniques Big -M method, Two-phase simplex method, Duality in simplex method, Dual simplex method, degeneracy in simplex and unbound solutions.

Transportation problem Formulation, solution, unbalanced Transportation problem. Finding initial basic feasible solutions, North-West corner rule, lowest cost entry method and Vogel's approximation method. Optimality test- MODI method, degeneracy in transportation, restricted transportation problem, conditional transportation problem.

Assignment Model Formulation, Hungarian method for optimal solution, solving unbalanced problem, restricted assignment, conditional assignment problems, crew assignment problems, Travelling salesman problem, Transportation problem as assignment problem.

Replacement Models and Sequencing Models Replacement Models**:** Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value, Replacement of items that fail suddenly, individual replacement policy, group replacement policy.

Sequencing Models: Solution of Sequencing Problem, Processing n Jobs through two machines, Processing n Jobs through three machines, Processing two Jobs through m machines, Processing n Jobs through m Machines.

4. Books and Materials

Text Book:

1. Robert Hisrich, Michael P. Peter, Dean A. Shepherd (2010), Entrepreneurship, Tata Mc Graw Hill, New Delhi

Reference Books:

1. Bholanath Datta (2009), Entrepreneurship, Excel publications, India.
2. David H Holt (2010), Entrepreneurship, Prentice hall of India, New Delhi, India

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COURSE STRUCTURE

A4033 - SPECIAL FUNCTIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics, required to analyze the problems in engineering. Topics to be covered in this course include: series solutions to Differential Equations, Bessel functions, Legendre polynomials, Hermite polynomials and Z - transforms. The mathematical skills derived from this course provides necessary base to analytical and design concepts occurring in the program.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A4033.1. Determine series solutions of ordinary differential equations about ordinary and regular singular points.

A4033.2. Solve problems in cylindrical and spherical coordinate systems using Bessel functions.

A4033.3. Relate algebraic polynomials with Legendre and Hermite polynomials.

A4033.4. Apply Z - Transforms to solve difference equations.

3. Course Syllabus

Series Solutions of Second Order Ordinary Differential Equations: Classification of Singularities, series solutions to Differential Equations around zero, Frobenius Method around zero.

Bessel Functions: Bessel's Differential equation, Recurrence formulae for $J_n(x)$, Generating function for $J_n(x)$, Orthogonality of Bessel functions.

Legendre Functions: Legendre's Differential equation, Rodrigue's formula, Legendre Polynomials, Generating function for $P_n(x)$, Recurrence formulae for $P_n(x)$, Orthogonality of Legendre functions.

Hermite Functions: Hermite's equation, Generating function of Hermite Polynomials, Orthogonal Property, Recurrence formulae for $H_n(x)$.

Z-Transforms: Definition, Some standard Z-transforms, Damping rule, Shifting rule, Multiplication by n, Initial and final value theorems. Inverse Z-transforms using partial fractions, Convolution theorem, Solution of difference equations by Z - transforms.

4. Books and Materials

Text Books:

1. B.S. Grewal, *Higher Engineering Mathematics*, 43rdEdition, Khanna Publishers, New Delhi, 2014.

Reference Books:

1. *M.D. Raisinghania, Ordinary and Partial Differential Equations, 6th Edition,* S.Chand& Co. Ltd. New Delhi.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.

OPEN ELECTIVE

COURSE STRUCTURE

A4034 – ENTREPRENEURSHIP DEVELOPMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course aims to provide students with an understanding of the nature of enterprise and entrepreneurship and introduces the role of the entrepreneur, will inculcate the knowledge of government supporting programs like financial assistance by public sector banks. Apart from this, students learn about the women entrepreneurs and success stories of women entrepreneurs, gain the knowledge of project management and profitability appraisal, focus on importance of training the new entrepreneurs as well as existing entrepreneurs.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to:

A4034.1. Understand the role, characteristics, qualities and functions of entrepreneur and use this knowledge to become future entrepreneurs.

