COURSE STRUCTURE AND SYLLABUS

For

ELECTRONICS AND INSTRUMENTATION ENGINEERING

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year - I Semester

S.No.	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-ES	Mathematics-II (Numerical Methods and Complex Variables)	4	--	--	3
4-BS	Applied Physics	4	--	--	3
5-ES	Computer Programming	4	--	--	3
6-ES	Engineering Drawing	1	--	3	3
7-HS	English - Communication Skills Lab -1	--	--	3	2
8-BS	Applied / Engineering Physics Laboratory	--	--	3	2
9-BS	Applied Physics – Virtual Labs - Assignments	--	--	2	--
10-ES	Engineering Workshop& IT Workshop	--	--	3	2
Total Credits					**24**

I Year - II Semester

S.No.	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics - III	4	--	--	3
3-BS	Applied Chemistry	4	--	--	3
4-ES	Electrical and Mechanical Technology	4	--	--	3
5-HS	Environmental Studies	4	--	--	3
6-ES	Data Structures	4	--	--	3
7-BS	Applied / Engineering Chemistry Laboratory	--	--	3	2
8-HS	English - Communication Skills Lab -2	--	--	3	2
9-ES	Computer Programming Lab	--	--	3	2
Total Credits					**24**

II Year - I Semester

S.No.	Subjects	L	T	P	Credits
1	Electronic Devices and Circuits	4	--	--	3
2	Network Analysis	4	--	--	3
3	Signals and Systems	4	--	--	3
4	Switching Theory and Logic Design	4	--	--	3
5	Transducer Technology	4	--	--	3
6	Managerial Economics and Financial Analysis	4	--	--	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	L	T	P	Credits
1	Electronic Circuit Analysis	4	--	--	3
2	Electromagnetic Waves and Transmission Lines	4	--	--	3
3	Control Systems	4	--	--	3
4	Pulse and Digital Circuits	4	--	--	3
5	Signal Conditioning	4	--	--	3
6	Principles of Communication	4	--	--	3
7	Electronic Circuit Analysis LAB	--	--	3	2
8	Instrumentation LAB - 1	--	--	3	2
Total Credits					**22**

III Year - I Semester

S.No.	Subjects	L	T	P	Credits
1	Computer Architecture and Organisation	4	--	--	3
2	Linear IC Applications	4	--	--	3
3	Digital IC Applications	4	--	--	3
4	Process Instrumentation	4	--	--	3
5	Digital Signal Processing	4	--	--	3
6	Pulse and Digital Circuits Lab	--	--	3	2
7	Linear IC Applications Lab	--	--	3	2
8	Digital IC Applications Lab	--	--	3	2
MC	Professional Ethics & Human Values	--	3	--	--
	Total Credits				**21**

III Year - II Semester

S.No.	Subjects	L	T	P	Credits
1	Micro Processors & Micro Controllers	4	--	--	3
2	VLSI Design	4	--	--	3
3	Analytical Instrumentation	4	--	--	3
4	Measuring Instruments	4	--	--	3
5	**OPEN ELECTIVE** 1. OOPs through Java 2. Data Mining 3. Power Electronics 4. Bio-Medical Engineering 5.Artificial Neural Networks	4	--	--	3
6	Micro Processors & Micro Controllers Lab	--	--	3	2
7	Process Instrumentation Lab	--	--	3	2
8	Digital Signal Processing Lab	--	--	3	2
MC	IPR & Patents	--	2	--	--
	Total Credits				**21**

IV Year - I Semester

S.No.	Subjects	L	T	P	Credits
1	Data Acquisition Systems	4	--	--	3
2	Management Science	4	--	--	3
3	Computer Networks	4	--	--	3
4	Digital Image Processing	4	--	--	3
5	**Elective I** 1. Quality and Reliability Engineering Systems(QRES) 2. Analog IC Design 3. Digital Control Systems	4	--	---	3
6	**Elective II** 1. Mixed Signal Design 2. Robotics & Automation 3. EMI/EMC	4	--	--	3
7	Instrumentation Lab – II	--	--	2	2
8	Instrumentation Lab – III	--	--	2	2
Total Credits					**22**

IV Year - II Semester

S.No.	Subjects	L	T	P	Credits
1	Industrial Automation	4	--	--	3
2	Data Communication	4	--	--	3
3	Embedded Systems	4	--	--	3
4	**Elective III** 1. Digital IC Design 2. Calibration & Standards 3.Micro Electro Mechanical Systems(MEMS)	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
Total Credits					**24**

Total Course Credits =   48+44 + 42 + 46 = 180

	L	T	P	C
I Year - I Semester	4	0	0	3

ENGLISH - I

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus in primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To imporve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theorotical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronounciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students particiapte in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.

5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparision.
9. To enable the students to write techincal reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher interventionis perimitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is perimitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the langauge skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails,letters and reports-- are to be tested along with appropriate langauge and expressions.
4. Examinations:
   I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

   (80% for the best of two and 20% for the other)

   Assignments= 5%

   End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regualtions)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. ' Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. ' The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved beacuase animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

   All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

	L	T	P	C
I Year - I Semester	4	0	0	3

MATHEMATICS-I

Course Objectives:

      1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.

      2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

      1. Solve linear differential equations of first, second and higher order.

      2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.

      3. Calculate total derivative, Jocobian and minima of functions of two variables.

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- Electrical circuits- Chemical reactions.

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)- Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

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 types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg,** Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy,** Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil,** Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

	L	T	P	C
I Year - I Semester	4	0	0	3

MATHEMATICS-II (Numerical Methods and Complex Variables)

UNIT I: Solution of Algebraic and Transcendental Equations:
Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

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 unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:
Trapezoidal rule- Simpson's 1/3rd and 3/8th rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

Unit-IV: Functions of a complex variable
Complex function , Real and Imaginary parts of Complex function, Limit**,** Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function**,** $C-R$ equations in polar form, Harmonic functions, Milne-Thomson method**,** Simple applications to flow problems,

Unit-V: Series Expansion and Complex Integration
Line integral of a complex function, Cauchy's theorem(only statement) , Cauchy's Integral Formula. Absolutely convergent and uniformly convergent of series of complex terms, Radius of convergence**,** Taylor's series, Maclaurin's series expansion, Laurent's series.

Unit-VI: Singularities and Residue Theorem
Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m, simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m**,** Evaluation of real definite integrals: Integration around the unit circle**,** Integration around semi circle, Indenting the contours having poles on the real axis.

Text Books:

1. **B.S.GREWAL,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:
1. **DEAN G. DUFFY,** Advanced engineering mathematics with MATLAB, CRC Press
2. **V.RAVINDRANATH and P.VIJAYALAKSHMI,** Mathematical Methods, Himalaya Publishing House.
3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **DAVID KINCAID, WARD CHENEY**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.

	L	T	P	C
I Year - I Semester	4	0	0	3

APPLIED PHYSICS

***OBJECTIVES**: Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:*

- *Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.*
- *Teach Concepts of coherent sources, its realization and utility optical instrumentation.*
- *Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.*
- *Understand the physics of Semiconductors and their working mechanism for their utility in sensors.*

UNIT-I
INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – construction and basic principle of Interferometers.

UNIT-II
DIFFRACTION: Fraunhofer diffraction at single slit - Cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III
POLARIZATION: Types of Polarization – Methods of production - Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).

LASERS: Characteristics– Stimulated emission – Einstein's Transition Probabilities- Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV
ELECTROMAGNETIC FIELDS: Scalar and Vector Fields – Electric Potential- Gradient, Divergence of fields – Gauss and Stokes theorems-Propagation of EM waves through dielectric medium.

UNIT-V
QUANTUM MECHANICS: Introduction - Matter waves – Schröedinger Time Independent and Time Dependent wave equations – Particle in a box. **FREE ELECTRON THEORY:** Defects of Classical free electron theory –Quantum Free electron theory - concept of Fermi Energy.

UNIT-VI
BAND THEORY OF SOLIDS: Bloch's theorem (qualitative) – Kronig – Penney model – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.
SEMICONDUCTOR PHYSICS: Conduction – Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors

***Outcome**: Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.*

List of Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshira sagar, S.Chand & Company Ltd., (2014)
2. 'Solid State Physics' by A.J.Dekker, Mc Millan Publishers (2011)

List of Reference Books:

1. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)
2. Applied Physics by P.K.Palanisamy, Scitech publications (2014)
3. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).

