JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)
ELECTRONICS AND INSTRUMENTATION ENGINEERING
COURSE STRUCTURE

I YEAR
I SEMISTER

S. No.	Subject	T	P	Credits
1	English – I	3	-	3
2	Mathematics - I	3+1	-	3
3	Mathematical Methods	3+1	-	3
4	Engineering Physics	3+1	-	3
5	Ethical & Moral Sciences	3	-	3
6	Engineering Drawing	1+3	-	3
7	English - Communication Skills Lab -1	-	3	2
8	Engineering Physics Laboratory	-	3	2
9	Engineering Physics – Virtual Labs – Assignments	-	2	-
10	Engineering Workshop& IT Workshop	-	3	2
	Total			**24**

I YEAR
II SEMISTER

S. No.	Subject	T	P	Credits
1	English – II	3	-	3
2	Mathematics – III	3+1	-	3
3	Engineering Chemistry	3+1	-	3
4	Engineering Mechanics	3+1	-	3
5	Computer Programming	3+1	-	3
6	Network Analysis	3+1	-	3
7	Engineering Chemistry Laboratory	-	3	2
8	English - Communication Skills Lab -2	-	3	2
9	Computer Programming Lab	-	3	2
	Total			**24**

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ELECTRONICS AND INSTRUMENTATION ENGINEERING
COURSE STRUCTURE

II Year
I Semester

S.NO	Subjects	T	P	Credits
1	Electronic Devices and Circuits	3+1		3
2	Electrical Technology	3+1		3
3	Signals and Systems	3+1		3
4	Data Structures	3+1		3
5	Transducer Technology	3+1		3
6	Environmental Studies	3		3
7	Electronic Devices and Circuits Lab		3	2
8	Networks & Electrical Technology Lab		3	2
Total credits				**22**

II Year

II Semester

S.NO	Subjects	T	P	Credits
1	Electronic Circuit Analysis	3+1		3
2	Electromagnetic Waves and Transmission Lines	3+1		3
3	Managerial Economics and Financial Analysis	3+1		3
4	Switching Theory and Logic Design	3+1		3
5	Signal Conditioning	3+1		3
6	Principles of Communication	3+1		3
7	Electronic Circuit Analysis LAB		3	2
8	Instrumentation LAB - I		3	2
Total credits				**22**

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ELECTRONICS AND INSTRUMENTATION ENGINEERING
COURSE STRUCTURE

III Year I Semester

S.NO	Subjects	T	P	Credits
1	Pulse and Digital Circuits			3
2	Linear Integrated Circuit Applications			3
3	Digital System Design(DICA)			3
4	Control Systems			3
5	Digital Signal Processing			3
6	Pulse and Digital Circuits Lab			2
7	LICA Lab			2
8	Digital System Design (DICA) Lab			2
9	IPR & Patents			2
Total credits				**23**

III Year II Semester

S.NO	Subjects	T	P	Credits
1	Micro Processors & Micro Controllers			3
2	Process Instrumentation			3
3	Analytical Instrumentation			3
4	Measuring Instruments			3
5	**OPEN ELECTIVE** 1.Medical Instrumentation 2.Electronic Measurements & Instrumentation			3
6	Micro Processors & Micro Controllers Lab			2
7	Process Instrumentation Lab			2
8	Digital Signal Processing Lab			2
9	Seminar			1
Total credits				**22**

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KAKINADA-533003, Andhra Pradesh (India)
ELECTRONICS AND INSTRUMENTATION ENGINEERING
COURSE STRUCTURE

IV YEAR **I SEMISTER**

S.NO	Subjects	T	P	Credits
1	Data Acquisition systems			3
2	Management Science			3
3	Computer Architecture and Organization			3
4	VLSI Design			3
5	**Elective I** 1. Quality and reliability Engineering systems(QRES) 2. Analog IC Design 3. Digital Control systems 4. Artificial neural network &Fuzzy Logic 5. Bio medical Instrumentation			3
6	**Elective II** 1. Object Oriented Program and Operating System 2. Digital Image Processing 3. Mixed signal Design 4. Robotics & Automation 5. EMI/EMC			3
7	Instrumentation Lab – II			2
8	Instrumentation Lab – III			2
Total credits				**22**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)
ELECTRONICS AND INSTRUMENTATION ENGINEERING
COURSE STRUCTURE

IV Year
II Semester

S.NO	Subjects	T	P	Credits
1	Industrial Automation			3
2	Data Communication			3
3	**Elective III** 1. Digital IC Design 2. Embedded systems 3.Micro electromechanical systems(MEMS) 4. Computer Networks 5. Advanced Computer Architecture			3
4	**Elective IV** 1.Wireless Sensors and Networks 2.Calibration & standards 3. Fiber Optic Sensors 4.Telemetry & Tele control 5. System on Chip			3
5	Project			9
Total credits				**21**

Total Course Credits : 48+44+45+43 = 180

SYLLABUS

I Year – I SEMESTER

T	P	C
3+1	0	3

ENGLISH –I
(Common to All Branches)

DETAILED TEXT-I English Essentials : Recommended Topics :

1. **IN LONDON: M.K.GANDHI**
   OBJECTIVE: To apprise the learner how Gandhi spent a period of three years in London as a student.
   OUTCOME: The learner will understand how Gandhi grew in introspection and maturity.
2. **THE KNOWLEDGE SOCIETY- APJ KALAM**
   OBJECTIVE: To make the learners rediscover India as a land of Knowledge.
   OUTCOME: The learners will achieve a higher quality of life, strength and sovereignty of a developed nation.
3. **THE SCIENTIFIC POINT OF VIEW- J.B.S. HALDANE**
   OBJECTIVE: This essay discusses how scientific point of view seeks to arrive at the truth without being biased by emotion.
   OUTCOME: This develops in the student the scientific attitude to solve many problems which we find difficult to tackle.
4. **PRINCIPLES OF GOOD WRITING:**
   OBJECTIVE: To inform the learners how to write clearly and logically.
   OUTCOME: The learner will be able to think clearly and logically and write clearly and logically.
5. **MAN'S PERIL**
   OBJECTIVE: To inform the learner that all men are in peril.
   OUTCOME: The learner will understand that all men can come together and avert the peril.
6. **THE DYING SUN—SIR JAMES JEANS**
   OBJECTIVE: This excerpt from the book "The Mysterious Universe" presents the mysterious nature of the Universe and the stars which present numerous problems to the scientific mind. Sir James Jeans uses a poetic approach to discuss the scientific phenomena.
   OUTCOME: This provides the students to think about the scientific phenomena from a different angle and also exposes the readers to poetic expressions.
7. **LUCK—MARK TWAIN**
   OBJECTIVE: This is a short story about a man's public image and his true nature. The theme of the story is that luck can be a factor of life, so that even if one is incompetent but lucky, one can still succeed.
   OUTCOME: The story is humourous in that it contains a lot of irony. Thus this develops in the learner understand humourous texts and use of words for irony.

Text Book : 'English Essentials' by Ravindra Publications

NON-DETAILED TEXT:

(From Modern Trailblazers of Orient Blackswan)
(Common single Text book for two semesters)
(Semester I (1 to 4 lessons)/ Semester II (5 to 8 lessons)

1. **G.D.Naidu**
   OBJECTIVE: To inspire the learners by G.D.Naidu's example of inventions and contributions.
   OUTCOME: The learner will be in a position to emulate G.D.Naidu and take to practical applications.
2. **G.R.Gopinath**
   OBJECTIVE: To inspire the learners by his example of inventions.
   OUTCOME: Like G.R.Gopinath, the learners will be able to achieve much at a low cost and help the common man.
3. **Sudhamurthy**
   OBJECTIVE: To inspire the learners by the unique interests and contributions of Sudha Murthy.
   OUTCOME: The learner will take interest in multiple fields of knowledge and make life worthwhile through social service.
4. **Vijay Bhatkar**
   OBJECTIVE: To inspire the learner by his work and studies in different fields of engineering and science.
   OUTCOME: The learner will emulate him and produce memorable things.

Text Book : 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers

I Year – I SEMESTER

T	P	C
3+1	0	3

MATHEMATICS – I (DIFFERENTIAL EQUATIONS)
(Common to All Branches)

UNIT I: Differential equations of first order and first degree:
Linear-Bernoulli-Exact-Reducible to exact.
Applications : Newton's Law of cooling-Law of natural growth and decay-orthogonal trajectories.
Subject Category
ABET Learning Objectives a d e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT II: Linear differential equations of higher order:
Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x).
Applications: LCR circuit, Simple Harmonic motion
Subject Category
ABET Learning Objectives a d e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT III Laplace transforms:
Laplace transforms of standard functions-ShiftingTheorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).
Application: Solutions of ordinary differential equations using Laplace transforms.
Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT IV Partial differentiation:
Introduction- Total derivative-Chain rule-Generalized Mean Value theorem for single variable (without proof)-Taylors and Mc Laurent's series for two variables– Functional dependence- Jacobian.
Applications: Maxima and Minima of functions of two variables with constraints and without constraints.
Subject Category
ABET Learning Objectives a c e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT V First order Partial differential equations:
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations
Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT VI Higher order Partial differential equations:
Solutions of Linear Partial differential equations with constant coefficients- Method of separation of Variables
Applications: One- dimensional Wave, Heat equations - two-dimensional Laplace Equation.
Subject Category

ABET Learning Objectives a e
ABET internal assessments 1 2 6
JNTUK External Evaluation B E

Books:

1. **B.S.GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
2. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
3. **GREENBERG,** Advanced Engineering Mathematics, 2nd edition, Pearson edn
4. **DEAN G. DUFFY,** Advanced engineering mathematics with MATLAB, CRC Press
5. **PETER O'NEIL,** advanced Engineering Mathematics, Cengage Learning.

Subject Category	ABET Learning Objectives	ABET Internal Assessments	JNTUK External Evaluation	Remarks
Theory Design Analysis Algorithms Drawing Others	a) Apply knowledge of math, science, & engineering b) Design & conduct experiments, analyze & interpret data c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints d) Function on multidisciplinary teams e) Identify, formulate, & solve engineering problems f) Understand professional & ethical responsibilities g) Communicate effectively h) Understand impact of engineering solutions in global, economic, environmental, & societal context i) Recognize need for & be able to engage in lifelong learning j) Know contemporary issues k) Use techniques, skills, modern tools for engineering practices	1. Objective tests 2. Essay questions tests 3. Peer tutoring based 4. Simulation based 5. Design oriented 6. Problem based 7. Experiential (project based) based 8. Lab work or field work based 9. Presentation based 10. Case Studies based 11. Role-play based 12. Portfolio based	A. Questions should have: B. Definitions, Principle of operation or philosophy of concept. C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference. D. Design oriented problems E. Trouble shooting type of questions F. Applications related questions G. Brain storming questions	

I Year – I SEMESTER

T	P	C
3+1	0	3

MATHEMATICS – II
(MATHEMATICAL METHODS)

(Common to All Branches)

UNIT I Solution of Algebraic and Transcendental Equations:

Introduction- Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method (One variable and Simultaneous Equestions)

Subject Category
ABET Learning Objectives a e k
ABET internal assessments 1 2 4 6
JNTUK External Evaluation A B E

UNIT II Interpolation:

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unevenly spaced points - Lagrange's Interpolation formula

Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 4 6
JNTUK External Evaluation A B E

UNIT III Numerical solution of Ordinary Differential equations:

Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods

Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 4 6
JNTUK External Evaluation A B E

UNIT IV Fourier Series:

Introduction- Determination of Fourier coefficients – even and odd functions –change of interval– Half-range sine and cosine series
application: Amplitude, spectrum of a periodic function

Subject Category
ABET Learning Objectives a e d
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT V Fourier Transforms:

Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms

Subject Category
ABET Learning Objectives a d e k
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT VI Z-transform:

Introduction– properties – Damping rule – Shifting rule – Initial and final value theorems - Inverse z transform- -Convolution theorem – Solution of difference equation by Z - transforms.

Subject Category
ABET Learning Objectives a b e k
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

BOOKS:

1. **B.S. GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
2. **DEAN G. DUFFY,** Advanced Engineering Mathematics with MATLAB, CRC Press
3. **V.RAVINDRANATH and P. VIJAYALAXMI,** Mathematical Methods, Himalaya Publishing House
4. **ERWYN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India

Subject Category	ABET Learning Objectives	ABET Internal Assessments	JNTUK External Evaluation	Remarks
Theory Design Analysis Algorithms Drawing Others	a) Apply knowledge of math, science, & engineering b) Design & conduct experiments, analyze & interpret data c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints d) Function on multidisciplinary teams e) Identify, formulate, & solve engineering problems f) Understand professional & ethical responsibilities g) Communicate effectively h) Understand impact of engineering solutions in global, economic, environmental, & societal context i) Recognize need for & be able to engage in lifelong learning j) Know contemporary issues k) Use techniques, skills, modern tools for engineering practices	1. Objective tests 2. Essay questions tests 3. Peer tutoring based 4. Simulation based 5. Design oriented 6. Problem based 7. Experiential (project based) based 8. Lab work or field work based 9. Presentation based 10. Case Studies based 11. Role-play based 12. Portfolio based	A. Questions should have: B. Definitions, Principle of operation or philosophy of concept. C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference. D. Design oriented problems E. Trouble shooting type of questions F. Applications related questions G. Brain storming questions	

I Year – I SEMESTER

T	P	C
3+1	0	3

ENGINEERING PHYSICS

UNIT-I

PHYSICAL OPTICS FOR INSTRUMENTS

"Objective Designing an instrument and enhancing the resolution for its operation would be effective as achieved through study of applicational aspects of physical Optics"

INTERFACE : Introduction – Interference in thin films by reflection – Newton's rings.

DIFFRACTION : Introduction – Fraunhofer diffraction - Fraunhofer diffraction at double slit (qualitative) – Diffraction grating – Grating spectrum – Resolving power of a grating – Rayleigh's criterion for resolving power.

POLARIZATION : Introduction – Types of Polarization – Double refraction – Quarter wave plate ad Half Wave plate.

UNIT-II

COHERENT OPTICS – COMMUNICATIONS AND STRUCTURE OF MATERIALS

Objectives while lasers are trusted Non-linear coherent sources established for the fitness of instrumentation, establishing a structure property relationship for materials requires allotment of an equivalent footing in convening the physics knowledge base.

LASERS: Introduction – coherent sources – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Three and Four level pumping schemes – Ruby laser – Helium Neon laser.

FIBER OPTICS : Introduction – Principle of Optical Fiber – Acceptance angle and acceptance cone – Numerical aperture.

CRYSTALLOGRAPHY : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC

X-RAY DIFFRACTION TECHNIQUES : Directions and planes in crystals – Miller indices – Separation between successive [h k l] planes – Bragg's law.

UNIT-III

MAGNETIC, ELECTRIC FIELD RESPONSE OF MATERIALS & SUPERCONDUCTIVITY

"Objective many of the Electrical or Electronic gadgets are designed basing on the response of naturally abundant and artificially made materials, while their response to E- or H- fields controls their performance.

MAGNETIC PROPERTIES : Magnetic permeability – Magnetization – Organ or magnetic moment – Classification of Magnetic materials – Dir, para, Ferro, anti ferro and ferri-magnetism – Hysteresis curve

DIELECTRIC PROPERTIES : Introduction – Dielectric constant – Electronic, ionic and orientational polarization – internal fields – Clausius – Mossotti equation – Dielectric loss, Breakdown and Strength.

SUPERCONDUCTIVITY : General properties – Meissner effect – Type I and Type II superconductors – BCS Theory Flux quantization London's equations – Penetration depth – DC and AC Josephson effects – SQUIDS.

UNIT – IV

ACOUSTICS AND EM – FIELDS:

Objective: The utility and nuances of ever pervading SHM and its consequences would be the first hand-on to as it clearly conveyed through the detailed studies of Acoustics of Buildings, while vectorial concepts of EM fields paves the student to gear – up for a deeper understanding.

ACOUSTICS: Sound absorption, absorption coefficient and its measurements, Reverberations time – Sabine's formula, Eyring's formula.

ELECTRO-MAGNETIC FIELDS: Gauss and stokes theorems (qualitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations (Calculus approach).

UNIT – V

QUANTUM MECHANICS FOR ELECTRONIC TRANSPORT

Objective: The discrepancy between classical estimates and laboratory observations of physical properties exhibited by materials would be lifted out through the understanding quantum picture of sub-atomic world dominated by electron and its presence.

QUANTUM MECHANICS: Introduction to matter waves – Schrodinger Time Independent and Time Dependent wave equations – Particle in a box.

FREE ELECTRON THEORY: Classical free electron theory – electrical conductivity – Mean free path – Relaxation time and drifty velocity – Quantum free electron theory – Fermi – Dirac (analytical) and its dependence on temperature – Fermi energy – density of states – derivations for current density.

BAND THEORY OF SOLIDS: Bloch theorem (qualitative) – Kronig – Penney model – Origin of energy band formation in solids – Classification of materials into conductors, semi – conductors & insulators – Concepts of effective mass of electron - concept of hole.

UNIT – VI

SEMICONDUCTOR PHYSICS:

Objective: In the wake of ever increasing demand for the space and power the watch word "small is beautiful", understanding the physics of electronic transport as underlying mechanism for appliances would provide a knowledge base.

Introduction – Intrinsic semiconductor and carrier concentration – Equation for conductivity – Extrinsic semiconductor and carrier concentration – Drift and diffusion – Einstein's equation – Hall Effect – direct & indirect band gap semiconductors – Electronic transport Mechanism for LEDs, Photo conductors and solar cells.