A4034.2. Interpret various Institutional supports for setting up a business enterprise and apply this knowledge while approaching these institutions for financial support.

A4034.3. Illustrate role, importance and functions of women entrepreneur and use this knowledge to become future women entrepreneurs.

A4034.4. Infer the concept of Project Management and steps in Project development and analyze while taking future project assignments.

A4034.5. Indicate training programs and different training institutions to impart training and apply this knowledge to train existing and future entrepreneurs.

3. Course Syllabus

ENTREPRENEURSHIP: Importance and role of entrepreneurship, Qualities of an entrepreneur, Functions of entrepreneur, Theories of entrepreneurship, Stimulants of entrepreneurship and Barriers to entrepreneurship, Ethics and Social Responsibility, Role of entrepreneur in economic development

INSTITUTIONAL SUPPORT: Role of Government: Role of IDBI, SIDBI, SIDO, NIESBUD, DIC, Entrepreneurship Development Institute, T-Hub (Telangana Hub).

WOMEN ENTREPRENEURSHIP: Role & Importance, Functions of women entrepreneur, Profile of Indian Women Entrepreneur, Problems of Women Entrepreneurs, Women Entrepreneurship Development in India and in Foreign Countries.

PROJECT MANAGEMENT: Concept of project and classification of project, Project life cycle identification, Project formulation, Project report, Project evaluation- profitability appraisal, social cost benefit analysis, feasibility analysis, financial analysis and project financing, Project implementation, Project completion.

ENTREPRENEUR TRAINING: Designing appropriate training programmes to inculcate Entrepreneurial Spirit, significance of entrepreneurial training, Feedback and Performance ofTrainees, NSIC, Pradhan Mantri Kaushal Vikas Yojana (PMKVY), Telangana Academy for Skill and Knowledge (TASK).

4. Books and Materials

Text Book:

1. Robert Hisrich, Michael P. Peter, Dean A. Shepherd (2010), Entrepreneurship, Tata Mc Graw Hill, New Delhi

Reference Books:

1. Bholanath Datta (2009), Entrepreneurship, Excel publications, India.
2. David H Holt (2010), Entrepreneurship, Prentice hall of India, New Delhi, India

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COURSE STRUCTURE

A4035– HUMAN RESOURCE MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The Students are able to understand the nature and significance of human resource management in contemporary world, the challenges that HR managers face in performing the HR functions. The Course provides the various Human Resource Development functions that an organization deals with individual employees for employee and Organizational growth. It also addresses the grievances of the employees and settlement of disputes for Industrial relations.

Course Pre/co requisites

This course has no specific pre/co requisites.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to

A4035.1. Identify functions of Human Resource Management
A4035.2. Illustrate the process of Recruitment and selection
A4035.3. Analysis the needs and methods for training
A4035.4. Outline the functional relationship of performance and compensation
A4035.5. Illustrates the importance of Industrial relations through collective bargaining, trade unions and industrial settlement machinery.

3. Course Syllabus

INTRODUCTION HUMAN RESOURCE MANAGEMENT: Introduction and significance of HRM, Scope, functions of HRM, changing environment of HRM and Challenges. Human Resource Planning, Objectives, Factors influencing Human Resource planning, HR Planning Process.

JOB ANALYSIS AND RECRUITMENT: Job analysis- Job description, Job specification, Sources of Recruitment; Selection, process of selection and techniques, Retention of Employees.

HUMAN RESOURCES DEVELOPMENT: Training Vs Development, Need, Process of training, Methods of training, Training Evaluation, Career planning, Performance Management System, Methods of Appraisal, Common Errors.

COMPENSATION MANAGEMENT: Concepts and components of wages, Factors influencing wage fixation, Job evaluation, Methods of payment, Incentives and Fringe benefits.

INDUSTRIAL RELATIONS: Components of Industrial Relation, Trade Unions, functions of Trade Union, Employee Participation, Collective Bargaining, Grievance Redressal, Industrial Dispute Settlement machinery.