	L	T	P	C
I Year - I Semester	4	0	0	3

COMPUTER PROGRAMMING

Learning objectives:
Formulating algorithmic solutions to problems and implementing algorithms in C.
- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:
History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:
Introduction to C Programming- Identifiers, The main () Function, The printf () Function
Programming Style - Indentation, Comments, Data Types**,** Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.
Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:
Control Flow-Relational Expressions - Logical Operators:
Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.
Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV
Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.
Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:
Arrays & Strings
Arrays: One-DimensionalArrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, LargerDimensionalArrays- Matrices
Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:

Pointers, Structures, Files

Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types,Structuresdeclaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, Bl Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

	L	T	P	C
I Year - I Semester	1	0	3	3

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective is 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: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.

UNIT II

Objective: To introduce the students to use scales and orthographic projections, projections of points & simple lines.

Scales: Plain scales, diagonal scales and vernier scales

Orthographic Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to of the reference planes (HP,VP or PP)

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 inclination and traces- HT, VT

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 Agarwal & Agarwal, Tata McGraw Hill Publishers

Reference Books:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

| | **L** | **T** | **P** | **C** |
| **I Year - I Semester** | **0** | **0** | **3** | **2** |

ENGLISH - COMMUNICATION SKILLS LAB- 1

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inqueries on the phone, thanking and responding to Thanks
   Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
   Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
   Practice work.

UNIT 4:

1. Letters and Sounds
   Practice work.

UNIT 5:

1. The Sounds of English
   Practice work.

UNIT 6:

1. Pronunciation
2. Stress and Intonation
   Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

The rubric to assess the learners:

Body language		Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language		Total 10 marks	Remarks
Gestures & Postures	Eye Contact				Grammar	Vocabulary & expressions		

- **Lab Assessment: Internal (25 marks)**
  1. Day-to-Day activities: 10 marks

  2. Completing the exercises in the lab manual: 5 marks

  3. Internal test (5 marks written and 5 marks oral)

- **Lab Assessment: External (50 marks)**
  1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording.

  2. Oral: Reading aloud a text or a dialogue- 10 marks

  3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

	L	T	P	C
I Year - I Semester	0	0	3	2

APPLIED / ENGINEERING PHYSICS LAB

(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

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 spacer using wedge film and 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 vibrations in stretched strings – Sonometer.

8. Determination of velocity of sound – Volume Resonator.

9. L- C- R Series Resonance Circuit.

10. Study of I/V Characteristics of Semiconductor diode.

11. I/V characteristics of Zener diode.

12. Characteristics of Thermistor – Temperature Coefficients.

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 in semiconductors.

16. Time constant of CR circuit.

17. Determination of wavelength of laser source using diffraction grating.

18. Determination of Young's modulus by method of single cantilever oscillations.

19. Determination of lattice constant – lattice dimensions kit.

20. Determination of Planck's constant using photocell.

21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements.*

	L	T	P	C
I Year - I Semester	**0**	**0**	**2**	**0**

APPLIED / ENGINEERING PHYSICS VIRTUAL LABS - ASSIGNMENTS

(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

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
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

	L	T	P	C
I Year - I Semester	**0**	**0**	**3**	**2**

<div align="center">

ENGINEERING WORKSHOP & IT WORKSHOP

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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 Tenon 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:
- Understand the basic components and peripherals of a computer.
- To become familiar in configuring a system.
- Learn the usage of productivity tools.
- Acquire knowledge about the netiquette and cyber hygiene.
- Get hands on experience in trouble shooting a system?

1. **System Assembling, Disassembling and identification of Parts / Peripherals**

2. **Operating System Installation**-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

3**. MS-Office / Open Office**
      a. **Word** - Formatting, Page Borders, Reviewing, Equations, symbols.
      b. **Spread Sheet** - organize data, usage of formula, graphs, charts.
      c. **Power point** - features of power point, guidelines for preparing an effective
         presentation.
      d. **Access**- creation of database, validate data.

4. **Network Configuration & Software Installation**-Configuring TCP/IP, proxy and firewall   settings. Installing application software, system software & tools.

5. **Internet and World Wide Web**-Search Engines, Types of search engines, netiquette, cyber hygiene.

6. Trouble Shooting-Hardware trouble shooting, Software trouble shooting.

7. **MATLAB-** basic commands, subroutines, graph plotting.

8. **LATEX**-basic formatting, handling equations and images.

OUTCOMES:
- Common understanding of concepts, patterns of decentralization implementation in Africa †
- Identified opportunities for coordinated policy responses, capacity building and implementation of best practices †
- Identified instruments for improved decentralization to the local level †
- Identified strategies for overcoming constraints to effective decentralization and sustainable management at different levels

Text Books:
1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition by Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press, 2002.
5. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008
6. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.
7. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
8. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

	L	T	P	C

I Year - II Semester

L	T	P	C
4	0	0	3

ENGLISH -II

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus in primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To imporve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theorotical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronounciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students particiapte in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparision.
9. To enable the students to write techincal reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher interventionis perimitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is perimitted to use lecture method when a completely new concept is introduced in the class.
6.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the langauge skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails,letters and reports-- are to be tested along with appropriate langauge and expressions.
4. Examinations:
   I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

   (80% for the best of two and 20% for the other)

   Assignments= 5%

   End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 **(R-16 Regulations)**

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL:THE GREAT INDIAN SCIENTISTS Published by **Cenguage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. ' A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME:

The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and sterngthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. ' The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. ' Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

	L	**T**	**P**	**C**
I Year - II Semester	**4**	**0**	**0**	**3**

MATHEMATICS-III

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

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- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.
Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.
Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.
Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.
Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.
Applications: Equation of continuity, potential surfaces

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.
Applications: Work done, Force.

Text Books:
1. **B.S.Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:
1. **Greenberg,** Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil,** Advanced Engineering Mathematics,7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith,** Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

	L	T	P	C
I Year - II Semester	**4**	**0**	**0**	**3**

APPLIED CHEMISTRY
(Common to EEE, ECE, CSE, IT, EIE, E.Com.E,)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:
- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries (Unit I).
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced (Unit II).
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory (Unit III).
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced (Unit IV).
- Understanding of crystal structures will help to understand the conductivity, semiconductors and superconductors. Magnetic properties are also studied (Unit V).
- With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced (Unit VI).

UNIT I: HIGH POLYMERS AND PLASTICS
Polymerisation : Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates
Elastomers – Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.
Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY
Fuels:- Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

Explosives:- Introduction, classification, examples: RDX, TNT and ammonium nitrite - rocket fuels.

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION
Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.
Corrosion:- Definition – Theories of Corrosion (electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion –   Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: –   Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating)

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications

Liquid crystals:- Introduction – Types – Applications

Superconductors :- Type-I & Type-2, properties &applications

Green synthesis:- Principles - 3or 4 methods of synthesis with examples – R_4M_4 principles

UNIT V: SOLID STATE CHEMISTRY

Types of solids - close packing of atoms and ions - BCC , FCC, structures of rock salt - cesium chloride- spinel - normal and inverse spinels,

Non-elemental *semiconducting Materials:-* Stoichiometric, controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors - Semiconductor Devices:- p-n junction diode as rectifier – junction transistor.

Insulators (electrical and electronic applications)

Magnetic materials:- Ferro and ferri magnetism. Hall effect and its applications.

UNIT VI: NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICESSolar Energy: -

Introduction, application of solar energy, conversion of solar energy (Thermal conversion & photo conversion) – photovoltaic cell: design, working and its importance

Non-conventional energy sources:
(i)   Hydropower include setup a hydropower plant (schematic diagram)
(ii)   Geothermal energy: Introduction-schematic diagram of a geothermal power plant
(iii)   Tidal and wave power: Introduction- Design and working-movement of tides and their effect on sea level.
(iv)   Ocean thermal energy: Introduction, closed-cycle, ocean thermal energy conversion (OTEC), open cycle OTEC, hybrid OTEC, schematic diagram and explanation.
(v)   Biomass and biofuels

Fuel cells:- Introduction - cell representation, H_2-O_2 fuel cell: Design and working, advantages and limitations. Types of fuel cells: Alkaline fuel cell - methanol-oxygen - phosphoric acid fuel cells - molten carbonate fuel cells.