TEXT BOOKS

1. Solid state Physics by A.J. Dekker (Mc Millan India Ltd)
2. A text book of Engineering Physics by M.N. Avadhanulu & P.G. Kshirasagar (S. Chand publications)
3. Engineering Physics b;y M.R. Srinivasan (New Age international publishers)

REFERENCE BOOKS

1. 'Introduction to solid state physics' by Charles Kittle (Willey India Pvt.Ltd)
2. 'Applied Physics' by T. Bhimasenkaram (BSP BH Publications)
3. 'Applied Physics' by M.Arumugam (Anuradha Agencies)
4. 'Engineering Physics' by Palanisamy (Scitech Publishers)
5. 'Engineering Physics' by D.K.Bhattacharya (Oxford University press)
6. 'Engineering Physics' by Mani Naidu S (Pearson Publications)
7. 'Engineering Physics' by Sanjay D Jain and Girish G Sahasrabudhe (University Press)
8. 'Engineering Physics' by B.K.Pandey & S. Chaturvedi (Cengage Learning)

I Year – I SEMESTER

T	P	C
3+1	0	3

Professional Ethics and Human Values

UNIT I : Human Values:

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II : Engineering Ethics:

The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy –Professional and Professionalism –Professional Roles to be played by an Engineer –Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics-Kohlberg's Theory – Gilligan's Argument – Heinz's Dilemma.

UNIT III : Engineering as Social Experimentation:

Comparison with Standard Experiments – Knowledge gained – Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV : Engineers' Responsibility for Safety and Risk:

Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk-Short term v/s Long term Consequences- Expected Probability- Reversible Effects-Threshold Levels for Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V : Engineers' Responsibilities and Rights:

Collegiality-Techniques for Achieving Collegiality –Two Senses of Loyalty-obligations of Loyalty-misguided Loyalty – professionalism and Loyalty- Professional Rights –Professional Responsibilities – confidential and proprietary information-Conflict of Interest-solving conflict problems – Self-interest, Customs and Religion- Ethical egoism-Collective bargaining-Confidentiality-Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational Crimes-industrial espionage-price fixing-endangering lives- Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing.

UNIT VI : Global Issues:

Globalization- Cross-culture Issues-Environmental Ethics-Computer Ethics-computers as the instrument of Unethical behaviour-computers as the object of Unethical Acts-autonomous computers-computer codes of Ethics-Weapons Development-Ethics and Research-Analysing Ethical Problems in Research-Intellectual Property Rights.

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Text Books:

1. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
4. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
5. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication
6. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.

7. “Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

I Year – I SEMESTER

T	P	C
3+1	0	3

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

UNIT I

Objective: The objective is to introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.

Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.

UNIT II

Objective: The objective is to introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.

Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.

UNIT III

Objective: The objective is to make the students draw the projections of the lines inclined to both the planes.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

UNIT IV

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT V

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT VI

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

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

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers

REFERENCE BOOKS:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

I Year – I SEMESTER

T	P	C
0	3	2

ENGLISH – COMMUNICATION SKILLS LAB – I

Suggested Lab Manuals:

OBJECTIVE: To impart to the learner the skills of grammar as well as communication through listening, speaking, reading, and writing including soft, that is life skills.

BASIC COMMUNICATION SKILLS

UNIT 1	A. Greeting and Introductions
	B. Pure Vowels
UNIT 2	A. Asking for information and Requests
	B. Diphthongs
UNIT 3	A. Invitations
	B. Consonants
UNIT 4	A. Commands and Instructions
	B. Accent and Rhythm
UNIT 5	A. Suggestions and Opinions
	B. Intonation

Text Book:

'Strengthen your Communication Skills' Part-A by Maruthi Publications

Reference Books:

1. INFOTECH English (Maruthi Publications)
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)

I Year – I SEMESTER

T	P	C
0	3	2

ENGINEERING PHYSICS LAB

List of Experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence
2. Newton's rings –Radius of Curvature of Plano_Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of stretched string – Sonometer.
8. Determination of velocity of sound – Volume resonator.
9. L C R Senes Resonance Circuit
10. Study of I/V Characteristics of Semiconductor diode
11. I/V characteristics of Zener diode
12. Thermistor characteristics – Temperature Coefficient
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p.n junction.
15. Hall Effect for semiconductor.

REFERENCE REFERENCE:

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links)
2. Physics practical manual, Lorven Publications.

I Year – I SEMESTER

T	P	C
0	3	2

Engineering Physics
Virtual Labs - Assignments

List of Experiments

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size

URL : WWW.vlab.co.in

I Year – I SEMESTER

T	P	C
0	3	2

ENGINEERING WORKSHOP & IT WORKSHOP

ENGINEERING WORKSHOP:

Course Objective: To impart hands-on practice on basic engineering trades and skills.
Note: At least two exercises to be done from each trade.

Trade:

Carpentry	1. T-Lap Joint
	2. Cross Lap Joint
	3. Dovetail Joint
	4. Mortise and Tennon Joint
Fitting	1. Vee Fit
	2. Square Fit
	3. Half Round Fit
	4. Dovetail Fit
Black Smithy	1. Round rod to Square
	2. S-Hook
	3. Round Rod to Flat Ring
	4. Round Rod to Square headed bolt
House Wiring	1. Parallel / Series Connection of three bulbs
	2. Stair Case wiring
	3. Florescent Lamp Fitting
	4. Measurement of Earth Resistance
Tin Smithy	1. Taper Tray
	2. Square Box without lid
	3. Open Scoop
	4. Funnel

IT WORKSHOP:

Objectives: Enabling the student to understand basic hardware and software tools through practical exposure

PC Hardware:
Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers. Troubleshooting Hardware and software _ some tips and tricks.

Internet & World Wide Web:
Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums .Awareness of cyber hygiene(protecting the personal computer from getting infected with the viruses), worms and other cyber attacks .

Productivity tools Crafting professional word documents; excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools

(Note: Student should be thoroughly exposed to minimum of 12 Tasks)

PC Hardware

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

Task 2(Optional) : A practice on disassembling the components of a PC and assembling them to back to working condition.

Task 3: Examples of Operating systems- DOS, MS Windows, Installation of MS windows on a PC.
Task 4: Introduction to Memory and Storage Devices , I/O Port, Device Drivers, Assemblers, Compilers, Interpreters , Linkers, Loaders.
Task 5:
Hardware Troubleshooting (Demonstration):
Identification of a problem and fixing a defective PC(improper assembly or defective peripherals).
Software Troubleshooting (Demonstration):. Identification of a problem and fixing the PC for any software issues

Internet & Networking Infrastructure

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC ,Bluetooth Technology, Wireless Technology, Modem, DSL, Dialup Connection.
Orientation & Connectivity Boot Camp and web browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.
Task 7: **Search Engines & Netiquette:**
Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc). Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums
Task 8: Cyber Hygiene (Demonstration): Awareness of various threats on the internet. Importance of security patch updates and anti-virus solutions. Ethical Hacking, Firewalls, Multi-factor authentication techniques including Smartcard, Biometrics are also practiced

Word

Task 9 : MS Word Orientation:
Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving
Task 10: Creating project : Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Excel

Task 11: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations
Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

LOOKUP/VLOOKUP

Task 12: Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power Point

Task 13: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in Powerpoint.

Task 14: Focusing on the power and potential of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides, OLE in PPT.

TEXT BOOK:

Faculty to consolidate the workshop manuals using the following references

1. Computer Fundamentals, Anita Goel, Pearson
2. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson,2008
3. Information Technology Workshop,3e, G Praveen Babu, M V Narayana BS Publications.
4. Comdex Information Technology , Vikas Gupta, dreamtech.

REFERENCE BOOK:

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu

I Year – II SEMESTER

T	P	C
3+1	0	3

ENGLISH –II
(Common to All Branches)

DETAILED TEXT-II : Sure Outcomes: English for Engineers and Technologists

Recommended Topics :

1. **TECHNOLOGY WITH A HUMAN FACE**
   OBJECTIVE: To make the learner understand how modern life has been shaped by technology.
   OUTCOME: The proposed technology is people's technology. It serves the human person instead of making him the servant of machines.
2. **CLIMATE CHANGE AND HUMAN STRATEGY**
   OBJECTIVE: To make the learner understand how the unequal heating of earth's surface by the Sun, an atmospheric circulation pattern is developed and maintained.
   OUTCOME: The learner's understand that climate must be preserved.
3. **EMERGING TECHNOLOGIES**
   OBJECTIVE: To introduce the technologies of the 20th century and 21st centuries to the learners.
   OUTCOME: The learner will adopt the applications of modern technologies such as nanotechnology.
4. **WATER- THE ELIXIR OF LIFE**
   OBJECTIVE: To inform the learner of the various advantages and characteristics of water.
   OUTCOME: The learners will understand that water is the elixir of life.
5. **THE SECRET OF WORK**
   OBJECTIVE:: In this lesson, Swami Vivekananda highlights the importance of work for any development.
   OUTCOME: The students will learn to work hard with devotion and dedication.
6. **WORK BRINGS SOLACE**
   OBJECTIVE: In this lesson Abdul Kalam highlights the advantage of work.
   OUTCOME: The students will understand the advantages of work. They will overcome their personal problems and address themselves to national and other problems.

Text Book : 'Sure Outcomes' by Orient Black Swan Pvt. Ltd. Publishers

NON-DETAILED TEXT:

(From Modern Trailblazers of Orient Blackswan)
(Common single Text book for two semesters)
(Semester I (1 to 4 lessons)/ Semester II (5 to 8 lessons)

5. **J.C. Bose**
   OBJECTIVE: To apprise of J.C.Bose's original contributions.
   OUTCOME: The learner will be inspired by Bose's achievements so that he may start his own original work.
6. **Homi Jehangir Bhaba**
   OBJECTIVE: To show Bhabha as the originator of nuclear experiments in India.
   OUTCOME: The learner will be inspired by Bhabha's achievements so as to make his own experiments.
7. **Vikram Sarabhai**
   OBJECTIVE: To inform the learner of the pioneering experiments conducted by Sarabhai in nuclear energy and relevance of space programmes.
   OUTCOME: The learner will realize that development is impossible without scientific research.

8. **A Shadow- R.K.Narayan**
   OBJECTIVE: To expose the reader to the pleasure of the humorous story
   OUTCOME: The learner will be in a position to appreciate the art of writing a short story and try his hand at it.

Text Book : 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers

I Year – II SEMESTER

T	P	C
3+1	0	3

MATHEMATICS – III
(LINEAR ALGEBRA & VECTOR CALCULUS)
(Common to All Branches)

UNIT I Linear systems of equations:
Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- Gauss Elimination - Gauss Jordon and Gauss Seidal Methods.
Application: Finding the current in a electrical circuit.
Subject Category
ABET Learning Objectives a e k
ABET internal assessments 1 2 6 4
JNTUK External Evaluation A B E

UNIT II Eigen values - Eigen vectors and Quadratic forms:
Eigen values - Eigen vectors– Properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index – signature.
Application: Free vibration of a two-mass system.
Subject Category
ABET Learning Objectives a d e k
ABET internal assessments 1 2 4 6
JNTUK External Evaluation A B E

UNIT III Multiple integrals:
Review concepts of Curve tracing (Cartesian - Polar and Parametric curves)-
Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates.
Multiple integrals - double and triple integrals – change of variables – Change of order of Integration
Application: Moments of inertia
Subject Category
ABET Learning Objectives a e d
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT IV Special functions:
Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals
Application: Evaluation of integrals
Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT V Vector Differentiation:
Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities
Application: Equation of continuity, potential surfaces
Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT VI Vector Integration:
Line integral – work done – Potential function – area- surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems.
application: work done, Force

Subject Category	
ABET Learning Objectives	a e
ABET internal assessments	1 2 6
JNTUK External Evaluation	A B E

BOOKS:

1. **GREENBERG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
2. **B.V. RAMANA,** Higher Engineering Mathematics, Tata McGrawhill
3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
4. **PETER O'NEIL,** Advanced Engineering Mathematics, Cengage Learning
5. **D.W. JORDAN AND T. SMITH,** Mathematical Techniques, Oxford University Press

Subject Category	ABET Learning Objectives	ABET Internal Assessments	JNTUK External Evaluation	Remarks
Theory Design Analysis Algorithms Drawing Others	a) Apply knowledge of math, science, & engineering b) Design & conduct experiments, analyze & interpret data c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints d) Function on multidisciplinary teams e) Identify, formulate, & solve engineering problems f) Understand professional & ethical responsibilities g) Communicate effectively h) Understand impact of engineering solutions in global, economic, environmental, & societal context i) Recognize need for & be able to engage in lifelong learning j) Know contemporary issues k) Use techniques, skills, modern tools for engineering practices	1. Objective tests 2. Essay questions tests 3. Peer tutoring based 4. Simulation based 5. Design oriented 6. Problem based 7. Experiential (project based) based 8. Lab work or field work based 9. Presentation based 10. Case Studies based 11. Role-play based 12. Portfolio based	A. Questions should have: B. Definitions, Principle of operation or philosophy of concept. C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference. D. Design oriented problems E. Trouble shooting type of questions F. Applications related questions G. Brain storming questions	

I Year – II SEMESTER

T	P	C
3+1	0	3

ENGINEERING CHEMISTRY

UNIT-I: WATER TECHNOLOGY

Hard Water – Estimation of hardness by EDTA method – Potable water- Sterilization and Disinfection – Boiler feed water – Boiler troubles – Priming and foaming , scale formation, corrosion, caustic embrittlement, turbine deposits – Softening of water – Lime soda, Zeolite processes – Reverse osmosis – Electro Dialysis, Ion exchange process

Objectives : For prospective engineers knowledge about water used in industries (boilers etc.) and for drinking purposes is useful; hence chemistry of hard water, boiler troubles and modern methods of softening hard water is introduced.

UNIT-II : ELECTROCHEMISTRY

Concept of Ionic conductance – Ionic Mobilities – Applications of Kohlrausch law – Conductometric titrations – Galvanic cells – Electrode potentials – Nernst equation – Electrochemical series – Potentiometric titrations – Concentration cells – Ion selective electrode –Glass electrodes – Fluoride electrode; Batteries and Fuel cells

Objectives : Knowledge of galvanic cells, electrode potentials, concentration cells is necessary for engineers to understand corrosion problem and its control ; also this knowledge helps in understanding modern bio-sensors, fuel cells and improve them.

UNIT-III : CORROSION

Causes and effects of corrosion – theories of corrosion (dry, chemical and electrochemical corrosion) – Factors affecting corrosion – Corrosion control methods – Cathodic protection – Sacrificial Anodic, Impressed current methods – Surface coatings – Methods of application on metals (Hot dipping, Galvanizing, tinning , Cladding, Electroplating, Electroless plating) – Organic surface coatings – Paints – Their constituents and their functions.

Objectives : the problems associated with corrosion are well known and the engineers must be aware of these problems and also how to counter them

UNIT-IV : HIGH POLYMERS

Types of Polymerization – Stereo regular Polymers – Physical and Mechanical properties of polymers – Plastics – Thermoplastics and thermo setting plastics – Compounding and Fabrication of plastics – Preparation and properties of Polyethylene, PVC and Bakelite – Elastomers – Rubber and Vulcanization – Synthetic rubbers – Styrene butadiene rubber – Thiokol – applications.

Objectives : Plastics are materials used very widely as engineering materials. An understanding of properties particularly physical and mechanical properties of polymers / plastics / elastomers helps in selecting suitable materials for different purposes.

UNIT-V : FUELS

Coal – Proximate and ultimate analysis – Numerical problems based on analysis – Calorific vaule – HCV and LCV – Problems based on calorific values; petroleum – Refining – Cracking – Petrol – Diesel knocking; Gaseous fuels – Natural gas – LPG, CNG – Combustion – Problems on air requirements.

Objectives : A board understanding of the more important fuels employed on a large scale is necessary for all engineer to understand energy – related problems and solve them.

UNIT-VI : CHEMISTRY OF ADVANCED MATERIALS

Nanometerials (Preparation of carbon nanotubes and fullerenes – Properties of nanomaterials – Engineering applications) – Liquid crystals (Types – Application in LCD and Engineering Applications) – Fiber reinforced plastics – Biodegradable polymers – Conducting polymers – Solar cells (Solar heaters – Photo voltaic cells – Solar reflectors – Green house concepts –

Green chemistry (Methods for green synthesis and Applications) – Cement – Hardening and setting – Deterioration of cement concrete

Objectives : With the knowledge available now, future engineers should know at least some of the advanced materials that are becoming available. Hence some of them are introduced here.

TEXT BOOKSS

1. Jain and Jain (Latest Edition), Engineering Chemistry, Dhanpat Rai Publishing company Ltd,
2. N.Y.S.Murthy, V.Anuradha, KRamaRao "A Text Book of Engineering Chemistry", Maruthi Publications
3. C.Parameswara Murthy, C.V.Agarwal, Adhra Naidu (2006) Text Book of Engineering Chemistry, B.S.Publications
4. B.Sivasankar (2010), Engineering Chemistry, McGraw-Hill companies.
5. Ch.Venkata Ramana Reddy and Ramadevi (2013) , Engineering Chemistry, Cengage Learning

REFERENCES

1. S.S. Dara (2013) Text Book of Engineering Chemistry, S.Chand Technical Series
2. K.Sesha Maheswaramma and Mridula Chugh (2013), Engineering Chemistry, Pearson Publications.
3. R.Gopalan, D.Venkatappayya, Sulochana Nagarajan (2011), Text Book of Engineering Chemistry, Vikas Publications.
4. B.Viswanathan and M.Aulice Scibioh (2009), Fuel Cells, Principals and applications, University Press.

