JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., Act. No. 30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

Course Structure & Syllabus for B.Tech. (Regular)
R13 Regulations

ELECTRONICS AND INSTRUMENTATION ENGINEERING

B.Tech. I Year

S.No	Course code	Subject	Th	Tu/	Lab.	Credits
1.	13A52101	Communicative English	2	-	-	3
2.	13A56101	Engineering Physics	2	-	-	3
3.	13A51101	Engineering Chemistry	2	-	-	3
4.	13A54101	Mathematics - I	3	1	-	5
5.	13A12101	Programming in C & Data Structures	3	1	-	5
6.	13A54102	Mathematics - II	3	1	-	5
7.	13A04101	Network Analysis	3	1	-	5
8.	13A12102	Programming in C & Data Structures Lab	-	-	3	4
9.	13A99102	Engineering Physics & Engineering Chemistry Lab *	-	-	3	4
10.	13A99103	Engineering & IT Workshop #	-	-	3	4
11.	13A52102	English Language Comm. Skills Lab	-	-	3	4
Total Credits						45

Th = Theory; Tu = Tutorial & Lab = Laboratory:

* The students shall attend the Physics lab and Chemistry lab in alternate weeks. The end exam shall be conducted separately and average of the two exams shall be recorded by the University exam section.

The **s**tudents shall attend Engineering and IT work shop as a single lab every week and the end exam is conducted as a single lab. Sharing the Maximum marks and time for one task each from Engineering workshop and IT workshop. The sum of the marks awarded shall be recorded.

B.Tech. **II - I Semester**

S.No	Course code	Subject	Theory	Tu / Drg / Lab	Credits
1.	13A54302	Mathematics - III	3	1 - -	3
2.	13A04301	Electronic Devices & Circuits	3	1 - -	3
3.	13A04302	Signals & Systems	3	1 - -	3
4.	13A04303	Switching Theory & Logic Design	3	1 - -	3
5.	13A03304	Engineering Graphics	1	- 3 -	3
6.	13A02303	Electrical Technology	3	1 - -	3
7.	13A04305	Electronic Devices & Circuits Lab	-	- - 3	2
8.	13A02304	Electrical Engineering Lab	-	- - 3	2
9.	13A52301	Human Values and Professional Ethics(Audit Course)	2	- -	-
Total Credits					22

B.Tech. II - II Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A01403	Environmental Science	3	1 -	3
2.	13A04401	Pulse & Digital Circuits	3	1 -	3
3.	13A04402	Electronic Circuits Analysis & Design	3	1 -	3
4.	13A04409	Principles of Communications	3	1 -	3
5.	13A10401	Sensors, Transducers & Signal conditioning circuits	3	1 -	3
6.	13A01409	Fluid Mechanics & Strength of Materials	3	1 -	3
7.	13A04405	Electronic Circuits Analysis & Design Lab	-	- 3	2
8.	13A04406	Pulse & Digital Circuits Lab	-	- 3	2
Total Credits					22

B.Tech. III - I Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A02402	Control Systems Engineering	3	1 -	3
2.	13A04508	Linear & Digital IC Applications	3	1 -	3
3.	13A10501	Industrial Instrumentation	3	1 -	3
4.	13A05401	Computer Organization & Architecture	3	1 -	3
5.	13A10502	Analytical Instrumentation	3	1 -	3
6.	13A10503	Electronic Measurements & Instrumentation	3	1 -	3
7.	13A04509	Linear & Digital IC Applications Lab	-	- 3	2
8.	13A10504	Instrumentation Lab	-	- 3	2
Total Credits					22

B.Tech. III - II Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A52501	Managerial Economics & Financial Analysis	3	1 -	3
2.	13A04601	Microprocessors & Microcontrollers	3	1 -	3
3.	13A04602	Digital Signal Processing	3	1 -	3
4.	13A10601	Process Control	3	1 -	3
5.	13A10602	Power Plant Instrumentation	3	1 -	3
6.	13A10603	Modern Measurement Techniques	3	1 -	3
7.	13A10604	Process Control Lab	-	- 3	2
8.	13A10605	Modern Measurement Techniques Lab	-	- 3	2
9.	13A52502	Advanced English Language Comm. skills Lab(Audit course)	-	- 3	--
Total Credits					22