Outcomes: The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano-materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. Conductance phenomenon is better understood. The students are exposed to some of the alternative fuels and their advantages and limitations.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1.Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2.Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3.A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4.Applied Chemistry by H.D. Gesser, Springer Publishers
5.Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

L	T	P	C
4	0	0	3

ELECTRICAL & MECHANICAL TECHNOLOGY

ELECTRICAL TECHNOLOGY:

Preamble:
This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

Learning Objectives:
- To learn the basic principles of electrical law's and analysis of networks.
- To understand the principle of operation and construction details of DC machines.
- To understand the principle of operation and construction details of transformer.
- To understand the principle of operation and construction details of alternator and 3-Phase induction motor.
- To Understand the principles and construction of various measuring instruments.

UNIT - I
DC Machines:
Principle of operation of DC generator – emf equation – types of DC machine – torque equation of DC motor – applications – three point starter, speed control methods – OCC of DC generator
Transformers: Principle of operation of single phase transformers – e.m.f equation – losses –efficiency and regulation.

UNIT - II
AC Rotating Machines:
Principle of operation of alternators – regulation by synchronous impedance method –principle of operation of 3-Phase induction motor – slip-torque characteristics - efficiency – applications.

UNIT III
Measuring Instruments:
Classification – Deflection, controlling, damping torque, ammeter, voltmeter, wattmeter, MI, MC instruments – Energy meter – Construction of CRO.

Learning Outcomes:
- Able to analyse the various electrical networks.
- Able to understand the operation of DC generator, DC Motor ,3-point starter and Speed control methods.
- Able to analyse the performance of transformer.
- Able to explain the operation of 3-phase alternator and 3-phase induction motors.
- Able to explain the working principle of various measuring instruments.

MECHANICAL TECNOLOGY

Learning Objectives: The content of this course shall provide the student the basic concepts of various mechanical systems and exposes the student to a wide range of equipment and their utility in a practical situation. It shall provide the fundamental principles of fuels, I.C. Engines, transmission systems, heat transfer fundamentals and various manufacturing operations usually exist in any process plant.

UNIT-IV:

Energy Sources: Renewable and non renewable energy resources, renewable energy forms and conversions. Thermodynamic principles and laws.

Internal combustion engines: classification – working principle - engine components. Four stroke and two stroke petrol and diesel engines, comparisons. Performance parameters: IP, BP, FP, SFC, BTE, ITE, ME.

UNIT-V:

Heat Transfer: Modes of heat transfer- heat transfer parameters, various thermo physical properties. Conduction - heat transfer for extended surfaces, Types of fins, Fin equation for rectangular fin, Fin efficiency, Fin effectiveness. Convection – Mechanism, Natural and Forced Convection. Heat Transfer in laminar and turbulent flow over a flat plate. Radiation heat transfer: Thermal radiation, Blackbody radiation, Radiation intensity, Radiative properties, Basic laws of radiation.

UNIT-VI:

Transmission of power and manufacturing methods:

Belt, rope and chain drives- Different types - power transmission by belts and ropes, initial tensions in the belt.

Gears: classification of gears, applications.

Metal joining: arc welding, resistance welding, gas welding, brazing and soldering

Metal forming: forging – operations, rolling and extrusion principles

Machine tool: lathe classification, specifications, and operations.

Outcomes:

After completing the course, the student shall be able to understand:

- Working of I.C. Engines
- Modes of Heat transfer
- Power transmission by drives and different manufacturing methods.

Text Books:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.

2. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group

3. Mechanical Engineering Science K R Gopala Krishna, Subhas publications

4. Elements of Mechanical Engineering, M.L. Mathur, F.S.Metha & R.P.Tiwari Jain Brothers Publs., 2009.

5. Heat transfer by P.K. Nag, Tata McGraw-Hill

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

4. Electrical Engineering – Prasad, Sivanagaraju, Cengage Learning

5. Theory of machines by Rattan   McGraw-Hill publications

6. Production Technology by   P.N.Rao by I & II McGraw-Hill publications

	L	T	P	C
	4	0	0	3

ENVIRONMENTAL STUDIES

Course Learning Objectives:

The objectives of the course is to impart

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

Course Outcomes:

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
- 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
- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
- Social issues both rural and urban environment and the possible means to combat the challenges
- The environmental legislations of India and the first global initiatives towards sustainable development.
- About environmental assessment and the stages involved in EIA and the environmental audit.
- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

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, Carbon Credits, 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, Sustainable mining of Granite, Literate, Coal, Sea and River sands.

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 Vs Oil and Natural Gas Extraction.

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-spots 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, Sustainable Life Studies.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

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, Green Campus – Green business and Green politics.

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

Text Books:

1. Environmental Studies, K.V. S. G. Murali Krishna, VGS Publishers, Vijayawada

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

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

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.

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

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. "Perspectives in Environment Studies" Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

		L	T	P	C
I Year - II Semester		**4**	**0**	**0**	**3**

DATA STRUCTURES

OBJECTIVES:

- To be familiar with basic techniques handling problems with Data structures
- Solve problems using data structures such as linear lists, stacks, queues, hash tables

UNIT-I: ARRAYS
Abstract Data Type, The Array as an Abstract Data Type, The Polynomial Abstract Data type-Polynomial Representation- Polynomial Addition. Spares Matrices, Introduction- Sparse Matrix Representation- Transposing a Matrix- Matrix Multiplication, Representation of Arrays.

UNIT-II: STACKS AND QUEUES
The Stack Abstract Data Type, The Queue Abstract Data Type, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

UNIT-III: LINKED LISTS
Single Linked List and Chains, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input- Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists- Reference Counts, Shared and Recursive Lists

UNIT-IV: TREES
Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Thread Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

UNIT-V: GRAPHS
The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal S Algorithm, Prim s Algorithm, Sollin's Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure.

UNIT-VI: SORTING

Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort, Summary of Internal Sorting

OUTCOMES:

- Apply advanced data structure strategies for exploring complex data structures.

- Compare and contrast various data structures and design techniques in the area
  Of Performance.

- Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and trade offs

TEXT BOOKS:

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson□

REFERENCE BOOKS:

1. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.□
2. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.□
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

	L	**T**	**P**	**C**
I Year - II Semester	**0**	**0**	**3**	**2**

APPLIED/ENGINEERING CHEMISTRY LABORATORY

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.

2. Trial experiment - Determination of HCl using standard Na_2CO_3 solution.

3. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.

4. Determination of $KMnO_4$ using standard Oxalic acid solution.

5. Determination of Ferrous iron using standard $K_2Cr_2O_7$ solution.

6. Determination of Copper using standard $K_2Cr_2O_7$ solution.

7. Determination of temporary and permanent hardness of water using standard EDTA solution.

8. Determination of Copper using standard EDTA solution.

9. Determination of Iron by a Colorimetric method using thiocynate as reagent.

10. Determination of pH of the given sample solution using pH meter.

11. Conductometric titration between strong acid and strong base.

12. Conductometric titration between strong acid and weak base.

13. Potentiometric titration between strong acid and strong base.

14. Potentiometric titration between strong acid and weak base.

15. Determination of Zinc using standard EDTA solution.

16. Determination of Vitamin – C.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books
1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuris (2012) *Laboratory Manual of engineering chemistry-II,* VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications K. Mukkanti (2009) *Practical Engineering Chemistry,* B.S. Publication.

		L	T	P	C
I Year - II Semester		0	0	3	2

ENGLISH - COMMUNICATION SKILLS LAB - 2

PRESCRIBED LAB MANUAL FOR SEMESTER II:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

  1. Debating - Practice work

UNIT 2:

  1. Group Discussions -- Practice work

UNIT 3:

  1. Presentation Skills - Practice work

UNIT 4:

  1. Interview Skills - Practice work

UNIT 5:

  1. Email, Curriculum Vitae , Practice work

UNIT 6:

  1. Idiomatic Expressions
  2. Common Errors in English , Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

	L	T	P	C
I Year - II Semester	0	0	3	2

COMPUTER PROGRAMMING LAB

OBJECTIVES:

• Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.

• Acquire knowledge about the basic concept of writing a program.

• Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.

• Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

• Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics
a) What is an OS Command, Familiarization of Editors - vi, Emacs
b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math
a) Write a C Program to Simulate 3 Laws at Motion
b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I
a)Write a C Program to Find Whether the Given Year is a Leap Year or not.
 b)Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II
a)Write a C Program to Find Whether the Given Number is
        i) Prime Number
        ii) Armstrong Number
b) Write a C program to print Floyd Triangle
c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

a) Write a C Program demonstrating of parameter passing in Functions and returning values.

b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch…case

b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values ofsin x and cos x and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays

Demonstration of arrays

a) Search-Linear.

b) Sorting-Bubble, Selection.

c) Operations on Matrix.