I Year – II SEMESTER

T	P	C
3+1	0	3

ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes ,resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction , direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces : Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. Introduction **,** limiting friction and impending motion, coulomb's laws of dry friction , coefficient of friction, cone of friction

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces : Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid : Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity : Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.

UNIT IV

Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia :** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives : The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Kinematics : Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics :** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

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UNIT – VI

Objectives: The students are to be exposed to concepts of work, energy and particle motion

Work – Energy Method : Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS:

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics: Statics and Dynamics 3rd edition, Andrew Pytel and Jaan Kiusalaas; Cengage Learning publishers.

REFERENCES:

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics , statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics , dynamics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
4. Engineering Mechanics , statics and dynamics – I.H.Shames, – Pearson Publ.
5. Mechanics For Engineers , statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
7. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
8. Engineering Mechanics , Fedinand . L. Singer , Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson, Mc Graw Hill publications
10. Engineering Mechanics, Tayal. Umesh Publ.

T	P	C
3+1	0	3

COMPUTER PROGRAMMING

Objectives: Formulating algorithmic solutions to problems and implementing algorithms in C

UNIT I:
Unit objective: Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux
Introduction: Computer systems, Hardware and Software Concepts**,**
Problem Solving: Algorithm / Pseudo code, flowchart, program development steps, computer languages: machine, symbolic and highlevel languages, Creating and Running Programs: Writing, Editing(vi/emacs editor), Compiling(gcc), Linking and Executing in under Linux.
BASICS OF C: Structure of a C program, identifiers, basic data types and sizes. Constants, Variables, Arthmetic , relational and logical operators, increment and decrement operators, conditional operator, assignment operator, expressions, type conversions, Conditional Expressions, precedence and order of evaluation, Sample Programs.

UNIT II:
Unit objective: understanding branching, iteration and data representation using arrays
SELECTION – MAKING DECISION: TWO WAY SELECTION: if-else, null else, nested if, examples, Multi-way selection: switch, else-if, examples**.**
ITERATIVE: loops- while, do-while and for statements , break, continue, initialization and updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest.
ARRAYS: Arrays- concepts, declaration, definition, accessing elements, storing elements, Strings and String Manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix**.**
STRINGS: concepts, c strings.

UNIT III:
Objective: Modular programming and recursive solution formulation
FUNCTIONS- MODULAR PROGRAMMING: functions, basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs, Passing 1-D arrays, 2-D arrays to functions.

UNIT IV:
Objective: Understanding pointers and dynamic memory allocation
POINTERS: pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address- dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT V:
Objective: Understanding miscellaneous aspects of C
ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications
BIT-WISE OPERATORS: logical, shift, rotation, masks.

UNIT VI:

Objective: Comprehension of file operations

FILE HANDLING: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, example programs

Text Books:

1. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PERSON
2. Programming in C, Second Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education
3. Programming in C, A practical approach Ajay Mittal PEARSON
4. The C programming Language by Dennis Richie and Brian Kernighan
5. Programming in C, B. L. Juneja, Anith Seth, Cengage Learning.

Reference Books and web links:

1. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE
2. Programming with C, Bichkar, Universities Press
3. Programming in C, Reema Thareja, OXFORD
4. C by Example, Noel Kalicharan, Cambridge

I Year – II SEMESTER

T	P	C
3+1	0	3

NETWORK ANALYSIS

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. (Text Books: 1,2,3, Reference Books: 3)

A.C Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule. (Text Books: 2,3, Reference Books: 3)

UNIT – II

Steady State Analysis of A.C Circuits : Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

UNIT – III

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

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case- resistance present in both branches, anti resonance at all frequencies. (Text Books:2,3, Reference Books: 3)

UNIT – IV

Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens- problem solving using dependent sources also. (Text Books: 1,2,3, Reference Books: 2)

UNIT – V

Two-port networks : Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also. (Text Books: 1,2, Reference Books: 1,3)

UNIT – VI

Transients : First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

TEXT BOOKS :

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning
3. Electric Circuit Analysis by Hayt and Kimmarle, TMH

REFERENCES:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers.
3. Network Analysis and Filter Design by Chadha, Umesh Publications.

I Year – II SEMESTER

T	P	C
0	3	2

ENGINEERING CHEMISTRY LABORATORY

List of Experiments

1. Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Quantitative analysis etc.,
2. Trial experiment – Estimation of HCI using standard Na_2co_3 solutions
3. Estimation of $KMnO_4$ using standard Oxalic acid solution.
4. Estimation of Ferric iron using standard $K_2Cr_2O_7$ solution.
5. Estimation of Copper using standard $K_2Cr_2O_7$ solution.
6. Estimation of Total Hardness water using standard EDTA solution.
7. Estimation of Copper using standard EDTA solution.
8. Estimation of Copper using Colorimeter
9. Estimation of pH of the given sample solution using pH meter.
10. Conductometric Titrations between strong acid and strong base
11. Conductometric Titrations between strong acid and Weak base
12. Potentiometric Titrations between strong acid and strong base
13. Potentiometric Titrations between strong acid and Weak base
14. Estimatinog of Zinc using standard potassium ferrocyanide solution
15. Estimation of Vitamin – C

TEXT BOOKSS

1. Dr.Jyotsna Cherukuis(2012)Laboratory Manual of Engineering Chemistry-II, VGS Techno Series
2. Chemistry Practical Manual, Lorven Publications
3. K. Mukkanti (2009) Practical Engineering Chemistry, B.S.Publication

I Year – II SEMESTER

T	P	C
0	3	2

ENGLISH – COMMUNICATION SKILLS LAB – II

Suggested Lab Manuals:

OBJECTIVE: To impart to the learner the skills of grammar as well as communication through listening, speaking, reading, and writing including soft, that is life skills.

ADVANCED COMMUNICATION SKILLS

UNIT 6	Body language
UNIT 7	Dialogues
UNIT 8	Interviews and Telephonic Interviews
UNIT 9	Group Discussions
UNIT 10	Presentation Skills
UNIT 11	Debates

Text Book:

'Strengthen your Communication Skills' Part-B by Maruthi Publications

Reference Books:

1. INFOTECH English (Maruthi Publications)
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)

T	P	C
0	3	2

COMPUTER PROGRAMMING LAB

Exercise l

a) Write a C Program to calculate the area of triangle using the formula
area = (s (s-a) (s-b)(s-c))$^{1/2}$ where s= (a+b+c)/2

b) Write a C program to find the largest of three numbers using ternary operator.

c) Write a C Program to swap two numbers without using a temporary variable.

Exercise 2

a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

b) Write a C program to find the roots of a quadratic equation.

c) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.

b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 4

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.

b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.

c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to implement a liner search.

c) Write a C program to implement binary search

Exercise 6

a) Write a C program to implement sorting of an array of elements .

b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them

Exercise 7

Write a C program that uses functions to perform the following operations:

i. To insert a sub-string in to given main string from a given position.
ii. To delete n Characters from a given position in a given string.
iii. To replace a character of string either from beginning or ending or at a specified location

Exercise 8

Write a C program that uses functions to perform the following operations using Structure:

i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers

Exercise 9

Write C Programs for the following string operations without using the built in functions

- to concatenate two strings
- to append a string to another string

- to compare two strings

Exercise 10

Write C Programs for the following string operations without using the built in functions

- to find t he length of a string
- to find whether a given string is palindrome or not

Exercise 11

a) Write a C functions to find both the largest and smallest number of an array of integers.

b) Write C programs illustrating call by value and call by reference cncepts.

Exercise 12

Write C programs that use both recursive and non-recursive functions for the following

i) To find the factorial of a given integer.

ii) To find the GCD (greatest common divisor) of two given integers.

iii) To find Fibonacci sequence

Exercise 13

a) Write C Program to reverse a string using pointers

b) Write a C Program to compare two arrays using pointers

Exercise 14

a) Write a C program consisting of Pointer based function to exchange value of two integers using passing by address.

b) Write a C program to swap two numbers using pointers

Exercise 15

Examples which explores the use of structures, union and other user defined variables

Exercise 16

a) Write a C program which copies one file to another.

b) Write a C program to count the number of characters and number of lines in a file.

c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

Electronic Devices and Circuits

Unit-I

Semi Conductor Physics : Insulators, Semi conductors and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

Unit- II

Junction Diode Characteristics : Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Devices*: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT. Construction, operation and characteristics of all the diodes is required to be considered.*

Unit- III

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms; Filters: Inductor filter, Capacitor filter, L- section filter, Π- section filter, Multiple L- section and Multiple Π section filter ,comparison of various filter circuits in terms of ripple factors.

Unit- IV

Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

Unit- V

Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability.

FET Biasing- methods and stabilization.

Unit- VI

Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters,

Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Electronic Devices and Circuits-B.P.Singh, Rekha Singh,Pearson Publications,Second Edition.
3. Electronic Devices and Circuits-David A.Bell, Oxford University Press, Fifth Edition.

REFERENCES:

1. Electronic Devices and Circuits- K. Satya Prasad,
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition
3. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky,Pearson Publications,Tenth Edition.
4. Electronic Devices and Circuits -BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, Pearson, 2nd edition.

5. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

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II Year – I SEMESTER

T	P	C
3+1	0	3

Electrical Technology

This course covers various topics related to principle of operation and performance of various electrical machines.

Learning objectives:

i. To learn the principle of electromechanical energy conversion of single excited and multi excited machines.
ii. To understand the principle of operation, constructional details and operational characteristics of DC generators.
iii. To understand the principle and characteristics of DC motors. To introduce starting and speed control methods of DC motors.
iv. To learn the principle of operation and constructional details of transformers. Develop the equivalent circuit and evaluate the performance of transformers.
v. To learn the principle of operation and constructional details of three phase induction motor. Study the torque – slip characteristics and starting methods of induction motor.
vi. To study the principle of operation of single phase induction motor, shaded pole motor, capacitor motor and AC servo motor.

UNIT I

ELECTROMECHANICAL ENERGY CONVERSION : Introduction to S.I units – Principles of electromechanical energy conversion – forces and torque in a magnetic field systems-energy balance – single excited machine – magnetic forces– co-energy – multi excited magnetic field system.

UNIT II

DC GENERATORS : Principle of operation and construction of DC generators - EMF equation – types of generators – magnetization and load characteristics of DC generators.

UNIT III

DC MOTORS : Principle of operation and construction of DC Motors – types of DC Motors – Characteristics of DC motors – basic starting methods for DC shunt motor – losses and efficiency – Swinburne's test – speed control of DC shunt motor – flux and Armature voltage control methods.

UNIT IV

TRANSFORMERS : Principle of operation of single phase transformer – types – constructional features – phasor diagram on no-load and load – equivalent circuit,
losses and efficiency of transformer - regulation of transformer – OC and SC tests – predetermination of efficiency and regulation.

UNIT V

INDUCTION MACHINE : Principle of operation and construction of three-phase induction motors –slip ring and squirrel cage motors – slip-torque characteristics – efficiency calculation – starting methods.

UNIT VI

SPECIAL MACHINES : Principle of operation and construction - single phase induction motor - shaded pole motors – capacitor motors and AC servomotor.

Learning outcomes:

1. Able to understand the principles of electro mechanical energy conversion.

2. Able to explain the operation of DC generator and analyze the characteristics of DC generator.

3. Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DC motors.

4. Capability to develop equivalent circuit and evaluate performance of transformers.

5. Ability to analyze speed – torque characteristics of induction motor and understand starting methods of induction motor.

6. Capability to understand the operation of various special machines.

TEXT BOOKS:

1. Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chand publications
2. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria & Sons

REFERENCE BOOKS:

1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
3. Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications,2nd edition

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Signals and Systems

UNIT I

SIGNAL ANALYSIS & FOURIER SERIES : Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions, Exponential and sinusoidal signals, Concepts of Impulse function, Unit step function, Signum function.Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum

UNIT II

FOURIER TRANSFORMS & SAMPLING: Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Sampling theorem – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT III

SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS : Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT IV

CONVOLUTION AND CORRELATION OF SIGNALS : Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT V

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

UNIT VI

Z–TRANSFORMS : Fundamental difference between continuous and discrete time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS :

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals & Systems- Narayan Iyer and K Satya Prasad , Cenage Pub.

REFERENCES :

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009
3. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
4. Signals and Systems – T K Rawat , Oxford University press, 2011

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II Year – I SEMESTER

T	P	C
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Data Structures

Objectives: Comprehensive knowledge of data structures and ability to implement the same in software applications

UNIT I:

Objective: exposure to algorithmic complexities, recursive algorithms, searching and sorting techniques

Preliminaries of algorithm, Algorithm analysis and complexity,

Data structure- Definition, types of data structures

Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi, Tail recursion

List Searches using Linear Search, Binary Search, *Fibonacci Search*

Sorting Techniques: Basic concepts, Sorting by : insertion (Insertion sort), selection (heap sort), exchange (bubble sort, quick sort), distribution (radix sort) and merging (merge sort) *Algorithms.*

UNIT II:

Objectives: Applying stack and queue techniques for logical operations

Stacks and Queues: Basic Stack Operations, Representation of a Stack using Arrays, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions.

Queues: Basic Queues Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues-Round robin Algorithm, Circular Queues, Priority Queues.

UNIT III:

Objectives: Exposure to list representation models in various types of applications

Linked Lists: Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, Reversing a single linked list, applications of single linked list to represent polynomial expressions and sparse matrix manipulation, Advantages and disadvantages of single linked list, Circular linked list, Double linked list

UNIT IV:

Objectives: Implementation of tree implementation in various forms

Trees: Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays and linked lists, operations on a Binary tree , Binary Tree Traversals (recursive), Creation of binary tree from in, pre and post order traversals

UNIT-V:

Objectives: Advanced understanding of other variants of trees and their operations

Advanced concepts of Trees: Tree Travels using stack (non recursive), Threaded Binary Trees. Binary search tree, Basic concepts, BST operations: insertion, deletion, Balanced binary trees – need, basics and applications in computer science (No operations)

UNIT VI:

Objectives: orientation on graphs, representation of graphs, graph traversals, spanning trees

Graphs: Basic concepts, Representations of Graphs: using Linked list and adjacency matrix, Graph algorithms

Graph Traversals (BFS & DFS), applications: Dijkstra's shortest path, Transitive closure, Minimum Spanning Tree using Prim's Algorithm, warshall's Algorithm(**Algorithemic Concepts Only, No Programs required**).

TEXT BOOKS:

1. Data Structure with C, Seymour Lipschutz, TMH
2. Data Structures using C,Reema Thareja, Oxford
3. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage
4. Data structures and algorithm analysis in C, 2nd ed, mark allen weiss

REFERENCE BOOKS:

1. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH
2. Classic Data Structures, 2/e, Debasis ,Samanta,PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz,Sahni, Anderson Freed,University Prees

T	P	C
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Transducer Technology

UNIT-I: INTRODUCTION TO MEASUREMENT SYSTEMS:
Functional Elements of an Instrument, Sensor Classification – Passive – R,L,C types and Active sensors. General Input Output Configuration, Methods of Correction.
GENERALIZED PERFORMANCE CHARACTERISTICS OF INSTRUMENTS:
Static characteristics and Dynamic characteristics of a measurement system, Calibration and standards, Errors in Measurement, Statistical analysis. Zero, first and second order system and their response.

UNIT – II: VELOCITY, ACCELERATION, FORCE AND TORQUE MEASUREMENT
Relative velocity – Translational and Rotational velocity measurement – Revolution counters and Timers – Magnetic and Photoelectric pulse counting, stroboscopic methods - Accelerometers of different types - Gyroscopes, piezoelectric sensors. Force measurement – Different methods –Torque measurement – Dynamometers- Gyroscopic Force and Torque Measurement – Vibrating wire Force transducer

UNIT – III: PRESSURE MEASUREMENT
Basics of Pressure measurement – Deadweight Gages and Manometers types – Force-Balance and Vibrating Cylinder Transducers – High and Low Pressure measurement – McLeod Gage, Knudsen Gage, Momentum Transfer Gages, Thermal Conductivity Gages, Ionization Gazes, Dual Gage Techniques.

UNIT – IV: FLOW MEASUREMENT
Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, mass flow meter, ultrasonic type ,vertex shedding type, Hotwire anemometer type, Laser Doppler Velocity meter.

UNIT – V: TEMPERATURE AND RADIATION MEASUREMENT
Resistive temperature detectors (RTDs), Thermistors, Thermocouples. Radiation Fundamentals, Total radiation pyrometer, Optical Pyrometer.

UNIT – VI: OTHER MEASUREMENTS
Liquid Level: Resistance gauge, capacitance gauge, ultrasonic method, Float type. Humidity measurement. Strain-Strain gauge, Displacement-LVDT.

TEXT BOOKS:

1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997.

REFERENCES:

1. Process Instruments and Control Handbook – by Considine D.M., 4/e, McGraw Hill International, 1993.
2. Mechanical and Industrial Measurements – by Jain R.K., Khanna Publishers, 1986.
3. Instrument Technology, vol. I – by Jones E.B., Butterworths, 1981.

T	P	C
3	0	3

Environmental Studies

Course Learning Objectives:

The objectives of the course is to impart

1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
4. An understanding of the environmental impact of developmental activities
5. Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

The student should have knowledge on

1. The natural resources and their importance for the sustenance of the life and recognise the need to conserve the natural resources
2. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
3. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
4. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
5. Social issues both rural and urban environment and the possible means to combat the challenges
6. The environmental legislations of India and the first global initiatives towards sustainable development.
7. About environmental assessment and the stages involved in EIA and the environmental audit

Syllabus:

UNIT - I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT - II

Natural 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, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT - IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.

Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

UNIT - V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT - VI

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism

The student should submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies by R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi

3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Environmental Studies by Piyush Malaviya, Pratibha Singh, Anoop singh: Acme Learning, New Delhi

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Electronic Devices and Circuits Lab

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments
(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
   Part A: V-I Characteristics
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics(CE Configuration)
   Part A: Input Characteristics
   Part B: Output Characteristics
5. FET Characteristics(CS Configuration)
   Part A: Drain Characteristics
   Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

PART C: Equipment required for Laboratory

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

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II Year – I SEMESTER

T	P	C
0	3	2

Networks & Electrical Technology Lab

PART – A

Any five experiments are to be conducted from each part

1. Series and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Brake test on 3-phase Induction motor (performance characteristics).
6. Regulation of alternator by synchronous impedance method

T	P	C
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Electronic Circuit Analysis

Unit-I

Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductances, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

Unit-II

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

Unit -III

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

Unit-IV

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

Unit-V

Power Amplifiers: Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Advanced power amplifiers, Distortion in amplifiers.

Unit-VI

Tuned Amplifiers : Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, effect of cascading single tuned amplifiers on band width, effect of cascading double tuned amplifiers on band width, staggered tuned amplifiers, stability of tuned amplifiers, wideband amplifiers.

TEXT BOOKS:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 1972.
2. Electronic Circuit Analysis-B.V.Rao,K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
3. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

REFERENCES:

1. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.
2. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.

3. Electronic Circuits-I-Ravish R Singh-Peason Publications.
4. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
5. Electronic circuits Principles and Application-R.D.S.Samuel,B.Sujatha,Elesevier Publications.

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II Year – II SEMESTER

T	P	C
3+1	0	3

Electromagnetic Waves and Transmission Lines

UNIT I

Electrostatics: Coulomb's Law, Electric Field Intensity Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

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

UNIT II

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

UNIT III

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H. Sinusoidal Variations. Wave Propagation in Lossless and Conducting Media. Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics. Polarization. Illustrative Problems.

UNIT IV

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor. Illustrative Problems.

UNIT VI

Transmission Lines - I : Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading. Illustrative Problems.

UNIT VI

Transmission Lines – II : Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations. Smith Chart – Configuration and Applications, Single and Double Stub Matching. Illustrative Problems.

TEXT BOOKS :

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCES :

1. Electromagnetic Fields and Wave Theory –GSN Raju, Pearson Education 2006
2. Engineering Electromagnetics:Nathan Ida,Springer(India)Pvt.Ltd., New Delhi, 2nd ed., 2005.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
4. Electromagnetic Field Theory and TransmissionLines :G SasiBhushanaRao,Wiley India 2013
5. Transmission Lines and Networks–Umesh Sinha,Satya Prakashan (Tech. India Publications), New Delhi, 2001.
6. Electromagnetic waves and transmission lines – R S Rao, PHI, EEE edition

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II Year – II SEMESTER

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Unit – I: (*The Learning objective of this Unit is to understand the concept and nature of Managerial Economic s and its relationship with other disciplines, Concept of Demand and Demand forecasting)

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Concepts of Demand-Types-Determents-Law of Demand its Exception-Elasticity of Demand-Types and Measurement-Demand forecasting and its Methods.

(**The Learner is equipped with the knowledge of estimating the Demand for a product and the relationship between Price and Demand)

Unit – II: (*The Learning objective of this Unit is to understand the concept of Production function, Input Output relationship, different Cost Concepts and Concept of Cost-Volume-Profit Analysis)

Production and Cost Analyses:

Production function-Isoquants and Isocosts-Law of Variable proportions-Cobb-Douglas Production function-Economics of Sale-Cost Concepts-Opportunity Cost-Fixed vs Variable Costs-Explicit Costs vs Implicit Costs-Out of Pocket Costs vs Imputed Costs-Cost Volume Profit analysis-Determination of Break-Even Point (Simple Problem)

(**One should understand the Cost Concepts for decision making and to estimate the least cost combination of inputs).

Unit – III: (*The Learning Objective of this Unit is t understand the Nature of Competition, Characteristics of Pricing in the different market structure and significance of various pricing methods)

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly and Monopolistic and Oligopoly – Features – Price, Output Determination – Managerial Theories of firm: Maris and Williamson's models – Methods of Pricing: Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive, Transaction based pricing, Priority Pricing.

(** One has to understand the nature of different markets and Price Output determination under various market conditions)

Unit – IV: (*The Learning objective of this Unit is to know the different forms of Business organization and their Merits and Demerits both public & private Enterprises and the concepts of Business Cycles)

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle.

(**One should equipped with the knowledge of different Business Units)

Unit – V: (*The Learning objective of this Unit is to understand the different Accounting Systems preparation of Financial Statements and uses of different tools for performance evaluation)

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow cash flow statements (Simple Problems)

(**The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis)

Unit – VI: (*The Learning objective of this Unit is to understand the concept of Capital, Capitalization, Capital Budgeting and to know the techniques used to evaluate Capital Budgeting proposals by using different methods)

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Need for Capital Budgeting-Techniques of Capital Budgeting-Traditional and Modern Methods.

(**The Learner is able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making)

Note: *Learning Objective

** Learning Assessment

TEXT BOOKS

1. Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakara rao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

REFERENCES:

1. V. Maheswari: Managerial Economics, Sultan Chand.
2. Suma Damodaran: Managerial Economics, Oxford 2011.
3. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012

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Switching Theory and Logic Design

UNIT – I

Review of Number systems & codes:

i) Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, problem solving.
ii) 4 bit codes, BCD, Excess-3, 2421, 84-2-1 $9^{'s}$ compliment code etc.,
iii) Logic operations and error detection & correction codes; Basic logic operations - NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS, Forms, Gray code, error detection, error correction codes (parity checking, even parity, odd parity, Hamming code) NAND-NAND and NOR-NOR realizations.

UNIT – II

Minimization techniques:

Boolean theorems, principle of complementation & duality, De-morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

UNIT – III

Combinational logic circuits design :

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit, Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, 4-bit digital comparator.

UNIT – IV

Introduction of PLD's :

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

UNIT – V

Sequential circuits I:

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

UNIT – VI

Sequential circuits II :

Finite state machine; Analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures. Realization of circuits using various flip-flops. Meelay to Moore conversion and vice-versa.

TEXT BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.

2. Switching Theory and Logic Design by A. Anand Kumar

3. Digital Design by Mano PHI.

REFERENCE BOOKS:

1. Modern Digital Electronics by RP Jain, TMH

2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers

3. Micro electronics by Milliman MH edition.

II Year – II SEMESTER

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Signal Conditioning

UNIT-I:

SIGNAL CONDITIONING FOR RESISTIVE SENSORS

Measurement of resistance, Voltage dividers - amplifiers for voltage dividers, wheat stone bridge- balance measurements-deflection measurements- sensitivity, linearity, analog linearization of resistive sensor bridges. Grounding and Isolation, sensor bridge calibration and compensation. Kelvin bridge.

UNIT-II

SIGNAL CONDITIONING FOR INDUCTIVE VARIATION SENSORS

Problems and alternatives, ac bridges - measurement of inductance – Hey bridge, maxwell's bridge, anderson bridge. carrier amplifiers and coherent detection – fundamentals and structure, application to the LVDT, variable oscillators, resolver - to - digital and digital – to - resolver converters.

UNIT-III

SIGNAL CONDITIONING FOR CAPACITIVE VARIATION SENSORS

measurement of Capacitance - schering bridge, Desauty bridge. Specific signal conditioners for capacitive sensors. phase sensitive detectors for capacitive sensors, sensitivity, linearity, capacitive bridge analog liniearisaton.

UNIT-IV

SIGNAL CONDITIONING FOR SELF-GENERATING SENSORS

Chopper and low-drift amplifiers, offset and drifts amplifiers, electrometer amplifiers, charge amplifiers, noise in amplifiers.

UNIT-V

ELEMENTS OF SIGNAL CONDITIONING CIRCUITS:

Inverting and non inverting amplifiers, difference amplifier, integrator and differentiator circuits,V-to-Iand I-to-V converters, instrumentation amplifier, Log and Anti log amplifiers, Schmitt Trigger, Comparators, Multivibrators, 555 timer, Precision rectifiers. Active filters, interference types and reduction.

UNIT-VI

SIGNAL CONDITIONING CIRCUITS FOR OTHER SENSORS

Signal Conditioning Circuits for Thermometers based on semiconductor junctions-Magnetodiodes-Photodiodes-Sensors based on MOSFET Transistors-Charge-Coupled and CMOS Image sensors-Fiber Optic Sensors and Ultrasonic based sensors.

TEXT BOOKS:

1. Sensors and Signal Conditioning : Ramon Pallás Areny, John G. Webster; 2nd edition, John Wiley and Sons,2000.

2. Sensors and Transducers – D.Patranabis, TMH 2003

REFERENCES:

1. Instrument Transducers – An Introduction to Their Performance and Design – by Herman K.P. Neubrat, Oxford University Press.
2. Measurement System : Applications and Design – by E.O. Doeblin, McGraw Hill Publications.
3. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987
4. Process Control Instrumentation Technology – D. Johnson, John Wiley and Sons

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Principles of Communication

UNIT I

Introduction : Types of communications, Analog, pulse and digital Types of signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Autocorrelation, convolution.

UNIT II

Amplitude Modulation : Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM : Diode detector.

UNIT III

Angle Modulation : Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT IV

Pulse Modulations : Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing.

UNIT V

Digital Communication : Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

UNIT VI

Digital Modulation : ASK, FSK, PSK, DPSK, QPSK ;demodulation

TEXT BOOKS:

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

REFERENCES

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2ndEd. 2004.
3. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.,.

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Electronic Circuit Analysis LAB

Note: The students are required to design the electronic circuit and they have to perform the simulation using Multisim/ Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory**.**

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

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

PART B: Equipment required for Laboratory

Software:

i. Multisim/ Pspice/Equivalent Licensed simulation software tool

ii. Computer Systems with required specifications

Hardware:

11. Regulated Power supplies
12. Analog/Digital Storage Oscilloscopes
13. Analog/Digital Function Generators
14. Digital Multimeters
15. Decade Résistance Boxes/Rheostats
16. Decade Capacitance Boxes
17. Ammeters (Analog or Digital)
18. Voltmeters (Analog or Digital)
19. Active & Passive Electronic Components

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II Year – II SEMESTER

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Instrumentation LAB - l

(Minimum 10 experiments should be conducted)

1. RTD – characteristics
2. Thermocouple – characteristics
3. LVDT – characteristics.
4. Displacement measurement using inductive pickup/ capacitive pickup.
5. Inductive and capacitive transducers.
6. RPM indicator using Strobotron/Gyroscope
7. Acceleration transducer.
8. Pressure measurement using Bourdon tube
9. Piezoelectric transducer.
10. Measurement of R, L and C using bridge circuits.
11. Measurement of Level using Capacitance Transducer.
12. Measurement of Humidity.
13. Measurement of strain using strain gauge

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III Year – I SEMESTER

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PULSE AND DIGITAL CIRCUITS

OBJECTIVES

The student will be made

- To Understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To analyze different types of Multi vibrators and their design procedures.
- To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
- To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.

UNIT I

LINEAR WAVESHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

NON-LINEAR WAVE SHAPING : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT III

SWITCHING CHARACTERISTICS OF DEVICES : Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Digital Logic gate circuits: Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families.

UNIT IV

MULTIVIBRATORS :

Bistable Multi Vibrator: Analysis and Design of Fixed Bias ,Self Bias Bistable Multi Vibrator, Collector catching Diodes, Commutating Capacitors, Methods of Triggering using RC network &Diode , Emitter Coupled Bistable Multi Vibrator (Schmitt trigger),

Monostable Multi Vibrator: Analysis and Design of Collector Coupled Monostable Multi Vibrator, Triggering method of a Monostable Multi Vibrator, Application of Monostable Multi Vibrator as a Voltage to Time Converter,

Astable Multi Vibrator: Analysis and Design of Collector Coupled Astable Multi vibrator , Application of Astable Multi Vibrator as a Voltage to Frequency Converter. All circuits are transistor version

UNIT V

VOLTAGE TIME BASE GENERATORS : General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT VI

SYNCHRONIZATION AND FREQUENCY DIVISION & SAMPLING GATES : Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals,

Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Applications of sampling gates.

TEXT BOOKS :

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002 .

REFERENCES :

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

2. Wave Generation and Shaping - L. Strauss.

3. Pulse, Digital Circuits and Computer Fundamentals - R.Venkataraman.

OUTCOMES

After going through this course the student will be able to

- Design linear and non-linear wave shaping circuits.
- Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design different multivibrators and time base generators.

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LINEAR IC APPLICATIONS

OBJECTIVES

The student will

- Study characteristics, realize circuits, design for signal analysis using Op-amp ICs.
- Study the linear and non-linear applications of operational amplifiers.
- Study IC 555 timer, PLL and VCO with their applications.
- Study and understand different types of ADCs and DACs
- Acquire skills required for designing and testing integrated circuits

UNIT I

INTEGRATED CIRCUITS: Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual

Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

UNIT II

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and Temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, FET input. Op-Amps, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rates, CMRR, PSRR, drift, Frequency Compensation technique.

UNIT III

LINEAR and NON-LINEAR APPLICATIONS OF OP- AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNIT IV

ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS:

Introduction, Butter worth filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and All pass filters.

Four Quadrant multiplier, balanced modulator, IC1496,Applications of analog switches and Multiplexers, Sample & Hold amplifiers.

UNIT V

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

UNIT VI

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

TEXT BOOKS :

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.

REFERENCES :

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.

2. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.

3. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.

4. Operational Amplifiers – C.G. Clayton, Butterworth & Company Publ.Ltd./ Elsevier, 1971.

5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition

OUTCOMES

After going through this course the student will be able to

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Acquire skills required for designing and testing integrated circuits
- Understand the gain-bandwidth concept and frequency response of the three basic amplifiers. Understand thoroughly the operational amplifiers with linear integrated circuits.
- Design combinational logic circuits for different applications.

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DIGITAL SYSTEM DESIGN & DIGITAL IC APPLICATIONS

OBJECTIVES

The student will be introduced to

- The electrical behavior of CMOS both in static and dynamic conditions and before that study the diode/transistor-transistor logic and Emitter coupled logic.
- In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.

- Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
- Understand the concepts of SSI Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Unit-I:
Digital Design Using HDL: Design flow, program structure, History of VHDL, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

Unit-II:
VHDL Modelling : Simulation, Logic Synthesis, Inside a logic Synthesizer, Constraints, Technology Libraries, VHDL and Logic Synthesis, Functional Gate-Level verification, Place and Route, Post Layout Timing Simulation, Static Timing, Major Netlist formats for design representation, VHDL Synthesis-Programming Approach.

Unit-III:
Programmable Logic Devices (PLDs) & Memories: Programmable Read Only Memory, Programmable Logic Array, Programmable Array Logic Devices, ROM: Internal structure, 2D-Decoding, Commercial ROM types, timing and applications,. Static RAM: Internal structure, SRAM timing, standard, synchronous SRAMS, Dynamic RAM: Internal structure, timing, synchronous DRAMs. Design considerations of PLDs with relevant Digital ICs.

Unit-IV:
Digital Logic Families and Interfacing: Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families.bipolar logic, transistor-transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic.

Unit-V:
Combinational Logic Design: Adders & Subtractors, Ripple Adder, Look Ahead Carry Generator, Binary Parallel Adder, Binary Adder-Subtractor, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Cascading Comparators, Dual Priority Encoder, Design considerations with relevant Digital ICs, modeling of Circuits by using VHDL.

Unit-VI:
Sequential Logic Design: SSI Latches and Flip-Flops, Counters, Design of Counters using Digital ICs, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, MSI Registers, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Registers, MSI Shift Registers, Design considerations with relevant Digital ICs, modeling of circuits by using VHDL.
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Text Books:

1. Digital Design Principles & Practices – John F.Wakerly, PHI/ Pearson Education Asia, 3rd Edition, 2005.
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

References:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.

2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

OUTCOMES:

After going through this course the student will be able to

- Understand the concepts of different logics and implementations using Integrated circuits.
- Design and analyze any Digital design in real time applications.
- Extend the digital operations to any width by connecting the ICs and can also design, simulate their results using hardware description language.
- Understand the concepts of MSI Registers and Modes of Operation of Shift Registers, Universal Shift Registers.

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CONTROL SYSTEMS

OBJECTIVES

The student will

- Learn the fundamental concepts of Control systems and mathematical modelling of the system
- Study the concepts of time response and frequency response of the system
- Understand the basics of stability analysis of the system

UNIT I

INTRODUCTION

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

UNIT II

TRANSFER FUNCTION REPRESENTATION

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

UNIT III

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 – Effects of proportional derivative, proportional integral systems.

UNIT IV

STABILITY ANALYSIS IN S-DOMAIN

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

Root Locus Technique:

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

UNIT V

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 IN FREQUENCY DOMAIN:

Polar Plots, Nyquist Plots Stability Analysis.

UNIT VI

CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers. State Space Analysis of Continuous Systems 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

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.