B.Tech. IV - I Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A52601	Management Science	3	1 -	3
2.	13A04701	VLSI Design	3	1 -	3
3.	13A04703	Embedded Systems	3	1 -	3
4.	13A10701	Computer Control of Process	3	1 -	3
5.		**Elective – I** (Open Elective)	3	1 -	3
6.	13A10702 13A10703 13A10704	**Elective-II** System Design using Micro controllers Telemetry & Tele-control Petro Chemical Instrumentation	3	1 -	3
7.	13A10705	Computer Control of Process Lab	-	- 3	2
8.	13A10706	Microprocessors & Embedded Systems Lab	-	- 3	2
Total Credits					22

B.Tech. IV - II Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A10801	Bio-Medical Instrumentation	3	1 -	3
2.	13A10802	Opto-Electronics & LASER Instrumentation	3	1 -	3
3.	13A10803 13A10804 13A10805	**Elective-III** Aero Space Instrumentation. Automotive Electronics. Neural Networks , Fuzzy Logic & Genetic Algorithms	3	1 -	3
4.	13A10806 13A10807 13A10808	**Elective-IV** Instrumentation Buses & Data Networks Robotics & Automation PLC & Distributed Control Systems	3	1 -	3
5.	13A10809	Seminar & Comprehensive Viva-voce	-	- -	3
6.	13A10810	Project work	-	- -	10
Total Credits					25

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year	**Th**	**Tu**	**C**
	2	**0**	**3**

Common to All Branches

(13A52101) COMMUNICATIVE ENGLISH

Preamble:

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of Engineering and Technology. The prescribed books serve the purpose of preparing them for everyday communication and to face global competitions in future.

The first text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and student-centered. They should be encouraged to participate in the classroom activities keenly.

The text for non-detailed study is meant for extensive reading/reading for pleasure by the students. They may be encouraged to read some selected topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

Course Objective:

- *To enable the students to communicate in English for academic and social purpose.*
- *To enable the students to acquire structure and written expressions required for their profession.*
- *To develop the listening skills of the students.*
- *To inculcate the habit of reading for pleasure.*
- *To enhance the study skills of the students with emphasis on LSRW skills.*

Learning Outcome:

- *The students will get the required training in LSRW skills through the prescribed texts and develop communicative competence.*

UNIT I

Chapter entitled 'Humour' from "Using English"

Chapter entitled 'Biography - (Homi Jehangir Bhabha)' from "New Horizons"

Listening - Techniques - Importance of phonetics

L- Meet & Greet and Leave taking, Introducing Oneself and Others (Formal and Informal situations)

R- Reading Strategies -Skimming and Scanning

W- Writing strategies- sentence structures

G-Parts of Speech –Noun-number, pronoun-personal pronoun, verb- analysis

V-Affixes-prefix and suffix, root words, derivatives

UNIT II

Chapter entitled 'Inspiration' from "Using English"

Chapter entitled 'Biography - (Jagadish Chandra Bose)' from "New Horizons"

L- Listening to details

S- Apologizing, Interrupting, Requesting and Making polite conversations

R- Note making strategies

W- Paragraph-types- topic sentences, unity, coherence, length , linking devices
G-Auxiliary verbs and question tags
V- synonyms-antonyms, homonyms, homophones, homographs, words often confused

UNIT III
Chapter entitled 'Sustainable Development' from "Using English"
Chapter entitled 'Short Story - (The Happy Prince)' from "New Horizons"
L- Listening to themes and note taking
S- Giving instructions and Directions, making suggestions, Accepting ideas, fixing a time and Advising
R- Reading for details -1
W- Resume and cover letter
G- Tenses – Present tense, Past tense and Future tense
V-Word formation and One-Word Substitutes