Exercises - 9 Structures

a)Write a C Program to Store Information of a Movie Using Structure

b)Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

a)Write a C Program to Access Elements of an Array Using Pointer

b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

 a)   Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

     Understand the difference between the above two programs

Exercise – 12 Strings

a) Implementation of string manipulation operations **with** library function.

        i) copy
        ii) concatenate
        iii) length
        iv) compare

b) Implementation of string manipulation operations **without** library function.

        i) copy
        ii) concatenate
        iii) length
        iv) compare

Exercise -13 Files
a)Write a C programming code to open a file and to print it contents on screen.
b)Write a C program to copy files

Exercise - 14 Files Continued
a) Write a C program merges two files and stores their contents in another file.
b)Write a C program to delete a file.

OUTCOMES:

• Apply and practice logical ability to solve the problems.

• Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment

• Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs

• Understand and apply the in-built functions and customized functions for solving the problems.

• Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

• Document and present the algorithms, flowcharts and programs in form of user-manuals

•Identification of various computer components, Installation of software

Note:
a) All the Programs must be executed in the Linux Environment. (Mandatory)
b) The Lab record must be a print of the LATEX (.tex) Format.

	L	T	P	C
II Year - I Semester	4	0	0	3

ELECTRONIC DEVICES AND CIRCUITS

Objectives:

The main objectives of this course are:

- The basic concepts of semiconductor physics are to be reviewed.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
- The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers in different configuration is explained.

Syllabus:

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 Diodes: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Photo diode, Tunnel Diode, SCR, UJT. Construction, operation and characteristics of all the diodes are 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, 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. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.
3. Electronic Devices and Circuits-David A.Bell, Oxford University Press, Fifth Edition.

References:

1. Electronic Devices and Circuits-K. Satya Prasad, VGS Book Links.
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.

Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

L	T	P	C
4	0	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.

COURSE OBJECTIVES:

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transients states in RLC circuits.
3. To know the basic Laplace transforms techniques in periods' waveforms.
4. To understand the two port network parameters.
5. To understand the properties of LC networks and filters.

COUSE OUTCOME:

1. gain the knowledge on basic network elements.
2. will analyze the RLC circuits behavior in detailed.
3. analyze the performance of periodic waveforms.
4. gain the knowledge in characteristics of two port network parameters (Z, Y, ABCD, h & g).
5. analyze the filter design concepts in real world applications.

	L	T	P	C
II Year - I Semester

L	T	P	C
4	0	0	3

SIGNALS & SYSTEMS

OBJECTIVES:

The main objectives of this course are given below:
- To introduce the terminology of signals and systems.
- To introduce Fourier tools through the analogy between vectors and signals.
- To introduce the concept of sampling and reconstruction of signals.
- To analyze the linear systems in time and frequency domains.
- To study z-transform as mathematical tool to analyze discrete-time signals and systems.

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

UNIT –II: FOURIER SERIES AND FOURIER TRANSFORM:
Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT –III: 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-IV: ANALYSIS OF LINEAR SYSTEMS: Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system. 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.

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-time 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.

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
3. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009
4. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
5. Signals and Systems – T K Rawat , Oxford University press, 2011

OUTCOMES:

At the end of this course the student will able to:
- Characterize the signals and systems and principles of vector spaces, Concept of orthgonality.
- Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
- Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
- Understand the relationships among the various representations of LTI systems
- Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.
- Apply z-transform to analyze discrete-time signals and systems.

	L	T	P	C
II Year - I Semester	4	0	0	3

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.

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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.

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II Year - I Semester	**4**	**0**	**0**	**3**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to all Branches)

• **Course Objectives:**
• The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
• To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
• To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I
Introduction to Managerial Economics and demand Analysis:
Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting..

UNIT – II
Production and Cost Analyses:
Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of Breakeven point.

UNIT – III
Introduction to Markets, Theories of the Firm & Pricing Policies:
Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive pricing and Priority Pricing.

UNIT – IV
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.

UNIT – V
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 and cash flow statements (Simple Problems)

UNIT – VI
Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:
*The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
* One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
*The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS
1. Dr. N. AppaRao, 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.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial
   Analysis', Ravindra Publication.

REFERENCES:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis,
   Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. VanithaAgarwal: 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
8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Univerties press, 2015

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II Year - I Semester	**0**	**0**	**3**	**2**

ELECTRONIC DEVICES AND CIRCUITS LAB

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

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.

.

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

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

Equipment required:

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

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II Year - I Semester

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NETWORKS & ELECTRICAL TECHNOLOGY LAB

Learning Objectives:
- To determine resonance frequency, Q-factor of RLC network.
- To analysis time response of first orders RC/RL network for non-sinusoidal inputs.
- To estimate parameters of two port networks
- To understand the concept network theorems in network reduction of electrical networks.
- To determine efficiency of dc shunt machine with actual loading.
- To analyse performance of 3 phase induction motor
- To understand the significance of regulation of an alternators through synchronous impedance method.

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. Speed control of D.C. Shunt motor by Armature & flux control methods
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

Learning Outcomes:
- Able to analyse RLC circuits and understand resonant frequency and Q-factor.
- Able to determine first order RC/RL networks of periodic non- sinusoidal waveforms.
- Able to apply network theorems to analyze the electrical network.
- Able to describe the performance of dc shunt machine.
- Able to investigate the performance of 1-phase transformer.
- Able to perform tests on 3-phase induction motor and alternator to determine their performance characteristic

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II Year - II Semester	4	0	0	3

ELECTRONIC CIRCUIT ANALYSIS

Objectives:

The main objectives of this course are:

- Small signal high frequency BJT transistor amplifier Hybrid-π equivalent circuit and the expressions for conductances and capacitances are derived.
- Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
- The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
- Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.
- Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.
- Different types of tuned amplifier circuits are analyzed.

Outcomes:

At the end of this course the student can able to:

- Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
- Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT
- Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
- Know the classification of the power and tuned amplifiers and their analysis with performance comparison.

Syllabus:

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, cascaded 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, 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, 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 Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

References:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
3. Electronic Circuit Analysis-B.V.Rao,K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
4. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

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II Year - II Semester	**4**	**0**	**0**	**3**

EM WAVES AND TRANSMISSION LINES

OBJECTIVES:

The main objectives of this course are to understand:
1. Fundamentals of steady electric and magnetic fields using various laws
2. The concept of static and time varying Maxwell equations and power flow using pointing theorem
3. Wave characteristics in different media for normal and oblique incidence
4. Various concepts of transmission lines and impedance measurements

SYLLABUS:

UNIT I:
Review of Co-ordinate Systems, **Electrostatics:**, Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems. **[1,5]**

UNIT II: 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**. [1,5]**
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. **[1,2]**

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 Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types. Illustrative Problems. **[1,2,3]**

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. **[2,3,4]**

UNIT V: Transmission Lines - I : Types, Parameters, T&π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Loading - Types of Loading. Illustrative Problems. **[1,7]**

UNIT VI: Transmission Lines – II : Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Stub Matching-single & double, Illustrative Problems. **[1,7]**

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.

Reference Books:

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 Transmission Lines: G SasiBhushana Rao,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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OUTCOMES:

At the end of this course the student can able to:
1. Determine E and H using various laws and applications of electric & magnetic fields
2. Apply the Maxwell equations to analyze the time varying behavior of EM waves
3. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
4. Calculate Brewster angle, critical angle and total internal reflection
5. Derive the expressions for input impedance of transmission lines
6. Calculate reflection coefficient, VSWR etc. using smith chart

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II Year - II Semester

CONTROL SYSTEMS

Course objectives

1. To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback

2. To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis

3. To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices

4. To analyze the system in terms of absolute stability and relative stability by different approaches

5. To design different control systems for different applications as per given specifications

6. To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability

UNIT-1
Introduction
System Control System, Open Loop Control System, Closed loop Control System, Different Examples
Mathematical models of Physical Systems
Differential equations of physical systems, Transfer functions, Block diagram Algebra, Signal flow graphs with illustrative examples
Effects of Feedback
Feedback Characteristics and its advantages, Linearizing effect of feedback

UNIT-2
Controller Components
DC Servomotor (Armature Controlled and Field Controlled) with necessary derivation for transfer function, AC Servomotor and its transfer function, AC Tachometer, Potentiometer, Synchros, AC Position Control Systems
Time Response Analysis
Standard test Signals, Time response of first and second order systems, steady state errors and error constants, Effect of adding a zero to a system, Design specifications of second order systems, Performance indices

UNIT-3
Concepts of Stability and Algebraic Criteria
The concept of Stability, Necessary Conditions for Stability, Routh-Hurwitz Srability Criterion, Relative stability analysis,
The Root Locus Technique
Introduction, The Root Locus concepts, Construction of Root Loci

UNIT-4
Frequency response analysis
Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion

UNIT-5
Introduction to Design
The design problem, Preliminary consideration of classical design, Realization of basic Compensators, Cascade compensation in time domain and frequency domain, Tuning of PID Controllers

UNIT-6
State Variable Analysis and Design
Introduction, Concepts of State, State Variables and State models, State models for linear continuous-time systems, State variables and linear discrete-time systems, Solution of state equations and Concepts of Controllability and Observability.