OUTCOMES

After going through this course the student will be able to

- Represent the mathematical model of a system
- Determine the response of different order systems for various step inputs
- Analyse the stability of the system

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DIGITAL SIGNAL PROCESSING

OBJECTIVES

The student will be able to

- Define and use Discrete Fourier Transforms (DFTs)
- Use Z - transforms and discrete time Fourier transforms to analyze a digital system.
- Understand simple finite impulse response filters
- Learn the design procedures used for filter bank
- Learn to program a DSP processor to filter signals

UNIT I

INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

UNIT II

DISCRETE FOURIER SERIES& FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT,Computation of DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT III

REALIZATION OF DIGITAL FILTERS: Review of Z-transforms, Applications of Z – transforms, solution of difference equations - digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function,

UNIT IV

IIR & FIR DIGITAL FILTERS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT V

MULTIRATE DIGITAL SIGNAL PROCESSING: Decimation, interpolation, sampling rate conversion, Implementation of sampling rate conversion.

UNIT VI

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory ,multiport memory, VLSI architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS 320C5X- Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On- chip registers, On-chip peripherals

TEXT BOOKS:

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

2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002

4. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006

2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.

3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.

4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.

5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006

OUTCOMES

After going through this course the student will be able to

- Estimate the spectra of signals that are to be processed by a discrete time filter, and to verify the performance of a variety of modern and classical spectrum estimation techniques.
- Design and simulate a digital filter
- Design new digital signal processing systems.
- Design and realize FIR, IIR filters
- Program a DSP processor to filter signals

III Year – I	**T**	**P**	**C**
SEMESTER	**0**	**0**	**2**

Pulse & Digital Circuits Lab

1. Linear wave shaping.

2. Non Linear wave shaping – Clippers.

3. Non Linear wave shaping – Clampers.

4. Transistor as a switch.

5. Study of Logic Gates & Some applications.

6. Study of Flip-Flops & some applications.

7. Sampling Gates.

8. Astable Multivibrator.

9. Monostable Multivibrator.

10. Bistable Multivibrator.

11. Schmitt Trigger.

12. UJT Relaxation Oscillator.

13. Bootstrap sweep circuit.

Equipment required for Laboratory:

1. RPS - 0 – 30 V

2. CRO - 0 – 20 M Hz.

3. Function Generators - 0 – 1 M Hz

4. Components

5. Multi Meters

	T	P	C
III Year – I SEMESTER	**0**	**0**	**2**

LIC APPLICATIONS LAB

Minimum Twelve Experiments to be conducted :

1. Study of ICs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order)
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.

9. IC 555 Timer – Astable Operation Circuit.

10. Schmitt Trigger Circuits – using IC 741 and IC 555.

11. IC 565 – PLL Applications.

12. IC 566 – VCO Applications.

13. Voltage Regulator using IC 723.

14. Three Terminal Voltage Regulators – 7805, 7809, 7912.

15. 4 bit DAC using OP AMP.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

***

III Year – I **T P C**
SEMESTER **0 0 2**

Digital System Design & DICA Laboratory

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to develop VHDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer. Further, it is required to verify the logic with necessary hardware.

List of Experiments:

1. Realization of Logic Gates

2. 3 to 8 Decoder- 74138

3. 8*1 Multiplexer-74151 and 2*1 De-multiplexer-74155

4. 4-Bit Comparator-7485.

5. D Flip-Flop- 7474

6. Decade Counter- 7490

7. 4 Bit Counter-7493

8. Shift Register-7495

9. Universal shift register-74194/195

10. Ram (16*4)-74189 (read and write operations)

11. ALU

Equipment Required:

1.Xilinix ISE software-latest version

2. Personal computer with necessary pheripherals

3.Hardware kits- Various FPGA families.

	T	P	C
III Year – I SEMESTER	**0**	**0**	**2**

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Unit I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

Unit II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright

Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

Unit III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

Unit IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law

Unit V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

Unit VI

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime.

REFERENCE BOOKS:

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections
4. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
7. M.Ashok Kumar and Mohd.Iqbal Ali: “Intellectual Property Right” Serials Pub.

III Year – II	T	P	C
SEMESTER	0	0	3

MICRO PROCESSORS AND MICRO CONTROLLERS

OBJECTIVES : The student will

- learn concepts of microprocessor, different addressing modes and programming of 8086.
- understand interfacing of 8086, with memory and other peripherals.
- learn concept of DMA, USART RS-232 and PIC controller.
- study the features of advanced processors and Pentium processors.
- study the features of 8051 Microcontroller, its instruction set and also other controllers.

UNIT-I: 8086/8088 MICROPROCESSORS

Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, special purpose activities, Minimum mode, maximum mode of 8086 system and timings, the processor 8088, machine language instruction formats, addressing mode of 8086, instruction set off 8086,assembler directives and operators.

UNIT-II: PROGRAMMING WITH 8086 MICROPROCESSOR

Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming.

UNIT-III: BASIC ANDSPECIAL PURPOSE PROGRAMMABLE PERIPHERALS AND THEIR INTERFACING WITH 8086/88

Semiconductor memory interfacing, dynamic RAM interfacing, interfacing i/o ports, PIO 8255 modes of operation of 8255,interfacing to D/A and A/D converters, stepper motor interfacing, control of high power devices using 8255.Programmable interrupt controller 8259A, the keyboard /display controller8279, programmable communication interface 8251 USART, DMA Controller 8257.

UNIT-IV: ADVANCED MICRO PROCESSORS

Salient features of 0386DX, architecture and signal description of 80386, register organization of 80386 and addressing modes, data types of 80386, real address mode of 80386, protected mode of 80386, segmentation and Paging, virtual 8086 mode and enhanced mode. Instruction set of 80386.The coprocessor 80387.

UNIT-V: 8051 MICROCONTROLLER

Introduction to microcontrollers, 8051Microcontrollers, 8051pin description, connections, I/O ports and memory organization, MCS51addressing modes and instructions, assembly language programming tools.

UNIT-VI: PIC MICROCONTROLLERSAND ARM 32-BIT MICROCONTROLLER

Overview and features, PIC16Cx/7X instructions, interrupts in PIC 16C61/71, PIC 16F8XX Flash controllers, I/O ports and timers. Introduction to 16/32 Bit processors, ARM architecture and organization, ARM / Thumb programming model, ARM / Thumb instruction set.

TEXT BOOKS:

1. A.K.Ray, K.M.Bhurchandi ,"Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications,2000.
2. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press,2010.

REFERENCES:

1. Ajay V Deshmukh, "Microcontrollers", TATA McGraw Hill publications,2012.
2. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.

OUTCOMES

After going through this course the student will be able to

- develop programs for different addressing modes.
- perform 8086 interfacing with different peripherals and implement programs
- describe the key features of serial and parallel communication and able to
- Design a microcontroller for simple applications.

	T	P	C
III Year – II SEMESTER	**0**	**0**	**3**

PROCESS INSTRUMENTATION

To introduce the students to Process dynamics. Also introduces different control modes of actions and tuning of PID controllers used in industry.

COURSE OBJECTIVES

- Introduces fundamentals of process dynamics.
- Introduces control actions and types of controllers.
- Introduces control settings and tuning.
- Introduces final control elements.
- Deals multi loop control systems.

COURSE OUTCOMES

- The student gains knowledge fundamentals of process dynamics.
- The students understand learn about different controllers.
- The students understand tuning of controllers using 1/4th decay ratio, IEA, ISE, ITAE.

- The student gains knowledge about control valves and can list types.
- The student can define - Control valve sizing and can define problems of Cavitations, flashing.
- The student gains knowledge on Feed forward control – Ratio control – Cascade control – Split range – Multivariable control and examples from distillation column and Boiler system

UNIT – I:
PROCESS DYNAMICS
Process variables – Load variables – Dynamics of simple pressure, flow level and temperature process –interacting and non-interacting systems – continuous and batch process – self-regulation – Servo and Regulator operation - problems.

UNIT – II:
CONTROL ACTIONS
Basic control actions – characteristics of two position, three position, Proportional, Single speed floating, Integral and Derivative control modes – PI, PD, PID control modes – Problems –

UNIT – III:
TYPES OF CONTROLLERS
Electronic, Pneumatic and Hydraulic Controllers to realize various control actions.

UNIT – IV:
CONTROLLER SETTINGS & TUNING OF CONTROLLERS
Evaluation criteria – 1/4th decay ratio, IEA, ISE, ITAE - determination of optimum settings for mathematically described process using time response and frequency response.
Tuning process curve reaction method – continuous oscillation method – damped oscillation method –problems.

UNIT – V:
FINAL CONTROL ELEMENTS & CONTROL VALVES
I/P Converter , P/I converter - pneumatic, electric and hydraulic actuators – valve positioner Control valves – characteristic of control valves – valve body – Globe, Butterfly, diaphragm, Ball valves –Control valve sizing – Cavitations, flashing - problems.

UNIT – VI:
MULTILOOP CONTROL SYSTEM
Feed forward control – Ratio control – Cascade control – Split range – Multivariable control and examples from distillation column and Boiler system.

TEXT BOOKS :

1.Chemical process control-by George stephanopoulus, Pearson Education,2005.
2. Process control instrumentation Technology Curtis.D.Jhonson, Pearson education publication,2004.

REFERENCES:

1. Process Control, Third Edition – Liptak B.G., Chilton Book Company, Pennsylvania, 1995
2. Process control – by Pollard A., Heinemann Educational Books, London, 1971.
3. Automatic Process Control – by Eckman D.P. , Wiley Eastern Ltd., New Delhi, 1993.
4. Process System Analysis and Control – Coughanowr, McGraw Hill, Singapore, 1991

5. Process Control – by Patranabis, TMH, 1991

III Year – II	T	P	C
SEMESTER	0	0	3

ANALYTICAL INSTRUMENTATION

The main objective is to introduce analysis instruments used in industry.

COURSE OBJECTIVES:

- The subject deals with measurement of PH, conductivity and gas analysers.
- Subject introduces UV-Visible spectroscopy, nuclear magnetic resonance and mass spectrometers.
- Deals about Gas and liquid chromatography.
- Deals with nuclear radiation detectors.

COURSE OUTCOMES:

- The student gains knowledge on PH , Conductivity meters ,CO analyzers, NOX analyzer, oxygen analyzer – paramagnetic type, magnetic wind type, electro chemical types
- The students get familiarized with UV, VIS Spectrophotometers – Single beam and double beam spectroscopy. IR Spectrophotometer, Sources and detectors, FT IR and Flame spectroscopy.

- Students understand about NMR Spectrometers, ESR Spectrometers, and Mass Spectrometers.
- Students can understand Instrumentation associated with Gas chromatography – Liquid chromatography.
- Students get knowledge on Ionization chamber, Geiger Muller counter, Proportional Counter, Scintillation counter and Solid state detectors.

UNIT – I: pH AND CONDUCTIVITY & DISSOLVED COMPONENT ANALYSER
Conductivity meters – pH meters – Dissolved oxygen, hydrogen analyzers – Sodium analyzer – Silica analyzer and sampling systems.

UNIT – II: GAS ANALYSERS
Thermal conductivity types – CO monitor – Oxygen Analysers - NOX analyzer – H2S analyzer system and sampling – Industrial analyzer circuits, Theory and problems on Beer – Lamberts Law.

UNIT – III: SPECTROSCOPY:
Beer – Lamberts Law, Sources and detectors, UV, VIS Spectrophotometers – Single beam and double beam spectroscopy. IR Spectrophotometer, Sources and detectors, FT IR Spectrometer.
Flame spectroscopy - atomic absorption Spectrophotometer – Atomic emission Spectrophotometer.

UNIT –IV: NMR, ESR AND MASS SPECTROMETERS:
Principles and Instrumentation associated with NMR Spectrometers, ESR Spectrometers, and Mass Spectrometers and their applications

UNIT – V: CHROMATOGRAPHY:
Classification of Gas and liquid chromatography, Principles and Instrumentation associated with Gas and liquid chromatography – sample injection systems, coloumns, isothermal operation, different detectors.

UNIT – VI: NUCLEAR RADIATION DETECTORS & APPLICATIONS:
Ionization chamber, Geiger Muller counter, Proportional Counter, Scintillation counter and Solid state detectors.

TEXT BOOK:
1. Instrumental Methods of Analysis – by Willard H.H., Merrit L.L., Dean J.A.. and Seattle F.L., CBS Publishing and Distributors, 6/e, 1995.
2. Handbook of Analytical Instruments – by R S Khandpur. TMH

REFERENCES:
1. Instrument Technology – by Jones B.E., Butterworth Scientific Publ., London, 1987.
2. Mechanical and Industrial Measurements – by Jain R.K., Khanna Publishing, New Delhi, 2/e, 1992.
3. Principles of Instrumental Analysis – by Skoog D.A. and West D.M., Holt Sounder Publication, Philadelphia, 1985.

III Year – II	T	P	C
SEMESTER	0	0	3

MEASURING INSTRUMENTS

UNIT-I: STANDARDS OF MEASUREMENT

Classification of standards – International standards. Primary standards. Secondary standards. Working standards. Voltage standard-primary standard-saturated weston cell, secondary standard-unsaturated weston cell, zener diode laboratory standard. Resistance standard. Time and frequency standards- atomic standards-caesium beam standard, hydrogen maser standard, Rubidium vapour standard, quartz crystal standard.

MEASUREMENT OF ELECTRICAL QUANTITIES

DC Analog meters- DC ammeters, DC voltmeters, multipliers, loading effects and errors. Ohm meters- series, shunt types and multimeter.

AC Analog meters-Electrodynamic meter, Moving Iron meter, AC voltmeters using rectifiers, peak and average responding voltmeter.True RMS voltmeter.

UNIT-II: MULTI INPUT AND STORAGE OSCILLOSCOPES

Dual trace oscilloscope, sampling oscilloscope, analog storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope.

UNIT-III: SIGNAL GENERATORS

Fixed and variable, sine-wave generators-AF & RF signal generators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform.

UNIT-IV: WAVE ANALYZERS AND RECORDERS

Wave Analyzers – frequency selective, heterodyne, Harmonic Distortion Analyzers, Spectrum Analyzer and digital Fourier analyser.

Recorders: strip chart, circular chart type, X-Y recorder, magnetic recorders, digital data recording, digital memory waveform recorder.

UNIT-V:FREQUENCY AND TIME MEASUREMENTS

Frequency Counters: Basic Principle, errors associated with counter, Different modes of operations: Frequency, Time, Time Period, Average time period, Totalizing.

UNIT-VI: DIGITAL SENSORS

Introduction to digital encoding transducer- classification-digital displacement transducers-shaft encoder-optical encoder. vibrating cylinder sensors, saw sensors, digital flow meters, Hall effect sensor, UV-IR Sensors, ultra sonic sensors.

TEXTBOOKS :

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Electronic measurements and instrumentation - Oliver-Cage, TMH.

REFERENCES :

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.
3. A course in Electrical and Electronic measurements and Instrumentation, A.K.Sawhney, Dhanpat Rai & Co.2011.

III Year – II	**T**	**P**	**C**
SEMESTER	**0**	**0**	**3**

(OPEN ELECTIVE)

MEDICAL INSTRUMENTATION

UNIT-I

Sources of Bioelectric potentials and Electrodes: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, introduction to bio-medical signals.

UNIT-II

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements,

Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT- III

Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT-IV

Bio telemetry and Instrumentation for the clinical laboratory Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT-V

X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention,

UNIT-VI

Modern Imaging Systems: Tomography, Magnetic resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.

TEXT BOOK:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John willey & Sons Inc.

Reference:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH)
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson)

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT I

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multi-meter for Voltage, Current and resistance measurements.

UNIT II

Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT III

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, . Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type.

UNIT IV

AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance -Schearing Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter.

UNIT V

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

UNIT VI

Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement. Data acquisition systems.

TEXTBOOKS :

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.

2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES :

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.

2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.

3. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

OUTCOMES

The student will be able to

- Select the instrument to be used based on the requirements.
- Understand and analyze different signal generators and analyzers.
- Understand the design of oscilloscopes for different applications.
- Design different transducers for measurement of different parameters.

III Year – II	T	P	C
SEMESTER	0	0	2

MICROPROCESSORS AND MICROCONTROLLERS LAB

The students are required to develop the necessary Algorithm, Flowchart and Assembly Language Program Source Code for executing the following functions using MASM/TASM software and to verify the results with necessary Hardware Kits.

PART-I: MICROPROCESSOR 8086

1. Introduction to MASM/TASM.
2. Arithmetic operation- Multi byte Addition and Subtraction, Multiplication and Division- Signed and unsigned Arithmetic operation, ASCII- Arithmetic operation.
3. Logic operations-Shift and rotate- Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
5. DOS/BIOS programming: Reading keyboard (Buffered with and without echo)- Display characters, Strings.

PART-II: INTERFACING WITH MICROPROCESSOR

1. 8259 – Interrupt Controller-Generate an interrupt using 8259 timer.
2. 8279 – Keyboard Display- Write a program to display a string of characters.
3. 8255 – PPI-Write ALP to generate sinusoidal wave using PPI.
4. 8251 – USART-Write a program in ALP to establish Communication between two processors.

PART-III: MICROCONTROLLER 8051

1. Reading and Writing on a parallel port.
2. Timer in different modes.
3. Serial communication implementation.

PART-IV: INTERFACING WITH MICROCONTROLLER

Write C programs to interface 8051 chip to Interfacing modules to Develop single chip solutions.

1. Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051.
2. Alphanumeric LCD panel and Hex keypad input interface to 8051.
3. External ADC and Temperature control interface to 8051.
4. Generate different waveforms Sine, Square, Triangular, and Rampetc. using DAC interface to 8051; change the frequency and Amplitude.