UNIT IV
Chapter entitled 'Relationships' from "Using English"
Chapter entitled 'Poem - (IF by Rudyard Kipling)' from "New Horizons"
L- Listening to news
S- Narrating stories, Expressing ideas and opinions and telephone skills
R- Reading for specific details and Information
W- Technical Report writing-strategies, formats-types-technical report writing
G- Voice and Subject–Verb Agreement
V- Idioms and prepositional Phrases

UNIT V
Chapter entitled 'Science and Humanism' from "Using English"
Chapter entitled 'Autobiography - (My Struggle for an Education by Booker T.Washington)' from "New Horizons"
L- Listening to speeches
S- Making Presentations and Group Discussions
R- Reading for Information
W- E-mail drafting
G- Conditional clauses and conjunctions
V- Collocations and Technical Vocabulary and using words appropriately

Text Books:

1. ***Using English*** *published by Orient Black Swan.*
2. ***New Horizons*** *published by Pearson.*

Reference Books:

1. ***Raymond Murphy's English Grammar with CD,*** *Murphy, Cambridge University Press, 2012.*
2. ***English Conversation Practice*** *–Grant Taylor, Tata McGraw Hill, 2009.*
3. ***Communication Skills,*** *Sanjay Kumar & Pushpalatha Oxford University Press, 2012.*
4. ***A Course in Communication Skills****- Kiranmai Dutt & co. Foundation Books, 2012.*
5. ***Living English Structures****- William Standard Allen-Pearson, 2011.*
6. ***Current English Grammar and Usage,*** *S M Guptha, PHI, 2013.*
7. ***Modern English Grammar****-Krishna SWAMI,.McMillan, 2009.*
8. ***Powerful Vocabulary Builder****- Anjana Agarwal, New Age International Publishers, 2011.*

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B.Tech. I Year	**Th**	**Tu**	**C**
	2	**0**	**3**

Common to All Branches

(13A56101) ENGINEERING PHYSICS

Preamble:

There has been an exponential growth of knowledge in the recent past opening up new areas and challenges in the understanding of basic laws of nature. This helped to the discovery of new phenomena in macro, micro and nano scale device technologies. The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering.

To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of engineering physics has been thoroughly revised keeping in view of the basic needs of all engineering branches by including the topics like optics, crystallography, ultrasonics, quantum mechanics, free electron theory. Also new phenomenon, properties and device applications of semiconducting, magnetic, superconducting and nano materials along with their modern device applications have been introduced.

Course Objective:

- *To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.*
- *To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and also to understand different types of defects in crystals adnoun-destructive evaluation using ultrasonic techniques.*
- *To get an insight into the microscopic meaning of conductivity , classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.*
- *To open new avenues of knowledge and understanding on semiconductor based electronic devices, basic concepts and applications of semiconductor and magnetic materials have been introduced which find potential in the emerging micro device applications.*
- *To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in modern emerging technologies are elicited.*

Learning Outcome:

- *The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.*
- *The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.*
- *The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.*

- *The electronic and magnetic properties of materials were successfully explained by free electron theory and focused on the basis for the band theory.*
- *The properties and device applications of semiconducting and magnetic materials are illustrated.*
- *The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.*

UNIT 1

PHYSICAL OPTICS, LASERS AND FIBRE OPTICS:

Physical Optics: Introduction - Interference in thin films by reflection – Newton's Rings – Fraunhofer diffraction due to single slit, double slit and diffraction grating.

Lasers: Introduction - Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients - Population inversion – Excitation mechanisms and optical resonator - Ruby laser - He-Ne laser – Applications of lasers.

Fibre optics: Introduction– Construction and working principle of optical fiber –Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in fibers - Optical fiber communication system – Applications of optical fibers in communications, sensors and medicine.

UNIT II

CRYSTALLOGRAPHY AND ULTRASONICS:

Crystallography: Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Structures of NaCl and Diamond –Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law –Laue and Powder methods – Defects in solids: point defects, line defects (qualitative) - screw and edge dislocation, burgers vector.

Ultrasonics: Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

UNIT III

QUANTUM MECHANICS AND FREE ELECTRON THEORY:

Quantum Mechanics: Introduction to matter waves – de'Broglie hypothesis - Heisenberg's uncertainty principle and its applications - Schrodinger's time independent and time dependent wave equation – Significance of wave function - Particle in a one dimensional infinite potential well - Eigen values and Eigen functions.