Text Book:

I.   J.Nagarath and M.Gopal, " **Control System Engineering,"** New Age International Publishers, Fifth Edition

Reference Books

1. Katsuhiko Ogata, "Modern Control Engineering," Pearson, Fifth Edition
2. S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, " Control Systems Engineering," Pearson, First Impression
3. Benjamin C. Kuo, Frarid Golnaraghi, " Automatic Control Systems," Wiley Student Edition, Eigth Edition
4. PadmaRaju and Reddy , " Instrumentation and Control Systems ", McGrawHill Education ,2016

Course Outcomes

1. This course introduces the concepts of feedback and its advantages to various control systems
2. The performance metrics to design the control system in time-domain and frequency domain are introduced.
3. Control systems for various applications can be designed using time-domain and frequency domain analysis.
4. In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.

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II Year - II Semester	4	0	0	3

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 study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families & Sampling Gates.

UNIT I
LINEAR WAVESHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential 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; 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, Design and analysis of 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.
Bistable Multivibrator: Analysis And Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector Catching Diodes, Commutating Capacitors, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

UNIT IV
Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.
Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

UNIT V
VOLTAGE TIME BASE GENERATORS:
General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

UNIT VI
LOGIC FAMILIES & SAMPLING GATES:
LOGIC FAMILIES: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, AOI Logic, Comparison of Logic Families.
SAMPLING GATES: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Six-Diode Gates, Reduction of Pedestal in Sampling Gates, Applications of Sampling Gates.

Text Books:
1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005

References:
1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition, 2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002
3. Pulse & Digital Circuits by Venkata Rao,K,Ramasudha K, Manmadha Rao,G., Pearson,2010

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.
- Utilize the non sinusoidal signals in many experimental research areas.

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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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II Year - II Semester	4	0	0	3

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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II Year - II Semester	0	0	3	2

ELECTRONIC CIRCUIT ANALYSIS LAB

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool**.** Further they are required to verify the result using necessary hardware equipment.

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

Equipment required:

Software:
1. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
2. Computer Systems with required specifications

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

INSTRUMENTATION LAB - 1

(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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4	0	0	3

COMPUTER ARCHITECTURE AND ORGANIZATION

OBJECTIVES:

- Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- In addition to this the memory management system of computer.

UNIT -I
Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

UNIT -II
Machine Instruction and Programs:
Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,
Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

UNIT -III
Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes,
Input/output Operations

UNIT -IV
INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,
Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -V
The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory,
Cache Memories: Mapping Functions, INTERLEAVING
Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT -VI
Processing Unit: Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory,
Execution of Complete Instruction, Hardwired Control,
Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

OUTCOMES:

- Students can understand the architecture of modern computer.
- They can analyze the Performance of a   computer using performance equation
- Understanding of different instruction types.
- 4. Students can calculate the effective address of an operand by addressing modes
- 5. They can understand how computer stores positive and negative numbers.
- 6. Understanding of how a computer performs arithmetic operation of positive and negative numbers.

Text Books:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization , John P. Hayes ,3rd Edition, McGraw Hill.

Reference Books:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy.
5. J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

	L	T	P	C
III Year - I Semester	4	0	0	3

LINEAR IC APPLICATIONS

OBJECTIVES

- To understand the basic operation &performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of performance parameters of OP-AMP
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using opamps
- To learn the internal structure, operation and applications of different analog ICs
- To 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, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques.

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: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.
Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

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 Choudhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
3.Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971

References :

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria &Sons;2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.
3. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.
4. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll,
   PHI, 6th Edition.
 5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition

OUTCOMES

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Diagnose and trouble-shoot linear electronic circuits.
- Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
- Understand thoroughly the operational amplifiers with linear integrated circuits.

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III Year - I Semester	**4**	**0**	**0**	**3**

<div align="center">

DIGITAL IC APPLICATIONS

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<u>**OBJECTIVES:**</u>

The main objectives of this course are:

- Introduction of digital logic families and interfacing concepts for digital design is considered.
- VHDL fundamentals were discussed to modeling the digital system design blocks.
- VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.
- Design and implementation of combinational and sequential digital logic circuits is explained.

<u>**Outcomes:**</u>

At the end of this course the student can able to:

- Understand the structure of commercially available digital integrated circuit families.
- Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
- Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.
- Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.

<u>**Syllabus**</u>:

UNIT-I
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.
<div align="center">(**Text book-1**)</div>

UNIT-II
Introduction to VHDL: Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modeling.
<div align="center">(**Text book-2**)</div>

UNIT-III
Behavioral Modeling: Process statement, variable assignment statement, signal assignment statement, wait statement , if statement, case statement ,null statement, loop statement, exit statement, next statement ,assertion statement, more on signal assignment statement ,Inertial Delay Model, Transport Delay Model ,Creating Signal Waveforms, Signal Drivers , Other Sequential Statements , Multiple Processes. Logic Synthesis, Inside a logic Synthesizer.
<div align="center">(**Text book-2**)</div>

UNIT-IV
Combinational Logic Design: Binary Adder-Subtractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and demultiplexers, parity circuits, comparators, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder, Design considerations of the above combinational logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

(Text book-1)

UNIT-V:
Sequential Logic Design: SSI Latches and flip flops, Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Universal Shift Registers, Design considerations of the above sequential logic circuits with relevant Digital ICs, modeling of above ICs using VHDL**.**

(Text book-1)

UNIT-VI:
Synchronous and Asynchronous Sequential Circuits: Basic design steps: State diagram, state table, state assignment, choice of flip flops and derivation of next state and output expressions, timing diagram. State assignment problem: One hot encoding. Mealy and Moore type FSM for serial adder, VHDL code for the serial adder. Analysis of Asynchronous circuits, State Reduction, State Assignment. A complete design example: The vending machine controller.

(**Reference text book- 1)**

Text Books

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

References:

1. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, ZvonkoVranesic, McGrawHill, 3rd Edition.

		L	T	P	C

III Year - I Semester

L   T   P   C
4   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

	L	T	P	C
III Year - I Semester	**4**	**0**	**0**	**3**

DIGITAL SIGNAL PROCESSING

OBJECTIVES

The student will be able to

- Analyze the Discrete Time Signals and Systems
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the various implementations of digital filter structures
- Learn the FIR and IIR Filter design procedures
- Know the need of Multirate Processing
- Learn the concepts of DSP Processors

UNIT I INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems , stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT II DISCRETE FOURIER SERIES & FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT III. DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT IV DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:
Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters.
Basic structures of FIR systems, *Lattice structures, Lattice-ladder structures*

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction, Decimation , Interpolation Sampling rate conversion ,Implementation of sampling rate converters**, *Applications – Sub-band Coding of Speech Signals ,Implementation of Digital Filter Banks, Trans-multiplexers.***

UNIT VI INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, 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

- Apply the difference equations concept in the anayziation of Discrete time systems
- Use the FFT algorithm for solving the DFT of a given signal
- Design a Digital filter (FIR&IIR) from the given specifications
- Realize the FIR and IIR structures from the designed digital filter.
- Use the Multirate Processing concepts in various applications(eg: Design of phase shifters, Interfacing of digital systems)
- Apply the signal processing concepts on DSP Processor.
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III Year - I Semester	**L**	**T**	**P**	**C**
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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

	L	T	P	C
III Year - I Semester	0	0	3	2

LIC APPLICATIONS LAB

Minimum Twelve Experiments to be conducted :

1. Study of OP AMPs – 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.

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

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III Year - I Semester

DICA LABORATORY

Note: The students are required to design and draw the internal logical structure of the following Digital Integrated Circuits and to develop VHDL/Verilog HDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

All the experiments are required to verify and implement the logical operations on the latest FPGA Hardware in the Laboratory.