EQUIPMENT REQUIRED FOR LABORATORY

1. MASM/TASM software
2. 8086 Microprocessor Kits
1. 8051 Micro Controller kits
2. Interfaces/peripheral subsystems
   i) 8259 PIC
   ii) 8279-KB/Display
   iii) 8255 PPI
   iv) 8251 USART
5. A/D and D/AC Interface

III Year – II	T	P	C
SEMESTER	0	0	2

PROCESS INSTRUMENTATION LAB

Process control lab contains 10 experiments; the overall course objective is to provide knowledge on controllers on different processes, final control elements, multi loops and process tuning.

COURSE OBJECTIVES:

- Flow control loop, Temperature level control unit
- Electronic controllers, Controller tuning and Multi loop control systems
- Control valve characteristics and actuators

COURSE OUTCOMES:

- The student gains knowledge on flow sensors I/P converters and how to regulate flow process loop with different control algorithms like PI,PD,PID.
- The student gains knowledge on RTD's and thermocouples and how to regulate temperature control unit of furnace with different digitalcontrol algorithms like PI,PD,PID.
- The students gains knowledge on design and implementation of two position and three position controllers by op-amps.
- The students gains knowledge about process tuning by open loop method and closed loop method
- The student acquire knowledge on linear and equal percentage control valves and their valve discharge values.

(Minimum 10 experiments should be conducted)

1. Flow level control unit.
2. Temperature level control unit.
3. Servo and regulator operation.
4. Realization of control actions: Pneumatic controllers. Hydraulic controllers.
5. Electronic controllers.
6. Process tuning – Process reaction curve method.
7. Process tuning – continuous and damped oscillation method.
8. Operation of flow loop in plant.
9. Input convertor – Pneumatic actuator.
10. Input convertor – Hydraulic actuator.
11. Control valve characteristics (Different types).
12. Multi loop control systems – Ratio Control.
13. Multi loop control systems – Cascade Control.

III Year – II	T	P	C
SEMESTER	0	0	2

DIGITAL SIGNAL PROCESSING LAB

LIST OF EXPERIMENTS:

1. Generation of Sinusoidal waveform / signal based on recursive difference equations
2. To find DFT / IDFT of given DT signal
3. To find frequency response of a given system given in (Transfer Function/ Differential equation form).
4. Generation of Sinusoidal signal through filtering
5. Noise removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.
6. To study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
7. To verify linear convolution.
8. To verify the circular convolution.
9. To design FIR filter (LP/HP) using windowing technique
   a) Using rectangular window
   b) Using triangular window
   c) Using Kaiser window
10. To Implement IIR filter (LP/HP) on DSP Processors
11. N-point FFT algorithm.
12. MATLAB program to generate sum of sinusoidal signals.
13. MATLAB program to find frequency response of analog LP/HP filters.
14. To compute power density spectrum of a sequence.
15. To find the FFT of given 1-D signal and plot.

III Year – II	T	P	C
SEMESTER	0	0	1

Seminar

IV Year – I	T	P	C
SEMESTER	0	0	3

DATA ACQUISITION SYSTEMS

Data Acquisition systems subject contain SIX units, the overall course objective is to provide knowledge on.

Objectives:

- Introduces single and multi channel DAS.
- Introduces digital to analog and anlog to digital conversion techniques.
- Introduces non-linear data convertor techniques and applications.
- Introduces monolithic data convertos and error budget of DAS.

Outcomes:

- Students can sketch block diagram of single and multichannel DAS.
- Student can define converter characteristics.
- Student can list and explain the operation of different DACs , ADCs and non-linear ADCs.
- Student get understanding of data convertor and monolithic data convertors and their applications.
- Student get aware of error budget analysis of DAS.

UNIT-I

INTRODUCTION: objective of a DAS, single channel DAS, multichannel DAS, components used in DAS. Converter characteristics- resolution- non linearity, settling time, monotonicity

UNIT-II

DIGITAL TO ANALOG CONVERTERS (DACS): principles and design of parallel R-2R, weighted resistor, charge mode, thermometer Inverted ladder, D/A decoding- codes other than ordinary binary.

UNIT-III

ANALOG TO DIGITAL CONVERTERS (ADCS): classification of A/D converters. Parallel feedback – successive approximation- ramp comparison- dual slope integration- voltage to frequency – voltage to time- logarithmic types of ADCS.

UNIT-IV

NON-LINEAR DATA CONVERTERS (NDC): basic NDC configurations- some common NDACS and NADCS- programmable non-linear ADCS- NADC using optimal sized ROM- high speed hybrid NADC- PLS based NADC- switched capacitor NDCS.

UNIT-V

DATA CONVERTER APPLICATIONS: DAC applications- analog multipliers/dividers. ADC APPLICATIONS: data acquisition systems- digital signal processing systems- PCM voice communication systems- test and measurement instruments- electronic weighing machines.

UNIT-VI

MONOLITHIC DATA CONVERTERS: typical study of monolithic DACS and ADCS, interfacing of DACS and ADCS to a up. ERROR BUDGET OF DACS and ADCS: error sources, error reduction and noise reduction techniques in DAS. Error budget analysis of DAS.

TEXT BOOKS:

1. E.R. Hnateck, user's handbook of D/A and A/D converters- Wiley
2. Data converters by G.B. Clayton

REFERENCES:

1. Electronic Analog/Digital conversions- Hermann Schmid- Tata McGraw Hill
2. Electronic instrumentation by HS Kalsi- TMH 2nd edition, 2004.
3. Electronic data converters fundamentals and applications- Dinesh K. Avenkar, B.S. Sonde- Tata McGraw Hill.

IV Year –I SEMESTER

T	P	C
0	0	3

MANAGEMENT SCIENCE

Unit I

Introduction to Management: Concept –nature and importance of Management – Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization - Types of organization structure

Unit II

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and Cchart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis)

Unit III

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions.

Unit IV

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

Unit V

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy alternatives

Unit VI

Contemporary Management Practice: Basic concepts of MIS, MRP, Justin-Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Text Books

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science'* Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, *Management Science'* TMH 2011.

References

1. Koontz & Weihrich: 'Essentials *of management'* TMH 2011
2. Seth & Rastogi: Global Management Systems, Cengage learning , Delhi, 2011
3. Robbins: Organizational Behaviour, Pearson publications, 2011
4. Kanishka Bedi: Production & Operations Management, Oxford Publications, 2011
5. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
6. Biswajit Patnaik: Human Resource Management, PHI, 2011
7. Hitt and Vijaya Kumar: Starategic Management, Cengage learning

Objective: To familiarize with the process of management and to provide basic insights into select contemporary management practices.
Codes/ Tables: Normal Distribution Function Tables need to be permitted into the examination Halls

IV Year – I	T	P	C
SEMESTER	0	0	3

COMPUTER ARCHITECTURE AND ORGANIZATION

Objectives

The student will

- Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.
- Understand the principles and the implementation of computer arithmetic and ALU.
- Understand the memory system, I/O organization
- Understand the operation of modern CPUs including interfacing, pipelining, memory systems and busses.
- Understand the principles of operation of multiprocessor systems

UNIT-I

BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data types, Complements, Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes.

COMPUTER ARITHMETIC: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-II

REGISTER TRANSFER LANGUAGE AND MICRO-OPERATIONS: Register Transfer language. Register Transfer, Bus and memory transfer, Arithmetic Micro-operations, logic micro operations, shift micro-operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions –Instruction cycle. Memory Reference Instructions. Input Onput and Interrupt. **CENTRAL PROCESSING UNIT -** Stack organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer

UNIT-III

MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, micro program example, Design of control unit-Hard wired control. Micro programmed control

UNIT-IV

THE MEMORY SYSTEM: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware

UNIT-V

INPUT-OUTPUT ORGANIZATION : Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP), Serial communication;

UNIT-VI

PIPELINE AND VECTOR PROCESSING: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors. **Multi**

processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration. Interprocessor Communication and Synchronization, Cache Coherence.

TEXT BOOKS:

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.
2. Computer Organization – Car Hamacher, ZvonksVranesic, SafwatZaky, V Edition, McGraw Hill, 2002.

REFERENCE:

1. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson, 2006.
2. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions, 1998.

Objectives

- Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.
- Understand the principles and the implementation of computer arithmetic and ALU.
- Understand the memory system, I/O organization
- Understand the operation of modern CPUs including interfacing, pipelining, memory systems and busses.
- Understand the principles of operation of multiprocessor systems.
- Demonstrate the relationship between the software and the hardware and focuses on the foundational concepts that are the basis for current computer design.

IV Year – I	T	P	C
SEMESTER	0	0	3

VLSI DESIGN

OBJECTIVES

The student will be introduced to

- Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects.
- Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
- Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.
- The concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).
- Design static CMOS combinational and sequential logic at the transistor level, including mask layout.

Unit-I:

Introduction : Introduction to IC Technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, MOS and CMOS Fabrication processes, BiCMOS Technology, Comparison between CMOS and Bipolar technologies.

Basic Electrical Properties Of MOS and Bi-CMOS Circuits: I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi-CMOS Inverter, Latch-up in CMOS circuits and BiCMOS Latch-up Susceptibility.

Unit-II:

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.

Unit-III:

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Fan-in and fan-out characteristics, Choice of layers, Transistor switches, Realization of gates using NMOS, PMOS and CMOS technologies.

Scaling Of MOS Circuits: Scaling models, Scaling factors for device parameters, Limits due to sub threshold currents, current density limits on logic levels and supply voltage due to noise.

Unit-IV:
Subsystem Design: Architectural issues, switch logic, Gate logic, examples of structured design, clocked sequential circuits, system considerations, general considerations of subsystem design processes, an illustration of design processes.

Unit-V:
VlSI Design Issues: VLSI Design issues and design trends, design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design, ASIC design flow, FPGA design flow, introduction to SoC design.

Unit-VI:
FPGA Design: Basic FPGA architecture, , FPGA configuration, configuration modes, FPGA design process- FPGA design flow, FPGA families, FPGA design examples-stack, queue and shift register implementation using VHDL, step-by-step approach of FPGA design process on Xilinx environment.

Text Books:

1. Essentials of VLSI Circuits and Systems By Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited,2005 Edition.
2. VLSI Design-Black Book By Dr. K.V.K.K. Prasad, Kattula Shyamala, Kogent Learning Solutions Inc.2012 Edition.

References:

1. VLSI Design By A.Albert Raj & T.Latha,PHI Learning Private Limited,2010.
2. VLSI Design-A.Shanthi and A.Kavita, New Age International Private Limited, 2006 First Edition.

OUTCOMES

After going through this course the student will be able to

- Apply the Concept of design rules during the layout of a circuit.
- Model and simulate digital VLSI systems using hardware design language.
- Synthesize digital VLSI systems from register-transfer or higher level descriptions
- Understand current trends in semiconductor technology, and how it impacts scaling and performance.

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IV Year – I	T	P	C
SEMESTER	0	0	3

(Elective I)

ANALOG IC DESIGN

OBJECTIVES

The student will be introduced to

- The student will be able to understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- In this course, students can study CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
- Another main object of this course is to motivate the graduate students to design and to develop the Analog CMOS Circuits for different Analog operations.
- The concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

UNIT -I:

MOS Devices and Modeling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT -IV:

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -V:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

UNIT -VI:

Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators.

Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

Reference Books:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn, 2013.

OUTCOMES

After going through this course the student will be able to

- Understand the concepts of MOS Devices and Modeling.
- Design and analyze any Analog Circuits in real time applications.
- Extend the Analog Circuit Design to Different Applications in Real Time.
- Understand of Open-Loop Comparators and Different Types of Oscillators.

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Digital Control Systems

1. **Introduction:** Basic Elements of discrete data control systems, advantages of discrete data control systems, examples.

   Signal conversion & processing: Digital signals & coding, data conversion & quantization, sample and hold devices, Mathematical modeling of the sampling process; Data reconstruction and filtering of sampled signals: Zero order hold, first order Hold and polygonal hold. Review of z-Transforms, Applications of z-Transforms to Difference equations and ladder Network problem, Signal between sampling instants using sub multiple sampling method, Modified z- Transforms.

2. Transfer functions, Block diagrams, signal flow graphs: Introduction, Pulse Transfer function, and z-Transfer function, Discrete Data System with cascaded elements separated by a sampler and not separated by a sampler. Closed loop systems, characteristic equation in discrete domain, causality and physically realizable systems; The Sampled signal flow graph, Modified z-transfer function, Multirate discrete data systems (slow rate and fast rate), closed loop multirate sampled systems.

3. Comparison of time response of continuous data and discrete data, Steady state error analysis of digital control systems, correlation between time response and root locations in s-plane and z-plane, Root loci for digital control systems, Effects of adding poles and zeros to open loop transfer function, discrete data systems:

4. Stability tests of discrete data systems: Bilinear transformation method, extension of RH criterion, Jury's Stability Test. Frequency – Domain Analysis: Polar plot of GH (z), Nyquist stability criterion, Bode plot, Gain Margin and Phase margin, Nicholas chart, Band width considerations, sensitivity analysis.

5. Review of state space techniques to continuous data systems, state equations of discrete data systems with sample and hold devices, state diagrams of digital systems, Decomposition of discrete data transfer function, state variable analysis of response between sampling instants, Controllability, Observability of LTI discrete data systems.

6. Design of digital control systems with digital controllers through bilinear transformation. Digital PID controller, Design for dead beat response, pole placement design by incomplete feedback or output feedback.

Text Books:

1. Digital control systems (Second Edition) by Kuo, Oxford University Press
2. Discrete Time control systems – by Ogatta, 2nd ed. (PHI)

References:

1. Digital Control Engineering – by M. Gopal, (New Age Publ.)
2. Control System Engineering – by Nagrath & Gopal (Wiley Eastern)
3. Continuous & Discrete Control Systems – by John Dorsey (MGH)

Artificial Neural Networks and Fuzzy Logic

1. Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Potential Applications of ANN.

Essentials of Artificial Neural Networks

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN-Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

2. Feed Forward Neural Networks

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training

Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence

theorem, Limitations of the Perceptron Model, Applications.

Multilayer Feed Forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back-propagation (BP)

Training, Summary of Back-propagation Algorithm, Kolmogorov Theorem, Learning

Difficulties and Improvements.

3. Associative Memories

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

4. Self-Organizing Maps (SOM) and Adaptive Resonance Theory (ART)

Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks, Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability- Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications.

5. Classical & Fuzzy Sets

Introduction to classical sets – properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, Properties, fuzzy relations, cardinalities, membership functions.

6. Fuzzy Logic System Components

Fuzzification, Membership Value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Applications

Neural network applications: Process identification, Fraction Approximation, Control and Process Monitoring, Fault diagnosis and Load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

Text Books:

1. Neural Netwroks, Fuzy logic , Gnenetic algorithms: synthesis and applications by Rajasekharan and Rai- PHI Publication.
2. Introduction to Artificial Neural Systems- Jacek M.Zurada, Jaico Publishing House, 1997.

Reference Books:

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Netwroks – James A Freeman and Davis Skapura, Pearson, 2002
3. Neural Netwroks – Simon Hykins, Pearson Education.
4. Neural Engineering by C. Eliasmith and CH. Anderson, PHI.
   Neural Netwroks and Fuzzy Logic System by Brok Kosko, PHI Publications

BIO MEDICAL INSTRUMENTATION

Medical Instrumentation subject contain SIX units, the overall course objective is to provide knowledge on Physiological parameters of human body and Medical Instrumentation System.

Objectives:

- Introduces Medical Instrumentation System.
- Different types of bio-signals in human body.
- sensors and electrodes used in medical applications.
- To introduce Medical instruments, Therapeutic equipment and Hemodialysis machine
- Electrical safety of medical equipment

Outcomes:

- Students can list characteristics of instruments
- Student can list problems encountered with measurements from human being.
- Student can classify bio-signals in human body.
- List sensors and electrodes used in medical applications.
- Students can list different kinds of electrodes used for EMG, ECG, EEG and EOG.
- Students can describe the operation of Pacemaker, Defibrillator, diathermy and respiratory instrumentation.
- Students get awareness on hazards and safety of medical equipment.

UNIT – I:

Components of Medical Instrumentation System. Bioamplifier. Static and dynamic characteristics of medical instruments. Biosignals and characteristics. Problems encountered with measurements from human beings.

UNIT – II:

Organisation of cell. Derivation of Nernst equation for membrane Resting Potential Generation and Propagation of Action Potential, Conduction through nerve to neuromuscular junction.

UNIT – III:

Electrode Theory. Biopotential Electrodes – Two electrode system and equivalent circuit, micro electrodes, body surface electrodes, needle electrodes. Biochemical Electrodes-Reference electrodes, PH electrode, Blood gas electrode-PCO_2, PO_2 electrodes, specific ion electrodes.

Neuro-Muscular Instrumentation And EOG: Specification of EEG and EMG machines. Electrode placement for EEG and EMG recording. Interpretation of EEG and EMG. Anatomy of Vision-EOG.

UNIT – IV:

Mechanical function, Electrical Conduction system of the heart. Cardiac cycle. Relation between electrical and mechanical activities of the heart.

Cardiac Instrumentation: Blood pressure and Blood flow measurement. Specification of ECG machine. Einthoven triangle, Standard 12-lead configurations, Interpretation of ECG waveform with respect to electro mechanical activity of the heart.

UNIT – V:

Therapeutic Equipment.: Pacemaker systems-pacing modes and pulse generators, internal pacemaker block diagram, power sources and electromagnetic interference. Defibrillators-ac defibrillation, dc defibrillator circuit, discharge waveforms. Diathermy. Hemodialysis machine.

UNIT – VI:

Respiratory Instrumentation: Physiology of respiratory system, Tests and instrumentation for mechanics of breathing: lung volumes and capacities, Spirometry, Pnemuotachograph Respiratory therapy equipment: Inhalators, Ventilators and respirators, humidifiers, nebulisers and aspirators.