Free electron theory: Classical free electron theory –- Sources of electrical resistance - Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution –Kronig-Penny model(qualitative) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

UNIT IV

SEMICONDUCTORS AND MAGNETIC MATERIALS:

Semiconductor Physics: Introduction – Intrinsic and extrinsic semiconductors – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Working principle of p-n junction diode, LED, laser diode and photodiode.

Magnetic materials: Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials – Hysteresis - Soft and hard magnetic materials and applications.

UNIT V

SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS:

Superconductivity: Introduction – Meissner effect - Properties of superconductors – Type I and type II superconductors – Flux quantization – London penetration depth – ac and dc Josephson effects – BCS theory(qualitative) – High T_c superconductors - Applications of superconductors.

***Physics of Nanomaterials*:** Introduction - Significance of nanoscale - Surface area and quantum confinement – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials: ball mill, chemical vapour deposition, sol-gel, plasma arcing and thermal evaporation – Properties of Carbon nanotubes – High strength applications – Properties of graphene – Graphene based Field Effect Transistor - Applications of nanomaterials.

Text Books:

1. Engineering physics – S. ManiNaidu, Pearson Education, I Edition, 2012.

2. Engineering Physics – V. Rajendran, MacGraw Hill Publishers, I Edition,2008.

Reference Books:

1. Engineering Physics – V. Rajendran, K.Thyagarajan Tata MacGraw Hill Publishers, III Edition, 2012.

2. Engineering Physics – RV.S.S.N. Ravi Kumar and N.V. Siva Krishna, Maruthi Publications , 2013

3. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish University Press, I Edition, 2009.

4. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning, I Edition, 2012

5. Engineering Physics – Hitendra K Mallik and AK Singh, McGraw Hill Education Pvt. Ltd, New Delhi , I Edition, 2010

6. Engineering Physics – M. Arumugam, Anuradha Publications II Edition, 1997.

7. Engineering physics – M.N. Avadhanulu and P.G. KshirSagar, Chand and Co, Revised Edition, 2013.

8. Solid State Physics – A.J. Dekkar, McMillan Publishers, Latest edition, 2012.

9. Engineering Physics – Gaur and Gupta Dhanapati, Rai Publishers , 7th Edition, 1992.

9. Text book of Nanoscience and Nanotechnology: B S Murthy, P.Shankar, Baldev Raj B B Rath, James Murday, University Press, I Edition, 2012.

10. Carbon Nanotubes and Graphene Device Physics – H.S. Philip Wong, Deji Akinwande, Cambridge University Press, 2011.

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B.Tech. I Year	**Th**	**Tu**	**C**
	2	**0**	**3**

Common to All Branches

(13A51101) ENGINEERING CHEMISTRY

Preamble:

Knowledge in chemistry serves as basic nutrient for the understanding and thereby design of materials of importance in life. Thus the advancement in Engineering is depend on the outcome of basic sciences. Many advances in engineering either produce a new chemical demand as in the case of polymers or wait upon chemical developments for their applications as in the case of implants and alloys. Currently the electronics and computer engineers are looking forward for suitable biopolymers and nano materials for use in miniature super computers, the electrical materials engineers are in search of proper conducting polymers, the mechanical engineers are on lookout for micro fluids and the civil engineers are looking for materials that are environmental friendly, economical but long lasting.

Course Objective:

- *The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.*
- *The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.*
- *The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.*
- *The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.*
- *After the completion of the course, the student would understand about the concepts of chemistry in respect of Electrochemical cells, fuel cells, mechanism of corrosion and factors to influence, polymers with their applications, analytical methods, engineering materials and water chemistry.*

Learning Outcome:

The student is expected to:

- *Understand the electrochemical sources of energy*
- *Understand industrially based polymers, various engineering materials.*
- *Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.*

UNIT 1

ELECTROCHEMISTRY:

Review of electrochemical cells, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries). Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen).