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

1. Realization of Logic Gates
2. Design of Full Adder using 3 modeling systems
3. 3 to 8 Decoder -74138
4. 8 to 3 Encoder (with and without parity)
5. 8 x 1 Multiplexer-74151 and 2x 4 De-multiplexer-74155
6. 4- Bit comparator-7485
7. D Flip-Flop-7474
8. Decade counter -7490
9. Shift registers-7495
10. 8-bit serial in-parallel out and parallel in-serial out
11. Fast In & Fast Out (FIFO)
12. MAC (Multiplier & Accumulator)
13. ALU Design.

Equipment/Software required:

1. Xilinx Vivado software / Equivalent Industry Standard Software
2. Xilinx Hardware / Equivalent hardware
3. Personal computer system with necessary software to run the programs and Implement.

	L	T	P	C
III Year - I Semester	0	3	0	0

PROFESSIONAL ETHICSAND HUMAN VALUES

Course Objectives:

*To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.

*Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.

UNIT I: Human Values:

Morals, Values and Ethics – Integrity –Trustworthiness - 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: Principles for Harmony:

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism — Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg's Theory - Gilligan's Argument –Heinz's Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV: Engineers' Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers' Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

- Related Cases Shall be dealt where ever necessary.

Outcome:
*It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.
*It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.

References:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
4. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications

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MICROPROCESSORS AND MICROCONTROLLERS

UNIT-I
 8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II
 8086 PROGRAMMING: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III
8086 INTERFACING : Semiconductor memories interfacing (RAM,ROM), 8254 software programmable timer/counter, Intel 8259 programmable interrupt controller, software and hardware interrupt applications, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, keyboard interfacing, alphanumeric displays (LED,7-segment display, multiplexed 7-segment display, LCD), Intel 8279 programmable keyboard/display controller, stepper motor, A/D and D/A converters.

UNIT-IV
80386 AND 80486 MICROPROCESSORS: Introduction, programming concepts, special purpose registers, memory organization, moving to protected mode, virtual mode, memory paging mechanism, architectural differences between 80386 and 80486 microprocessors.

UNIT-V
Intel 8051 MICROCONTROLLER: Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.
Assembly language programming: Instructions, addressing modes, simple programs.
Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.
.
UNIT-VI
PIC MICROCONTROLLER: Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877 architecture, instruction set of the PIC 16F877.

 Text Books:
  1. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall ,
     SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.
  2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth
     J.Ayala, Dhananjay V.Gadre,Cengage Learninbg , India Edition.
References:
  1. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey,
     Pearson, Eighth Edition-2012.
  2. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI
     Learning Private Limited, Second Edition, 2014.
  3. Microprocessors and Microcontrollers by N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Oxford
     University Press, Seventh Impression 2013

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III Year - II Semester

VLSI DESIGN

Objectives:

The main objectives of this course are:

- Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
- Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
- Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.

Outcomes:

At the end of this course the student can able to:

- Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon.
- Know three sets of design rules with which nMOS and CMOS designs may be fabricated.
- Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon.

Syllabus:

UNIT-I
Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.
(Text Book-1)

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.
(Text Book-1)

UNIT-III:
Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.
(Text Book-1)

UNIT-IV

Chip Input and Output circuits: ESD Protection, Input Circuits, Output Circuits and L(di/dt) Noise, On-Chip clock Generation and Distribution.

Design for Testability: Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based Techniques and Built-In Self Test techniques.

(Text Book-2)

UNIT-V

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex 8000FPGA, Altera Flex 10FPGA, Xilinx XC4000 series FPGA, Xilinx Spartan XL FPGA, Xilinx Spartan II FPGAs, Xilinx Vertex FPGA. Case studies: FPGA Implementation of Half adder and full adder.

Introduction to synthesis: Logic synthesis, RTL synthesis, High level Synthesis.

(Reference Text Book-1)

UNIT-VI:

Introduction to Low Power VLSI Design: Introduction to Deep submicron digital IC design**,** Low Power CMOS Logic Circuits: Over view of power consumption, Low –power design through voltage scaling, Estimation and optimisation of switching activity, Reduction of switching capacitance. Interconnect Design, Power Grid and Clock Design.

(Text Book-2)

Text Books:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill Education, 2003.

References:

1. Advanced Digital Design with the Verilog HDL, Michael D.Ciletti, Xilinx Design Series, Pearson Education
2. Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3'rd edition, David Hodges.

	L	T	P	C
III Year - II Semester	4	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.

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III Year -II Semester	4	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.

Text Books:
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.

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III Year - II Semester

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4	0	0	3

OOPS THROUGH JAVA
(OPEN ELECTIVE)

OBJECTIVE:
- To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
- To introduce object oriented concepts in C++ and Java.

Programming:

1. Write a Programme that computes the simple interest and compound interest payable on principal amount (in Rs.) of loan borrowed by the customer from a bank for a giver period of time (in years) at specific rate of interest. Further determine whether the b bank will benefit by charging simple interest or compound interest

2. Write a Programme to calculate the fare for the passengers traveling in a bus. When a Passenger enters the bus, the conductor asks "What distance will you travel?" On knowing distance from passenger (as an approximate integer), the conductor mentions the fare to the passenger according to following criteria.

3. Write a C++ Program to illustrate Enumeration and Function Overloading

4. Write a C++ Program to illustrate Scope and Storage class

5. Implementation of ADT such as Stack and Queues

6. Write a C++ Program to illustrate the use of Constructors and Destructors and Constructor Overloading

7. Write a Program to illustrate Static member and methods

8. Write a Program to illustrate Bit fields

9. Write a Program to overload as binary operator, friend and member function

10. Write a Program to overload unary operator in Postfix and Prefix form as member and friend function

11. Write a C++ Program to illustrate Iterators and Containers

12. Write a C++ Program to illustrate function templates

13. Write a C++ Program to illustrate template class

14. Write C++ Programs and incorporating various forms of Inheritance

15. Write a C++ Program to illustrate Virtual functions

16. To write a C++ program to find the sum for the given variables using function with default arguments.

17. To write a C++ program to find the value of a number raised to its power that demonstrates a function using call by value.

18. To write a C++ program and to implement the concept of Call by Address

19. To write a program in C++ to prepare a student Record using class and object

20. To implement the concept of unary operator overloading by creating a C++ program.

21. Write a C++ program for swapping two values using function templates

22. Write a C++ program to implement a file handling concept using sequential access.

OUTCOMES:
- Explain what constitutes an object-oriented approach to programming and identify potentialbenefits of object-oriented programming over other approaches.
- Apply an object-oriented approach to developing applications of varying complexities

DATA MINING

(OPEN ELECTIVE)

OBJECTIVES:

- Students will be enabled to understand and implement classical models and algorithms in data warehousing and data mining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

UNIT –I:
Introduction: Why Data Mining? What Is Data Mining?1.3 What Kinds of Data Can Be Mined?1.4 What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted? Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT –II:
Data Pre-processing: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT –III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

UNIT –IV:
Classification: Alterative Techniques, Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

UNIT –V
Association Analysis: Basic Concepts and Algorithms: Problem Defecation, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm. **(Tan & Vipin)**

UNIT –VI
Cluster Analysis: Basic Concepts and Algorithms: Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. **(Tan & Vipin)**

OUTCOMES:
- Understand stages in building a Data Warehouse
- Understand the need and importance of preprocessing techniques
- Understand the need and importance of Similarity and dissimilarity techniques
- Analyze and evaluate performance of algorithms for Association Rules.
- Analyze Classification and Clustering algorithms

Text Books:

1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

Reference Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining : Vikram Pudi and P. Radha Krishna, Oxford.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

POWER ELECTRONICS
(Open Elective)

Preamble:

The usage of power electronics in day to day life has increased in recent years. It is important for student to understand the fundamental principles behind all these converters. This course covers characteristics of semiconductor devices, ac/dc, dc/dc, ac/ac and dc/ac converters. The importance of using pulse width modulated techniques to obtain high quality power supply (dc/ac converter) is also discussed in detail in this course.

Learning Objectives:
- To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
- To understand the operation of single phase half wave and full–wave converters
- To understand the operation of different types of DC-DC converters.
- To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- To understand the operation of AC-AC converters and switch mode power supplies operation.