Electrical safety of medical equipment: Physiological effects of electrical current, shock hazards from electrical equipment. Methods of accident preventions: Grounding, double insulation, protection by low voltage, ground-fault circuit interrupter, isolation of patient connected paths, isolated power distribution system.

TEXT BOOKS:

1. Biomedical Instrumentation and Measurements – by Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer, PHI.
2. Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.

REFERENCES:

1. Principles of Applied Biomedical Instrumentation – by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
2. Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003, second edition.
3. Biomedical Telemetry – by Mackay, Stuart R., John Wiley.

IV Year – I	T	P	C
SEMESTER	0	0	3

(Elective II)

OBJECT ORIENTED PROGRAMMING & OPERATING SYSTEM

Course Objectives:

By the end of the course student will

- Describe the general architecture of computers
- Describe object oriented concepts
- Describe, contrast and compare differing structures for operating Systems
- Understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

UNIT-I:

Introduction to OOP

Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP

UNIT-II:

Computer System and Operating System Overview: Overview of computer operating systems, operating systems functions, protection and security, distributed systems, special purpose systems, operating systems structures and systems calls, operating systems generation.

UNIT-III:

Process Management – Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

UNIT-IV:

Memory Management: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation

UNIT-V:

Virtual Memory Management:

virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing

UNIT-VI:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

TEXT BOOKS:

1. The Complete Reference Java, 8ed, Herbert Schildt, TMH
2. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
3. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition– 2005, Pearson education

REFERENCE BOOKS:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/Operating%20Systems/New_index1.html
2. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH
3. Operating System A Design Approach-Crowley, TMH.
4. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.

Course Outcomes:

By the end of the course student will be able to

- describe the general architecture of computers
- describe object oriented concepts
- describe, contrast and compare differing structures for operating Systems
- understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

DIGITAL IMAGE PROCESSING

OBJECTIVES

The student will

- Learn the fundamental concepts and applications of Digital Image Processing.
- Learn the concepts of and how to perform Intensity transformations and spatial filtering.
- Understand the relationship between Filtering in spatial and frequency domains,
- Understand the concepts of and how to perform Image restoration and reconstruction.
- Understand the concepts of different color models and Color image processing.
- Learn the concepts of Wavelets and multi-resolution processing, Image compression and Watermarking, Morphological image processing, Image segmentation, Representation and description.

UNIT-1

Introduction: Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing

Image Transforms: Need for image transforms, Spatial Frequencies in image processing, introduction to Fourier transform, discrete Fourier transform, fast Fourier transform and its algorithm, properties of Fourier transform. Discrete sine transforms. Walsh Transform. Hadamard transform, Haar Transform. Slant transforms, SVD and KL Transforms or Hotelling Transform

UNIT-2

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods, using fuzzy techniques for intensity transformations and spatial filtering**Filtering in the frequency domain:** Preliminary concepts, Sampling and the Fourier transform of sampled functions, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing using frequency domain filters, Selective filtering, Implementation

UNIT-3

Image restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimation the degradation function, Inverse filtering, Minimum mean square error(Wiener)

filtering ,constrained least squares filtering ,geometric mean filtering ,image reconstruction from projections.

Unit-4

Color image processing: color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression

Unit-5

Wavelets and Multi-resolution Processing: image pyramids, sub band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimensions. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets.**Image compression:** Fundamentals, various compression methods-coding techniques, digital image water marking

Unit-6

Morphological image processing: preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, grey –scale morphology. **Image segmentation:** Fundamentals, point, line, edge detection thresholding, region –based segmentation, segmentation using Morphological watersheds, the use of motion in segmentation

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall , 2008.
2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , Digital Image Processing Using MATLAB , 2rd edition, Prentice Hall, 2009.
3. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002
4. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education, 2011

OUTCOMES

After going through this course the student will be able to

- Perform different transforms on image useful for image processing applications
- Perform spatial and frequency domain filtering on image and can implement all smoothing and sharpening operations on images
- Perform image restoration operations/techniques on images
- Operate effectively on color images and different color conversions on images and can code images to achieve good compression
- Do wavelet based image processing and image compression using wavelets
- Perform all morphological operations on images and can be able to do image segmentation also.
- Develop simple algorithms for image processing and use the various techniques involved in Bio Medical applications, etc.

MIXED SIGNAL DESIGN

OBJECTIVES

The student will be introduced to

- Understand the Switched capacitors Circuits and Operation and Analysis, PLLS.
- In this course, students can study Data Converter Fundamentals, Nyquist Rate A/D Converters.
- Another main object of this course is to motivate the graduate students to study and to analyze the Oversampling Converters and Continuous-Time Filters.
- The concepts of Continuous-Time Filters**,** CMOS Transconductors Using Triode and Active Transistors and MOSFET-C Filters.

UNIT-I:

Switched Capacitor Circuits: Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT-II:

Phased Lock Loop (PLL): Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-III:

Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-IV:

Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT-V:

Oversampling Converters: Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A

UNIT-VI:

Continuous-Time Filters: Introduction to Gm-C Filters, Bipolar Transconductors, CMOS transconductors Using Triode and Active Transistors, BiCMOS Tran conductors, MOSFET-C Filters.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

OUTCOMES

After going through this course the student will be able to

- Understand the concepts of Switched Capacitor circuits.
- Design and analysis of Nyquist Rate A/D Converters.
- Extend the Mixed Signal Design to Different Applications.
- Concepts of Oversampling Converters and Continuous-Time Filters.

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ROBOTICS AND AUTOMATION

UNIT – I**: BASIC CONCEPTS** Automation and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system, Dynamic stabilization of Robotics. ,**POWER SOURCES AND SENSORS** Hydraulic, Pneumatic and electric drivers – Determination HP of motor and gearing ratio, variable speed arrangements, Path Determination - Machinery Vision – Ranging – Laser – Acoustic, Magnetic Fiber Optic and Tactile Sensor

UNIT – II: **MANUPULATORS** Construction of Manupulators, Manupulator Dynamic and Force Control, Electronic and Pneumatic manupulators., **ACTUATORS AND GRIPPERS** Pneumatic, Hydraulic Actuators, Stepper Motor Control Circuits, End Effecter, Various types of Grippers, Design consideration.

UNIT – III: Differential transformation and manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

UNIT IV: **KINEMATICS** Forward and Inverse Kinematic Problems, Solutions of Inverse Kinematic problems, Multiple Solution, Jacobian Work Envelop – Hill Climbing Techniques.

UNIT V: **PATH PLANNING** Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

UNIT VI: **CASE STUDY** Multiple Robots – Machine Interface – Robots in Manufacturing and Non-Manufacturing applications – Robot Cell Design Selection of a Robot.

TEXT BOOKS: 1. Industrial Robotics by Groover M P , Pearson Edu.

2. Robotics by Fu K S , McGraw Hill.

REFERENCES:

1. Robotics by CSP Rao and V.V. Reddy, Pearson Publications

2. Robotics and Control by Mittal R K & Nagrath I J , TMH.

3. An Introduction to Robot Technology,by P. Coiffet and M. Chaironze ,Kogam Page Ltd. 1983 London.

4. Robotic Engineering by Richard D. Klafter, Prentice Hall

5. Introduction to Robotics by John J Craig , Pearson Edu.

7. Robot Dynamics and Control by Mark W. Spong and M. Vidyasagar, John Wiley & Sons.

EMI / EMC

Pre requisites: EMTL Course.

Objectives:

- Student shall be able to understand the root causes for Electromagnetic Noise (EMI), its sources.
- Shall be able to understand the effects of EMI and the required precautions to be taken/to be discussed with his peer group.
- Shall be able to understand the different measurement techniques of EMI (for conducted and normal) and their influences in detail.
- Shall be able to understand different compatibility techniques (EMC) to reduce/suppress EMI.
- Shall be able to understand different standards being followed across the world in the fields of EMI/EMC.

UNIT-I: **Natural and Nuclear sources of EMI / EMC** : Introduction, Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations. An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT-II:EMI from apparatus, circuits and open area test sites : Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive inter modulation, cross talk in transmission lines, transients in power supply lines, electromagnetic interference (EMI). Open area test sites and measurements.

UNIT-III: Radiated and conducted interference measurements: Anechoic chamber, TEM cell, GH TEM Cell, characterization of conduction currents / voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted EMI detectors and measurements.

UNIT-IV:ESD, Grounding, shielding, bonding and EMI filters : Principles and types of grounding, shielding and bonding, characterization of filters, power lines filter design. ESD, Electrical fast transients / bursts, electrical surges.

UNIT-V: Cables, connectors, components: Introduction, EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, opto-isolators, Transient and Surge Suppression Devices.

UNIT-VI: EMC standards- National / International .: Introduction, Standards for EMI and EMC, MIL-Standards, IEEE/ANSI standards, CISPR/IEC standards, FCC

regulations, Euro norms, British Standards, EMI/EMC standards in JAPAN, Conclusions.

Text Books :

1. Engineering Electromagnetic Compatibility by **Dr. V.P. Kodali, IEEE Publication**, Printed in India by ***S. Chand & Co. Ltd., New Delhi, 2000***.
2. Electromagnetic Interference and Compatibility **IMPACT series, IIT – Delhi,**

   Modules 1 – 9.

References :

1. Introduction to Electromagnetic Compatibility, NY, **John Wiley, 1992, by C.R. Pal.**

Outcomes-

At the end of this Course,

- Students shall be able to distinguish effects of EMI and counter measures by EMC-techniques.
- Students shall apply the knowledge gained in selecting proper gadget/device/appliance/system, as per EMC- norms specified by regulating authorities.
- Students shall choose career in the fields of EMI/EMC as an Engineer/Researcher/Entrepreneur in India/abroad.

IV Year – I	T	P	C
SEMESTER	0	0	2

INSTRUMENTATION LAB – II

(Minimum of ten experiments should be conducted.)

Process control lab contains 10 experiments; the overall course objective is to provide knowledge on different sensors and their measurement.

COURSE OBJECTIVES:

- Introduces analog circuit simulation.
- Linearization of transducer characteristic.
- Measurement techniques of pH, humidity, BP, flow, level and speed (non-contact) .
- PLC ladder construction for level application.
- Capacitive transducers
- PID controller setup

COURSE OUTCOMES:

- The student can design and construct an analog circuit for simulation.
- The student can examine Thermistor non linear characteristic, and can apply linearization technique The can determine the pH of different test solutions.
- The student can write ladder program for PLC's for level control application of single tank.
- The students can operate stroboscope to determine speed of motor.
- The students can calibrate and experiment on I/P and P/I converters.
- The students can appraise PID controller used for multi capacity systems.

1. Design and simulation of Analog Circuits using CAD Package.
2. Design of PCBs using Packages and Fabrication of PCB.
3. Linearization of Thermistor using Microprocessor.
4. Study of Level monitoring Instruments using PLC.
   pH measurements.
5. Measurement of Blood Pressure.
6. Calibration of P to I and I to P converters.
7. RPM indicator using Strobostrom/Gyroscope.
8. Measurement of Humidity.
9. Measurement of velocity of liquid using Ultrasonic (Doppler effect) method and also flow measurement.
10. Measurement of Level using Capacitance method/Transducer.
11. Displacement measurement using inductive pickup and capacitive pickup.
12. PID Controller setup (Flow/Temp. Level).

IV Year – I SEMESTER	T 0	P 0	C 2

INSTRUMENTATION LAB – III

This laboratory contains 10 experiments; the overall course objective is to provide practical knowledge on measurement of different chemical, analytical instruments and their automation.

COURSE OBJECTIVES

- UV-Visible, IR and mass spectrometers.
- Gas, liquid chromatography and flame photometers.
- Design of Data Acquisition system for acquiring physical quantities.
- Introduction to serial, parallel and advanced data communication techniques.

COURSE OUTCOMES

- The student can determine the concentration of the sample using Spectrometers.
- The student can appraise chromatography on separation and detection of different components in a mixture sample using.
- The student can design signal conditioning circuit for analog signal detection, conversion into digital form and transfer to PC using Data acquisition module.
- The student's can illustrate data transfer between two microprocessors using RS-232, GPIB interface and IEEE 1394.

1. Gas analyzer.
2. Gas and liquid chromatography.
3. Spectrometer: UV and VIS spectrometer.
4. Spectrometer: IR and FT IR Spectrometer.
5. Flame photometer.
6. Measurement of calorific value.
7. Mass spectrometer.
8. Interfacing of ADC to PC and observe the data.
9. Interfacing of DAC to PC and generate various types of signals.
10. Serial communication through RS-232C between µCs / PCs.
11. GPIB interface – master to slave data transfer.
12. GPIB interface – slave to slave data transfer.

13. Data transfer through IEEE-1394 (fireware) interface.

Equipment:

Gas/ Liquid chromatographer, Gas Analyzer, UV & VIS spectrometer, IR spectrophotometer, Absorption spectrophotometer, Flame photometer, Bomb calorimeter, ADC, DAC add-on cards for PC. GPIB interface Master / slave cards for PC, IEEE-1394 (fireware) interface for PC

IV Year – II SEMESTER	T	P	C
	0	0	3

INDUSTRIAL AUTOMATION

COURSE OBJECTIVES:

The objectives of this course are to help students:

- Understand the need for automation in process industries
- Learn programming of PLC
- Understand DCS and communication in DCS

COURSE OUTCOMES:

- The student can recall the need of industrial automation
- The student can write PLC ladder diagrams
- The student gains knowledge on computer control loops and programming methods for smart sensors.
- The students understand about DCS.

UNIT – I: Programmable logic controller (PLC) basics:

Definition, overview of PLC systems, input/output modules, power supplies and isolators.

UNIT – II: Basic PLC programming Programming on-off inputs/ outputs.

Creating Ladder diagrams Basic PLC functions PLC Basic Functions, register basics, timer functions, counter functions.

UNIT – III:PLC intermediate functions:

Arithmetic functions, number comparison functions, Skip and MCR functions, data move systems. Utilizing digital bits, sequencer functions, matrix functions.

UNIT – IV: PLC Advanced functions:

Analog PLC operation, networking of PLC, PLC-PID functions. PLC installation, troubleshooting and maintenance.

UNIT-V:DISTRIBUTED CONTROL SYSTEMS

Evolution - Different architectures - local control unit - Operator Interface - Displays – Engineering Interface.

APPLICATION OF DCS: DCS Applications in power plants, Iron and steel plants, Chemical plants, Cement plants, paper and pulp industries

UNIT-VI: Highway Addressable Remote Transducer(HART) AND FIELD BUS

Bus: Introduction, concept. HART protocol: Method of operation, structure, and applications. Smart transmitters, smart valves and smart actuators.

TEXT BOOKS:

1. John. W .Webb Ronald A Reis , Programmable Logic Controllers - Principles and Applications, Fourth edition, Prentice Hall Inc., New Jersey, 1998.
2.Michael Lucas, Distributed Control Systems, Van Nostrand Reinhold Co.,1986
3. Computer Control of Processes – M.Chidambaram. Narosa 2003

REFERENCES:

1. PC Based Instrumentation and Control Third Edition by Mike Tooley ; Elsevier

2. PC Interfacing and Data Acquisition Techniques for Measurement, Instrumentation and Control. By Kevin James; Elsevier
3. Practical Data Acquisition for Instrumentation and Control Systems by John Park and Steve Mackay
4. Distributed Control Systems, Lukcas M.P, Van Nostrand Reinhold Co., New York, 1986.
5.Popovic D. and Bhatkar V.P., Distributed Computer Control for industrial automation, Marcel
Dekkar Inc., 1990

IV Year – II	T	P	C
SEMESTER	0	0	3

DATA COMMUNICATIONS

UNIT I

DIGITAL MODULATION TECHNIQUES: FSK , MSK , BPSK , QPSK , 8-PSK , 16-PSK , 8- QAM , 16- QAM , Band width efficiency carrier recovery DPSK , clock recovery , Probability of error and bit error rate.

UNIT II

DATA COMMUNICATIONS: Serial, Parallel configuration, Topology, Transmission

modes, codes, Error Control, Synchronization, LCU. Serial and Parallel Interfaces, Telephone Networks and Circuits, Data modems.

UNIT III

Data Communication Protocols , Character and block Mode ,Asynchronous and

Synchronous Protocols, public Data Networks , ISDN. LOCAL AREA NETWORKS: token ring, Ethernet, Traditional, Fast and GIGA bit

Ethernet, FDDI

UNIT IV

DIGITAL MULTIPLEXING : TDM , T1 carrier , CCITT , CODECS, COMBO CHIPS , North American Hierarchy , Line Encoding , T-carrier , Frame Synchronization Inter Leaving Statistical TDM FDM , Hierarchy ,Wave Division Multiplexing .

UNIT V

WIRELESS LANS : IEEE 802.11 Architecture Layers, Addressing, Blue Tooth Architecture Layers, l2 Cap, Other Upper Layers .

UNIT VI

MULTI MEDIA: Digitalizing Video and Audio Compression Streaming Stored and Live Video and Audio , Real Time Interactive Video and Audio , VOIP

TEXT BOOKS

1. Electronic communication systems, fundamentals through advanced - W. TOMASI,

   Pearson 4th Edition.

2. Data communication and networking - B.A. Forouzen

IV Year – II SEMESTER	T	P	C
	0	0	3

(Elective III)

DIGITAL IC DESIGN

OBJECTIVES

- The student will be able to understand the MOS Design.
- In this course, students can study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.
- Another main object of this course is to motivate the graduate students to design and to develop the Digital Integreated Circuits for different Applications.
- The concepts of Semiconductor Memories, Flash Memory, RAM array organization.