Electrochemical sensors: Potentiometric Sensors and voltammetric sensors. Examples: analysis of Glucose and urea.

Corrosion: Electrochemical Theory of corrosion, Factors affecting the corrosion. Prevention: Anodic and cathodic protection and electro and electroless plating.

UNIT II

POLYMERS:

Introduction to polymers, Polymerisation process, mechanism: cationic, anionic, free radical and coordination covalent, Elastomers (rubbers), Natural Rubber, Compounding of Rubber,

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, buna-N, Polyurethene, Polysulfide (Thiokol) rubbers. Plastomers: Thermosetting and Thermoplatics, Preparation, properties and Engineering applications , PVC, Bakelite, nylons.

Conducting polymers: Mechanism, synthesis and applications of polyacetyline, polyaniline. Liquid Crystals: Introduction, classification and applications.

Inorganic Polymers: Basic Introduction, Silicones, Polyphospazins (-(R)2-P=N-) applications.

UNIT III

FUEL TECHNOLOGY:

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems, Solid Fuels–Coal, Coke : Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels: Petroleum: Refining of Petroleum, Gasoline: Octane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis.

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Origin, Production and uses of Natural gas, Producer gas, Water gas, Coal gas and Biogas. Flue Gas analysis by Orsat's apparatus, Solving of problems on Combustion.

UNIT IV

CHEMISTRY OF ENGINEERING MATERIALS:

Semiconducting and Super Conducting materials-Principles and some examples, Magnetic materials – Principles and some examples, Cement: Composition, Setting and Hardening (Hydration and Hydrolysis), Refractories: Classification, properties and applications, Lubricants: Theory of lubrication , properties of lubricants and applications, Rocket Propellants: Classification, Characteristics of good propellant

UNIT V

WATER TREATMENT:

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water: For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water: Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.External Treatment: Ion-Exchange and Permutit processes.

Demineralisation of brackish water: Reverse Osmosis and Electrodialysis

Text Books:

1. *Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, New Delhi, Fourth Edition, 2012.*
2. *A Text book of Engineering Chemistry by S.S Dhara, S.S.Umare, S. Chand Publications, New Delhi, 12th Edition, 2010.*

Reference Books:

1. *A Text Book of Enigneering Chemistry, Jain and Jain, Dhanapath Rai Publishing Company, New Delhi, 15th Edition, 2010.*
2. *Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH, Publications India Pvt Limited, Chennai, 2nd Edition, 2012.*
3. *Concepts of Engineering Chemistry- Ashima Srivastava and N.N. Janhavi, Acme Learning Pvt Ltd, First Edition, 2013.*
4. *Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu, BS Publications, Hyderabad, 3rd Edition, 2008.*
5. *Text Book of Engineering Chemistry, Shashichawla, Dhanapath Rai Publications, New Delhi, 4th Edition, 2011.*
6. *Engineering Chemistry, K. Sesha Maheswaramma and Mrudula Chugh, Pearson Education, First Edition, 2013.*

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B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

Common to All Branches

(13A54101) MATHEMATICS – I

Course Objective:

- *To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications in electrical circuits, deflection of beams, whirling of shafts.*
- *To prepare students for lifelong learning and successful careers using mathematical concepts of differential, Integral and vector calculus, ordinary differential equations and Laplace transforms.*
- *To develop the skill pertinent to the practice of the mathematical concepts including the student abilities to formulate the problems, to think creatively and to synthesize information.*

Learning Outcome:

- *The students become familiar with the application of differential, integral and vector calculus, ordinary differential equations and Laplace transforms to engineering problems.*
- *The students attain the abilities to use mathematical knowledge to analyze and solve problems in engineering applications.*

UNIT I

Exact, linear and Bernoulli equations, Applications to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

Non-homogeneous linear differential equations of second and 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 to oscillatory electrical circuits, Deflection of Beams, whirling of shafts.

UNIT II

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature, center of curvature, Involutes evolutes, envelopes.

UNIT III

Curve tracing – Cartesian, polar and parametric curves. Length of curves.

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes, surface area of solid of revolution in Cartesian and polar coordinates using double integral.