UNIT–I
Power Semi-Conductor Devices
Thyristors–Silicon controlled rectifiers (SCR's) – Characteristics of power MOSFET and power IGBT – Basic theory of operation of SCR–Static characteristics – Turn on and turn off methods–Dynamic characteristics of SCR – Snubber circuit design – Firing circuits for SCR

UNIT–II
AC-DC Single-Phase Converters
Single phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode – Single Phase full wave controlled rectifiers – center tapped configuration and bridge configuration – R load and RL load with and without freewheeling diode – Effect of source inductance in 1-phase fully controlled bridge rectifier.

UNIT–III
DC–DC Converters
Buck Converter operation – Time ratio control and current limit control strategies–Voltage and current waveforms–Derivation of output voltage –Boost converter operation –Voltage and current waveforms–Derivation of output voltage – Buck-Boost converter operation –Voltage and current waveforms – Principle operation of forward and fly back converters

UNIT – IV
DC–AC Converters
Single phase inverters–Unipolar and bipolar switching – Single phase half bridge and full bridge inverters with R and RL loads – PWM techniques– Sine triangular PWM technique– amplitude and frequency modulation Indices – Harmonic analysis.

UNIT – V
AC – AC Single-Phase Converters
Static V-I characteristics of TRIAC and modes of operation – Single phase AC-AC regulator phase angle control and integrated cycle control with R and RL load – For continuous and discontinuous conduction – Principle of operation of Cyclo-Converters

UNIT – VI
Switch Mode Power Supplies
Overview of Switching Power Supplies – Linear Power Supplies – DC to DC converters with electrical isolation – Control of Switch Mode DC Supplies – PWM duty ratio control – Current mode control – Power Supply Protection

Learning Outcomes:
Student should be able to
- Explain the characteristics of various power semiconductor devices and analyse the static and dynamic characteristics of SCR's.
- Design firing circuits for SCR.
- Able to explain the operation of single phase half wave and full–wave converters
- Analyse the operation of different types of DC-DC converters.
- Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- Analyse the operation of AC-AC converters.
- Able to explain switch mode power supplies operation and control

Text Books:
1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009

Reference Books:
1. Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
2. Elements of Power Electronics–Philip T.Krein.oxford.
3. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.
5. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

BIO-MEDICAL ENGINEERING
(OPEN ELECTIVE)

UNIT-I

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION: Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II

ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

UNIT-III

CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV

PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids,Myoelectric Arm, Laparoscope, Ophthalmology Instruments, Anatomy of Vision, Electrophysiological Tests, Ophthalmoscope, Tonometer for Eye Pressure Measurement, Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

UNIT-V:

DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring

UNIT-VI

MONITORS, RECORDERS AND SHOCK HAZARDS: Biopotential Amplifiers, Monitors, Recorders, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System.

Text Books:
1. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. "Bio-Medical Instrumentation", Cromewell , Wiebell, Pfeiffer

References:
1. "Introduction to Bio-Medical Equipment Technology", 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. "Hand Book of Bio-Medical Instrumentation", Khandapur. McGrawHill

ARTIFICIAL NEURAL NETWORKS

(OPEN ELECTIVE)

Course Objectives:

1. To Introduce the concept of Artificial Neural Networks , Characteristics, Models of Neuron, Learning Rules, Learning Methods, Stability and Convergence

2. To study the basics of Pattern Recognition and Feed forward Neural Networks

3. To study the basics of Feedback neural networks and Boltzmann machine

4. To introduce the Analysis of Feedback layer for different output functions, Pattern Clustering and Mapping networks

5. To study the Stability, Plasticity, Neocognitron and Different applications of Neural Networks

UNIT-I : Basics of Artificial Neural Networks
Introduction: Biological Neural Networks, Characteristics of Neural Networks, Models of Neuron, Topology, Basic Learning Rules
Activation and Synaptic Dynamics: Activation Dynamic Models, Synaptic Dynamic Models, Learning Methods, Stability & Convergence, Recall in Neural Networks

UNIT-II: Functional Units of ANN for Pattern Recognition Tasks: Pattern Recognition problem Basic Fundamental Units, Pattern Recognition Tasks by the Functional Units
Feed forward Neural Networks: Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of Pattern Mapping Networks

UNIT-III:
Feedback Neural Networks: Analysis of linear auto adaptive feed forward networks, Analysis of pattern storage Networks, Stochastic Networks & Stimulated Annealing, Boltzmann machine

UNIT-IV:
Competitive Learning Neural Networks**:** Components of a Competitive Learning Network, Analysis of Feedback layer for Different Output Functions, Analysis of Pattern Clustering Networks and Analysis of Feature Mapping Network

UNIT-V:
Architectures for Complex Pattern Recognition Tasks**:** Associative memory, Pattern mapping Stability – Plasticity dilemma: ART, temporal patterns, Pattern visibility: Neocognitron

UNIT-VI:
Applications of Neural Networks: Pattern classification, Associative memories, Optimization, Applications in Image Processing, Applications in decision making

Text Book

1.B.Yagnanarayana"Artificial Neural Networks", PHI

Reference Book

1. Laurene Fausett ,"Fundamentals of Neural Networks", Pearson Education

2. Simon Haykin , "Neural Networks", Second Edition

Course Outcomes

1. This Course introduces Artificial Neural Networks and Learning Rules and Learning methods

2. Feed forward and Feedback Neural Networks are introduced

3. Applications of Neural Networks in different areas are introduced

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III Year - II Semester	**0**	**0**	**3**	**2**

MICROPROCESSORS AND MICROCONTROLLERS LAB

LIST OF EXPERIMENTS

PART- A: **(Minimum of 5 Experiments has to be performed)**
8086 Assembly Language Programming using Assembler Directives
1.   Sorting.
2.   Multibyte addition/subtraction
3.   Sum of squares/cubes of a given n-numbers
4.   Addition of n-BCD numbers
5.   Factorial of given n-numbers
6.   Multiplication and Division operations
7.   Stack operations
8.   BCD to Seven segment display codes

PART- B: **(Minimum of 3 Experiments has to be performed)**
8086 Interfacing
1.   Hardware/Software Interrupt Application
2.   A/D Interface through Intel 8255
3.   D/A Interface through Intel 8255
4.   Keyboard and Display Interface through Intel 8279
5.   Generation of waveforms using Intel 8253/8254

PART- C: **(Minimum of 3 Experiments has to be performed)**
8051 Assembly Language Programs
1.   Finding number of 1's and number of 0's in a given 8-bit number
2.   Addition of even numbers from a given array
3.   Ascending / Descending order
4.   Average of n-numbers

PART-D: **(Minimum of 3 Experiments has to be performed)**
8051 Interfacing
1.   Switches and LEDs
2.   7-Segment display (multiplexed)
3.   Stepper Motor Interface
4.   Traffic Light Controller

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-Segemt Units
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.

	L	**T**	**P**	**C**
III Year - II Semester	**0**	**0**	**3**	**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.

	L	**T**	**P**	**C**
III Year - II Semester	**4**	**0**	**0**	**3**

DIGITAL SIGNAL PROCESSING LABORATORY

List of the Experiments / Programs

To Student has to perform at least FOUR Experiments in each part

PART-1(SIGNALS)

1) Generation of discrete time signals for discrete signals
2) To verify the Linear Convolution
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
3) To verify the Circular Convolution for discrete signals
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
4) To Find the addition of Sinusoidal Signals
5) To verify Discrete Fourier Transform(DFT) and Inverse Discrete Fourier Transform(IDFT)
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
6) Transfer Function Stability Analysis: using pole-zero plot, bode plot, Nyquist plot, z-plane plot.

PART-2 (FILTERS)

7) Frequency Response of IIR low pass Butterworth Filter
8) Frequency Response of IIR high pass Butterworth Filter
9) Frequency Response of IIR low pass Chebyshev Filter
10) Frequency Response of IIR high pass Chebyshev Filter
11) Frequency Response of FIR low pass Filter using Rectangle Window
12) Frequency Response of FIR low pass Filter using Triangle Window

PART – 3(IMAGE PROCESSING)

13) An image processing in a false contouring system
14) To generate the histogram equalization to the image
15) To verify the Normalized Cross Correlation to the addition of noise and removal of noise using filters to an image.
16) Compute the edge of an image using spatial filters.
17) Perform the image motion blur and calculate PSNR to the noise image and also noise free image.
18) To verify the PSNR to the Second order Decomposition of Discrete Wavelet transforms and to the reconstructed image using inverse Discrete Wavelet transform

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INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Objectives:
*To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.
*Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

UNIT I: Introduction to Intellectual Property Rights (IPR)
Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II: Copyrights and Neighboring Rights
Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers **–** Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III: Patents
Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV: Trademarks
Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets
Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract – Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

UNIT VI: Cyber Law and Cyber Crime
Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

Outcome:

* **IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.**

***Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.**

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

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IV Year - I Semester	**4**	**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.