UNIT-I:

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III:

Sequential MOS Logic Circuits: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV:

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V:

Interconnect: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconncet Techniques.

UNIT-VI:

Semiconductor Memories: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

Text Books:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

Reference Books:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson

OUTCOMES

After going through this course the student will be able to

- Understand the concepts of MOS Design.
- Design and analysis of Combinational and Sequential MOS Circuits.
- Extend the Digital IC Design to Different Applications.
- Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.

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EMBEDDED SYSTEMS

OBJECTIVES

After going through this course the student will be able to

- Understand the building blocks of typical embedded system and different memory technology and memory types.
- Learn the characteristics of an embedded system, quality attributes of embedded systems, application specific and domain specific embedded system,
- Learn about communication devices and basics about VLSI and integrated circuit design and learn concept of firmware design approaches, ISR concept. Interrupt sources, interrupt servicing mechanism, multiple interrupts,
- Understand the concepts of c versus embedded c and compiler versus cross-compiler.
- Learn about the integrated development environment, software utility tool. Also learn about quality assurance and testing of the design, testing on host machine, simulators.

Unit-I:

Introduction: Embedded System-Definition, History, Classification, application areas and purpose of embedded systems, The typical embedded system-Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of an Embedded systems, Application-specific and Domain-Specific examples of an embedded system.

Unit-II:

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

Unit-III:

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

Unit-IV:

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, How to choose an RTOS.

Hardware Software Co-Design: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

Unit-V:

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and

Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Unit-VI:

Embedded System Implementation And Testing: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications, 2005
2. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications.

References:

1. Embedded Systems, Raj Kamal-Tata McGraw Hill Education Private Limited, Second Edition, 2008
2. Embedding system building blocks By Labrosse, CMP publishers.

OUTCOMES

After going through this course the student will be able to

- Know basics of embedded system, classification, memories, different communication interface and what embedded firmware is and its role in embedded system, different system components.
- Distinguish all communication devices in embedded system, other peripheral device.
- Distinguish concepts of C versus embedded C and compiler versus cross-compiler.
- Choose an operating system, and learn how to choose an RTOS

Micro Electro Mechanical Systems (MEMS)

COURSE OBJECTIVES:

- The subject introduces different types of manufacturing processes.
- imparts knowledge on fundamental devices and processes.
- Processing sequence and design rules on Multi user and CMOS MEMS process.
- The subject introduces thermal, wireless and advanced present day applications.

COURSE OUTCOMES:

- The becomes familiar to MEMS process terminology.
- The student can describe MUMPs processing sequence
- The students can design rules for deployment of actuators
- The student can describe processing of CMOS, IC-MEMS.
- The students can list and appreciate thermal Transducers, wireless and advanced MEMS.

UNIT I:

Introduction: History of MEMS, Overview of MEMS Processes, Properties of Silicon, A Sample MEMS Process. Definitions and Terminology, A sample Process, Lithography and Etching. Micromachining: Subtractive Processes (Wet and Dry etching), Additive Processes (Evaporation, Sputtering, Epitaxial growth).

UNIT II:

Fundamental Devices and Processes: Basic mechanics and electrostatics for MEMS, parallel plate actuators, pull-in point, comb drives. Electrostatic actuators; MEMS foundries, Cronos MUMPs (multi user MEMS process).

UNIT III:

MUMPs (Multi User MEMS Process): JDS Uniphase MUMPs processing sequence and design rules. Design rules; applications; micro hinges and deployment actuators.
CMOS MEMS: CMOS foundry processes, integrated IC/MEMS, MEMS postprocessing, applications.

UNIT IV:

Thermal Transducers: bimorphs, “heatuators”, cilia arrays. Micro Opto Electro Mechanical Systems (MOEMS): Micro Scanners, Digital Mirror Display, Retinal Scanning Display.
Grating light valve, coroner cube retroreflector, optical switches, other micro-optical devices Piezoresistivity; Scanning Probe Microscopy: scanning tunneling icroscope (STM), atomic force
microscope (AFM).

UNIT V:

Wireless MEMS: mechanical and electrical resonators, Q-factor, switches, filters.Power for MEMS: thin film batteries, micro fuel cells, energy fields, MEMS Packaging and Assembly: microassembly: serial and parallel, deterministic and stochastic; microgrippers: HexSil process; packaging techniques.

UNIT VI:

The future of MEMS: MEMS in space; mechanical computers; invisible and ubiquitous computing.

Text Books:

1. MEMS a Practical Guide of Design, Analysis, and Applications Korvink, Jan, Paul, Oliver 2006,Approx. 9800 p., Oliver ISBN: 3-540-21117-9
2. Mechanics of Microelectromechanical Systems Lobontiu, Nicolae, Garcia, Ephrahim 2004, XII, 405 P.295 illus., Hardcover ISBN: 1-4020-8013-1

Reference books:

1. MEMS & Microsystems TMGH 2002 by Tai-ran Hsu
2. Microsensors, MEMS & Smart Devices John Wiley 2002 by JW Gardner & VK Varadan
3.Fundamentals of Microfabrication: The Science of Miniaturization, Second Edition ISBN: 0849308267, CRC Press, 1997 by Marc J Madou

COMPUTER NETWORKS

Objectives

The aim of this course is to introduce key concepts and principles of computer networks. The course will use a top-down approach to study the Internet and its protocol stack. Architecture, protocol, application-examples will include email, web and media-streaming. We will cover communications services (e.g., TCP/IP) required to support such network applications. The implementation and deployment of communications services in practical networks: including wired and wireless LAN environments, will be followed by a discussion of issues of network-security and network-management. Internet's architecture and protocols will be used as the primary examples to illustrate the fundamental principles of computer networking.

UNIT I

INTRODUCTION

OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

UNIT II

PHYSICAL LAYER

Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications; Narrow band, broad band ISDN and ATM.

UNIT III

DATA LINK LAYER

Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window. Medium Access Sub Layer: ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, wireless LANS, Bridges.

UNIT IV

NETWORK LAYER

Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. **DYNAMIC ROUTING:** Broadcast routing. Rotary for mobility, Congestion, Control Algorithms – General Principles of Congestion prevention policies. Internetworking: The Network layer in the internet and in the ATM Networks.

UNIT V

TRANSPORT LAYER

Transport Services, Connection management, TCP and UDP protocols; ATM AAL Layer Protocol.

UNIT VI

APPLICATION LAYER

Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media.

TEXT BOOKS

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.Third Edition TMH.

REFERENCES

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition,Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

Outcomes:

The student will be able to

Analyze a communication system by separating out the different functions provided by the network; and some example networks

Understand various network topologies required for communication

Understand that there are fundamental limits to any communications system;

Understand the general principles behind addressing, routing, reliable transmission and other stateful protocols as well as specific examples of each;

Have an informed view of both the internal workings of the Internet and of a number of common Internet applications and protocols

ADVANCED COMPUTER ARCHITECTURE

UNIT -I:

Fundamentals of Computer Design:

Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law.

Instruction set principles and examples- Introduction, Classifying instruction set- MEmory addressing- type and size of operands, Operations in the instruction set.

UNIT –II:

Pipelines:

Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design:

Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT -III:

Instruction Level Parallelism the Hardware Approach:

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.

UNIT-IV

ILP Software Approach

Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT –V:

Multi Processors and Thread Level Parallelism:

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.

UNIT –VI: Inter Connection and Networks:

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS:

1. John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

REFERENCE BOOKS:

1. John P. Shen and Miikko H. Lipasti - Modern Processor Design : Fundamentals of Super Scalar Processors
2. Computer Architecture and Parallel Processing - Kai Hwang, Faye A.Brigs., MC Graw Hill.
3. Advanced Computer Architecture - A Design Space Approach - Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson Ed.

IV Year – II SEMESTER	T	P	C
	0	0	3

(Elective IV)

WIRELESS SENSOR and NETWORKS

UNIT I

OVERVIEW OF WIRELESS SENSOR NETWORKS:

Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints an challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

ARCHITECTURES:

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT II

NETWORKING Technologies:

Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

UNIT-III

MAC Protocols for Wireless Sensor Networks:

Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT-IV

ROUTING PROTOCOLS:

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing

UNIT-V

TRANSPORT LAYER AND SECURITY PROTOCOLS:

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks,

UNIT- VI

SECURITY IN WSNs:

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

SENSOR NETWORK PLATFORMS AND TOOLS:
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

APPLICATIONS of WSN:
S Ultra wide band radio communication, Wireless fidelity systems. Future directions, Home automation, smart metering Applications

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press
3. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

REFERENCES:

1. . Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer
5. Wireless Sensor Networks – S Anandamurugan , Lakshmi Publications

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CALIBRATION & STANDARDS

UNIT I:
Standards. Definition of standard units. International standards. Primary standards. Secondary standards. Working standards. Voltage standard-primary standard-saturated weston cell, secondary standard-unsaturated weston cell, zener diode laboratory standard. Resistance standard. Current standard. Capacitance standard-primary-vacuum and gas filled, secondary-solid dielectric, ceramic capacitor. Inductance standard-mutual inductance-campbell primary standard, self inductance standard.Time and frequency standards- atomic standards-caesium beam standard, hydrogen maser standard, Rubidium vapour standard, quartz crystal standard.

UNIT II:
Define calibration, Principle of calibration, control of calibration environment, calibration chain and traceability, calibration records. Calibration accuracy versus installed accuracy.

UNIT III:
Testing and calibration. Measurement reliability. Primary calibration. Secondary calibration. Direct calibration. Indirect calibration. Routine calibration. Calibration curve, Static calibration. dynamic calibration, Self calibration requirements.

UNIT IV:
Calibration experiment and evaluation of results. Calibration of a DC voltmeter, DC ammeter, Ohm meter and an Oscilloscope.

UNIT V:
CALIBRATION OF PRESSURE, FLOW, TEMPERATURE AND TRANSDUCERS:
Calibration of transducers- pressure- calibration and testing by dead weight tester, frequency response tester, shock tube. Temperature- international practical temperature scales.
Liquid Flowmeters-In-situ method-insertion point velocity, dilution gauging, Laboratory method-master meter, volumetric method, gravimetric method, pipe prover method.

UNIT VI:
CALIBRATION OF MOTION, ACCELERATION, FORCE, VIBRATION, MASS AND TORQUE TRANSDUCERS:

Calibration of motion measuring devices: sinusoidal motion method, transient motion method and comparision method. Force – dynamic force calibration. Acceleration-reciprocity method, optical interferometry.

TEXT BOOKS:

1.Measurement and Instrumentation: Theory and Application By Alan S. Morris, Reza Langar
2.Measurement, Instrumentation, and Sensors Handbook, Second Edition: Spatial ... edited by John G. Webster, Halit Eren

REFERENCE BOOKS:

1.Jone’s Instrument Technology Volume1 Mechanical measurements, fourth edition,BH,2003.

1.A course in Electrical and Electronic measurements and Instrumentation, A.K.Sawhney, Dhanpat Rai & Co.2011.

2.Electronic Instruments and Instrumentation technology, M.M.S. Anand, PHI, 2005.

3.Instrumentation, Measurement and Analysis, second edition, B.C.Nakra, K.K.Chaudhry, TMH, 2004.

FIBRE OPTIC SENSORS

Fibre optic sensors subject contain SIX units, the overall course objective is to provide knowledge on Fibre optics principles and various sensing techniques.

COURSE OBJECTIVES:

- The subject introduces optical sources, detectors and fibre optic fundamentals.
- The subject introduces intensity, phase, wavelength modulation sensing techniques and related sensors.
- The subject introduces single mode fibre components.

COURSE OUTCOMES:

- The student gains knowledge construction and working of LED, semiconductor laser.
- The student understands construction and working of photo detectors.
- The student learns Fibre optic fundamentals and can list fibre types, defferentiate step and graded fibre.
- The student can list and explain different losses in fibres.
- The student can explain intensity, wavelength and phase modulation techniques and can explain how these techniques are used in industry for measuring various physical quantities.

UNIT – I:OPTICAL SOURCES AND DETECTORS

Light Emitting Diode - Principle, types of LED-Burrus LED-Edge emitting LED, characteristics, modulation of LED. **LASERS**: Principle, Laser characteristics, semiconductor Laser Diode. **Photo detectors**:Principle,PIN photo diode,avalanche photodiode and Photo voltaic diode. Noise in detectors.

UNIT – II: FIBRE OPTIC FUNDAMENTALS

Overview of optical fibers- Basic Optical Laws and Definitions, fiber types, Rays and Modes, Step and Graded Index fiber structure, mode theory for circular wave guides.
Signal Degradation in Optical Fibres : Attenuation : attenuation units, Absorption, Scattering Losses, Bending Losses, core and cladding Losses.

UNIT – III:FIBRE OPTIC SENSING TECHNIQUES

Fibre optic sensisng advantages over conventional sensors.Intensity-modulation-Introduction, Transmissive Concept, reflective Concept, Micro bending Concept, Intrinsic Concept,Phase-Modulation, Interferometer Techniques.Wavelength-Modulation - Bragg Grating Concept.

UNIT – IV: INTENSITY MODULATION SENSORS

intensity modulated fiber optic sensors. Reflective fiber optic sensors. Light interruption shutter/ Schelieren multimode fiber optic sensors, microbend optical fiber sensors.

UNIT – V: WAVELENGTH AND PHASE MODULATION SENSORS

Temperature and Strain measurement using Bragg gratings, evanescent wave fiber sensors, interferometric optical fibre sensors -fiber optic refractometers.

UNIT – VI:SINGLE MODE ALL FIBRE COMPONENTS

Introduction, directional couplers, polarizers, polarization splitters, polarization controllers, optical isolators, wavelength multiplexers and demultiplexers,switches and intensity modulators, phase and frequency modulators .

TEXT BOOKS

1. Optical Fibre Communications by Gerd Keiser, 3rd Edition, McGrawHill

2.Fundamentals of Fibre optics in telecommunications and sensor systems- Bishnu P PAL WILEY Eastern Ltd.

REFERENCE BOOKS

1.Optical Communication Systems by J.Gower. PHI.
2. M. Arumugam, 'Optical Fiber Communication and Sensors', Anuradha Agencies, 2002.
3.Fiber Optics Sensors B.D.Gupta

TELEMETRY AND TELECONTROL

COURSE OBJECTIVES:

- The subject introduces different types of telemetry systems.
- The student gains knowledge on TDM and FDM Telemetry systems
- The student gains knowledge on optical telemetry.
- The subject introduces use of Trasnsponders in satellite telemetry.

COURSE OUTCOMES:

- The student gains knowledge on pneumatic Electrical and Electronic Telemetry systems.
- The student learns Time division Multiplexing telemetry systems.
- The student learns characteristics of laser, and optical detectors
- The student learns applications of telemetry in satellite systems.

UNIT – I: TELEMETRY PRINCIPLES
Introduction, Functional blocks of Telemetry system, Methods of Telemetry - Non Electrical, Electrical, Pneumatic, Frequency, Power Line Carrier Communication .Intersymbol Interference.

UNIT – II: SYMBOLS AND CODES
Bits and Symbols, Time function pulses, Line and Channel Coding, Modulation Codes. Intersymbol Interference.

UNIT – II: FREQUENCY DIVISION MULTIPLEXED SYSTEMS
FDM, IRIG Standard, FM and PM Circuits, Receiving end, PLL

UNIT – III: TIME DIVISION MULTIPLEXED SYSTEMS
TDM-PAM, PAM /PM and TDM – PCM Systems. PCM reception. Differential PCM. Introduction, QAM, Protocols.

UNIT – IV: SATELLITE TELEMETRY
General considerations, TT&C Service, Digital Transmission systems, TT&C Subsystems, Telemetry and Communications.

UNIT – V: OPTICAL TELEMETRY
Optical fibers Cable – Sources and detectors – Transmitter and Receiving Circuits, Coherent Optical Fiber Communication System.

UNIT – VI: TELECONTROL METHODS
Analog and Digital techniques in Telecontrol, Telecontrol apparatus – Remote adjustment, Guidance and regulation – Telecontrol using information theory – Example of a Telecontrol System.

TEXT BOOKS:
1. Telemetry Principles – D. Patranabis, TMH, 2012.
2. Telecontrol Methods and Applications of Telemetry and Remote Control – by Swoboda G., Reinhold Publishing Corp., London, 1991

REFERENCES:
1. Handbook of Telemetry and Remote Control – by Gruenberg L., McGraw Hill,New York, 1987.
2. Telemetry Engineering – by Young R.E., Little Books Ltd., London, 1988.
3. Data Communication and Teleprocessing System – by Housley T., PH Intl.,Englewood Cliffs, New Jersey, 1987.

SYSTEM ON CHIP

OBJECTIVES

After going through this course the student will be able to

- Understand the System Architecture and Processor Architecture, approach for a SOC Design.
- Learn the, Basic concepts in Processor Micro Architecture, and Learn Different Types of Processors like VLIW Processors, Superscalar Processors etc.
- Learn about SOC external memory, Scratchpads and Cache memory and Multilevel Caches.
- Learn the SOC Design approach, Design and evaluation, Applications Like Image compression etc…

UNIT-I:

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

UNIT-II:

Processors : Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III:

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV:

Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor

UNIT-V:

Interconnect Configuration: Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT-VI:

Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

Text Books:

1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

Reference Books:

1. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

2. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

OUTCOMES

After going through this course the student will be able to

- Know basics of System Architecture and Processor Architecture.
- Know different Types of Processors Like VLIW Processors, Superscalar Processors etc. and Basic concepts in Processor Micro Architecture.
- Distinguish Cache memory and Multilevel Caches, SOC external memory.
- Know the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies.

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