UNIT IV

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT V

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's – Stoke's and Gauss's Theorems.

Text Books:

1. *Higher Engineering Mathematics, B.S.Grewal, Khanna publishers-42 Edition(2012)*
2. *Engineering Mathematics, Volume - I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher 1st Edition (2010)*

Reference Books:

1. *Engineering Mathematics Volume-I, by T.K.V. Iyengar, S.Chand publication-12th Edition(2013)*
2. *Engineering Mathematics, Volume - I, by G.S.S.Raju, CENGAGE publisher.(2013)*
3. *Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India-10thEdition(2012)*
4. *Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers(2008)*
5. *Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier-1st Edition(2001)*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

(13A12101) PROGRAMMING IN C & DATA STRUCTURES

Course Objective:

- *To make the student understand problem solving techniques*
- *Students will be able to understand the syntax and semantics of C programming language and other features of the language*
- *Get acquaintance with data structures, searching and sorting techniques*

Learning Outcome:

- *Student can effectively apply problem solving techniques in designing the solutions for a wide-range of problems*
- *Student can choose appropriate data structure and control structure depending on the problem to be solved*
- *Student can effectively use existing data structures and design new data structures appropriate to the problem to be solved*
- *Student can modularize the problem and also solution*
- *Student can use appropriate searching and sorting technique to suit the application.*

UNIT I

Introductory Concepts: Introduction to computers, What is a Computer, Block diagram of Computer, Computer Characteristics, Hardware Vs Software, How to develop a program, Software development life cycle, Structured programming, Modes of operation, Types of programming languages, Introduction to C, Desirable program characteristics.

Introduction to Computer problem solving: Introduction, The problem solving aspect, Top down design, Implementation of algorithms.

Introduction to C programming: The C character set, Writing first program of C, Identifiers and key words, A more useful C program, Entering the program into the computer, Compiling and executing the program, Data types, Constants, Variables and arrays, Declarations, Expressions, Statements, Symbolic Constants.

Operators and Expressions: Arithmetic operators, Unary operators, Relational and Logical operators, Assignment operators, Conditional operator, Library functions.

Fundamental algorithms: Exchanging the values of two variables, Factorial computation, Sine function computation, Reversing the digits of an integer, Generating prime numbers.

UNIT II

Data Input and Output: Preliminaries, Single character input-getchar function, Single character output-putchar function, Entering input data-the scanf function, More about the scanf function, Writing output data-The printf function, More about the printf function, The gets and puts functions, Interactive(conversational) programming.

Preparing and running a complete C program: Planning a C program, Writing a C program, Error diagnostics, Debugging techniques.

Control statements: Preliminaries, Branching: if-else statement, Looping: The while statement, More looping: The do-while statement, Still more looping: The for statement, Nested control structures, The switch statement, Break statement, Continue statement, The comma operator, The goto statement.

Functions: A brief overview, Defining a function, Accessing a function, Function prototypes, Passing arguments to a function, Recursion

UNIT III

Program Structure: Storage classes, Automatic variables, External (global) variables, Static variables, Multi file programs, More about library functions.

Arrays: Defining an array, Processing an array, Passing arrays to functions, Multi dimensional arrays.

Array Techniques: Array order reversal, Removal of duplicates from an ordered array, Finding the K^{th} smallest element.

Merging, Sorting and Searching: The two way merge, Sorting by selection, Sorting by exchange, Sorting by insertion, Sorting by partitioning, Recursive Quick sort, Binary Search.

Strings: Defining a string, NULL character, Initialization of strings, Reading and Writing a string, Processing the strings, Character arithmetic, Searching and Sorting of strings, Some more Library functions for strings

UNIT IV

Pointers: Fundamentals, Pointer Declarations, Passing pointer to a function, Pointers and one dimensional array, Dynamic memory allocation, Operations on pointers, Pointers and multi dimensional arrays, Arrays of pointers, Passing functions to other functions, More about pointer declarations.

Structures and Unions: Defining a structure, Processing a structure, User defined data type (typedef), Structures and Pointers, Passing structures to functions, Unions.