4. Books and Materials

Text Books:

1. BiswajeetPattnayak (2009), Human Resource Management, Prentice hall of India, New Delhi, India.
2. R. Wayne Mondy and Robert M. Noe (2009), Human Resource Management, Pearson, India.

Reference Books:

1. Aswathappa. K. (2007), Human Resources and Personnel Management, Tata MC Graw Hill, New Delhi, India.
2. Monappa. A, Saiyadain. M. (1979), Personnel Management, Tata Mc Graw Hill, New Delhi, India.
3. C. B. Mamoria (2003), Personnel Management, Himalaya Publishing House, India.

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COURSE STRUCTURE

A4036 – LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

2. Course Description

Course Overview

This course addresses the concepts and techniques of Logistics and Supply chain management. It covers Customer services, Bench marking process, Sourcing issues. Apart from Network design and Co-ordination in supply chain, it discusses role of Information Technology and Global logistics & Global supply chain issues.

Course Pre/co requisites

This course has no specific pre/co requisites.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to

A4036.1. Explain the concepts of Logistics & Supply chain management.
A4036.2. Analyze the role of Supply chain drivers & Customer services of supply chain.
A4036.3. Examine the Benchmarking process and role of Sourcing in supply chain.
A4036.4. Analyze Network design in supply chain along with Coordination in supply chain.
A4036.5. Examine the role of IT in supply chain as well as Global logistics & Global supply chain.

3. Course Syllabus

Introduction to Supply Chain Management: Concept, Objectives, Scope and Functions of Supply Chain; Process view of a Supply Chain. Supply Chain Drivers - Facilities, Inventory, Transportation, Information, Sourcing, Pricing; Obstacles to achieve Strategic fit, Role of Aggregate Planning in Supply Chain, Methods and Managing Supply and Demand.

Logistics Management: Introduction, Difference between Logistics and Supply Chain; Inbound, Inter and Outbound Logistics; Integrated Logistics Management; 3PL, 4PL, Intermodal and Reverse Logistics. Supply Chain Customer Service - The Marketing and Logistics interface, Customer Service and Customer Retention, Service-Driven Logistics System, Setting customer Service Priorities and Service Standards.

Bench marking: Objectives, Bench marking Cycle, Process and types, Setting Bench marking Priorities. Sourcing in supply chain: Role of Sourcing in Supply Chain Management, Supplier Scoring and Assessment; Supplier Selection and Controlling; The Procurement process, Sourcing Planning and Analysis; Global Sourcing.

Network design in Supply Chain: The role of distribution in the Supply Chain Management, factors influencing distribution network design; Transportation Fundamentals: The role of Transportation in Supply Chain, Factors influencing Transportation Decisions, Modes of transportation, Transportation documentation. Coordination in Supply Chain: Introduction, Lack of Supply Chain Coordination and the Bullwhip effect, Impact of Lack of Coordination, Obstacles to Coordination in Supply Chain, Managerial levers to achieve Coordination.

IT in Supply Chain: The role of IT in the Supply Chain, The Supply Chain IT framework; CRM, Internal SCM, SRM; The future of IT in Supply Chain, Supply Chain IT in Practice. Global Logistics and Global Supply Chain: Logistics in Global Economy, Change in Global Logistics, Global Supply Chain business process; Global Strategy; Global Purchasing, Global SCM.

4. Books and Materials

Text Book:

1. K.Shridharabhat, “Logistics and Supply Chain management”, Himalaya Publishers, New Delhi, 2009.

Reference BookS:

1. Sunil Chopra and Peter Meindl, “ Supply Chain Management: Strategy, Planning & Operations”, Pearson Education, New Delhi, 2004.
2. Donald J Bowerfox and David J Closs, “ Logistics Management: The integrated Supply Chain Process”, TMH, 2003.
3. D.K.Agarwal, “Logistics and Supply Chain management”, Mc millan Publishers, 2011.
4. B.Rajasekhar, Acharyulu, “Logistics and Supply Chain management”, Excel Books, New Delhi, 2009.