	L	T	P	C
IV Year - I Semester	4	0	0	3

MANAGEMENT SCIENCE

Course Objectives:

*To familiarize with the process of management and to provide basic insight into select contemporary management practices

*To provide conceptual knowledge on functional management and strategic management.

UNIT I

Introduction to Management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

UNIT II

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) 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. Operationlizing change through performance management.

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. Global strategies, theories of Multinational Companies.

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.

Course Outcome:

*After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.

*Will familiarize with the concepts of functional management project management and strategic management.

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
8. Prem Chadha: Performance Management, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.)   Delhi 2015.
9. Anil Bhat& Arya Kumar : Principles of Management, Oxford University Press, New Delhi, 2015.

L	T	P	C
4	0	0	3

COMPUTER NETWORKS

OBJECTIVES:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach—Analysis—

UNIT – I:
Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models

UNIT – II:
Physical Layer – Fourier Analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel - Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols

UNIT – III:
The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols- A Utopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N- A Protocol Using Selective Repeat

UNIT – IV:
The Medium Access Control Sublayer-The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Carrier Sense Multiple Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols, Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sublayer Protocol-Ethernet Performance-Fast Ethernet Gigabit Ethernet-10-Gigabit Ethernet-Retrospective on Ethernet, Wireless Lans-The 802.11 Architecture and Protocol Stack-The 802.11 Physical Layer-The802.11 MAC Sublayer Protocol-The 805.11 Frame Structure-Services

UNIT – V:
Design Issues-The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service-Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms-Approaches to Congestion Control-Traffic Aware Routing-Admission Control-Traffic Throttling-Load Shedding**.**

UNIT – VI:

Transport Layer – The Internet Transport Protocols: Udp, the Internet Transport Protocols: Tcp

Application Layer –The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

OUTCOMES:

- Understand OSI and TCP/IP models
- Analyze MAC layer protocols and LAN technologies
- 3 .Design applications using internet protocols
- 4 .Understand routing and congestion control algorithms
- 5 .Understand how internet works

Text Books

1. Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education

Reference Books

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011

	L	T	P	C
IV Year - I Semester	4	0	0	3

DIGITAL IMAGE PROCESSING

UNIT-1
Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image 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, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms

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
Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

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, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction from projections.

UNIT-4
Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding
Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT-5
Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.
Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

UNIT-6
Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Text Books

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

Reference Books

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Course Objectives:

Students undergoing this course are expected to:

1. Familiarize with basic concepts of digital image processing and different image transforms
2. Learn various image processing techniques like image enhancement, restoration, segmentation and compression
3. Understand color fundamentals and different color models
4. Understand wavelets and morphological image processing

Course Outcomes:

After undergoing the course students will be able to

1. Perform image manipulations and different digital image processing techniques
2. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
3. Analyze pseudo and fullcolor image processing techniques.
4. Apply various morphological operators on images

L	T	P	C
4	0	0	3

QUALITY AND RELIABILITY ENGINEERING SYSTEMS

(ELECTIVE – I)

Course objectives:

1. The aim of this course is to provide students with a basic understanding of the approaches and techniques to assess and improve process and/or product quality and reliability.

2. The objectives are to introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring

3. To understand techniques of modern reliability engineering tools.

UNIT-I
Quality value and engineering – quality systems – quality engineering in product design and production process – system design – parameter design – tolerance design, quality costs – quality improvement.

UNIT-II
Statistical process control $\overline{X}$, R, p, c charts, other types of control charts, process capability, process capability analysis, process capability index. (SQC tables can be used in the examination)

UNIT-III
Acceptance sampling by variables and attributes, design of sampling plans, single, double, sequential and continuous sampling plans, design of various sampling plans.

UNIT-IV
Loss function, tolerance design – N type, L type, S type; determination of tolerance for these types. online quality control – variable characteristics, attribute characteristics, parameter design.
Quality function deployment – house of quality, QFD matrix, total quality management concepts. quality information systems, quality circles, introduction to ISO 9000 standards.

UNIT-V
Reliability – Evaluation of design by tests - Hazard Models, Linear, Releigh, Weibull. Failure Data Analysis, reliability prediction based on weibull distribution, Reliability improvement.

UNIT-VI

Complex system, reliability, reliability of series, parallel & standby systems & complex systems & reliability prediction and system effectiveness.

Maintainability, availability, economics of reliability engineering, replacement of items, maintenance costing and budgeting, reliability testing.

Text Books:
1.   G Taguchi, 'Quality Engineering in Production Systems - McGraw Hill
2.   E.Bala Guruswamy, 'Reliability Engineering', Tata McGraw Hill,
3.   Montgomery "Statistical Quality Control : A Modern Introduction" Wiley

Reference Books:

1.   Frank.M.Gryna Jr. "Jurans Quality planning & Analysis", McGraw Hill.
2.   Philipposs, 'Taguchi Techniques for Quality Engineering', McGraw Hill,
3.   LS Srinath, 'Reliability Engineering', Affiliated East West Pvt. Ltd.,
4.   Eugene Grant, Richard Leavenworth "Statistical Process Control",McGraw Hill.
5.   W.A. Taylor, 'Optimization & Variation Reduction in Quality', Tata McGraw Hill
6.   Quality and Performance Excellence: James R Evans, Cengage learning

Course outcome:

Upon successful completion of this course, students should be able to:

1. Understand quality and reliability concept, beware of some basic techniques for quality improvement, and acquire fundamental knowledge of statistics and probability.

2. Apply control charts to analyze and improve the process quality

3. Design a simple sampling plan, construct its OC curve and evaluate its effectiveness on a given sampling process

4. Acquire the concepts of the reliability, *and calculate* the system reliability based on the given component connection; *calculate* the reliability based on the given failure model

ANALOG IC DESIGN
(ELECTIVE – I)

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.

References:

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

DIGITAL CONTROL SYSTEMS
(ELECTIVE – I)

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)

	L	**T**	**P**	**C**
IV Year - I Semester	**4**	**0**	**0**	**3**

MIXED SIGNAL DESIGN
(ELECTIVE – II)

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.

ROBOTICS AND AUTOMATION

(ELECTIVE – II)

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.

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

EMI / EMC

(ELECTIVE – II)

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,

- o Students shall be able to distinguish effects of EMI and counter measures by EMC-techniques.

- o Students shall apply the knowledge gained in selecting proper gadget/device/appliance/system, as per EMC- norms specified by regulating authorities.

- o Students shall choose career in the fields of EMI/EMC as an Engineer/Researcher/Entrepreneur in India/abroad.

	L	T	P	C
IV Year - I Semester	0	0	3	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).

	L	**T**	**P**	**C**
IV Year - I Semester	**0**	**0**	**3**	**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

	L	T	P	C
IV Year - II Semester	4	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

	L	**T**	**P**	**C**
IV Year - II Semester	**4**	**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

	L	T	P	C
IV Year - II Semester	4	0	0	3

EMBEDDED SYSTEMS

Objectives:

The main objectives of this course are given below:

- The basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
- Fundamental issues in hardware software co-design were presented and explained.
- Familiarise with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.
- Embedded system implementation and testing tools are introduced and discussed.

Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
- The hardware components required for an embedded system and the design approach of an embedded hardware.
- The various embedded firmware design approaches on embedded environment.
- Understand how to integrate hardware and firmware of an embedded system using real time operating system.

Syllabus:

UNIT-I
INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of 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, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation, Device Drivers.
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, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

	L	T	P	C
IV Year - I Semester	4	0	0	3

DIGITAL IC DESIGN
(ELECTIVE III)

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.

References:

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.

CALIBRATION & STANDARDS

(ELECTIVE III)

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.
2. A course in Electrical and Electronic measurements and Instrumentation, A.K.Sawhney, Dhanpat Rai & Co.2011.
3. Electronic Instruments and Instrumentation technology, M.M.S. Anand, PHI, 2005.
4. Instrumentation, Measurement and Analysis, second edition, B.C.Nakra, K.K.Chaudhry, TMH, 2004.

MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)
(ELECTIVE III)

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