File Handling: Why files, Opening and closing a data file, Reading and Writing a data file, Processing a data file, Unformatted data files, Concept of binary files, Accessing the file randomly (using fseek).

Additional Features: Register variables, Bitwise operations, Bit Fields, Enumerations, Command line parameters, More about Library functions, Macros, The C Preprocessor

UNIT V

Introduction to Data Structures: Data abstraction

Stacks and Queues: Stacks, Stacks using dynamic arrays, Queues, Circular Queues using dynamic arrays

Evaluations of expressions: Expressions, Evaluating postfix expressions, Infix to Postfix, Multiple Stacks and Queues.

Linked Lists: Singly Linked lists and chains, Representing chains in C, Linked Stacks and Queues.

Text Books:

1. *"Programming with C", Byron Gottfried, Third Edition, Schaum's Outlines, Mc Graw Hill.*
2. *"Fundamentals of Data Structures in C", Horowitz, Sahni, Anderson-freed, Second Edition, Universities Press.*
3. *"How to Solve it by Computer", R.G. Dromey, Pearson. (Pascal implementations may be considered without loss of generality or Instructors may replace them with C language programs)*

Reference Books:

1. *"Programming in C", Pradip Dey, Manas Ghosh, Oxford Higher Education*
2. *"Programming in C and Data Structures", Hanly, Koffman, Kamthane, Ananda Rao, Pearson.*
3. *"Programming in C", Reema Thareja, Oxford Higher Education.*
4. *"Computer Fundamentals and C Programming", First Edition, Dr.P.Chenna Reddy, Available at: www.pothi.com.*
5. *"Data Structure and Program Design in C", Second Edition, Kruse, Tondo, Leung, Mogalla, Pearson.*
6. *"Programming with C", R.S. Bichkar, University Press.*
7. *"Computer Science A Structured Programming Approach Using C", Third Edition, Fourouzan & Gilberg, Cengage Learning.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

(13A54102) MATHEMATICS – II

Course Objective:

- *This course aims at providing the student with the concepts of Matrices, Fourier series, Fourier and Z-transforms and partial differential equations which find the applications in engineering.*
- *Our emphasis will be more on logical and problem solving development in Numerical methods and their applications.*

Learning Outcome:

- *The student becomes familiar with the application of Mathematical techniques like Fourier series, Fourier and z-transforms.*
- *The student gains the knowledge to tackle the engineering problems using the concepts of Partial differential equations and Numerical methods.*

UNIT I

Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonolization of matrix. Calculation of powers of matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

UNIT II

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method.

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's Interpolation formula.

Curve fitting: Fitting of a straight line – Second degree curve – Exponentional curve-Power curve by method of least squares. Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

UNIT III

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods – Predictor-Corrector Method – Milne's Method. Numerical solution of Laplace equation using finite difference approximation.

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT IV

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

UNIT V

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

Text Books:

1. *Higher Engineering Mathematics, B.S.Grewal, Khanna publishers- 42 Edition(2012)*
2. *Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher 5th Edition (2012)*

Reference Books:

1. *Engineering Mathematics, Volume - II, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher-1st Edition (2010)*
2. *Engineering Mathematics, Volume - II, by G.S.S.Raju, CENGAGE publisher – 1st Edition(2013)*
3. *Mathematical Methods by T.K.V. Iyengar, S. Chand publication-8th Edition(2013)*
4. *Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers (2008)*
5. *Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India 10th Edition (2013)*

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B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

(13A04101) NETWORK ANANLYSIS

Course Objective:

To help students develop an understanding on analyzing electrical circuits using various techniques. To make the student familiarize with the fundamental concepts of coupled circuits, resonance, filters and to analyze the transient response in electric circuits.

Learning Outcome:

Upon completion of the course, students will be able to:

- *Solve the electrical network using mesh and nodal analysis by applying network theorems.*
- *Understand the basic concepts of coupled circuits, resonance and filters and solve problems.*
- *Analyze transient response in AC and DC electric circuits*

UNIT I

Circuit Analysis Techniques: Voltage and Current Laws, Basic Nodal and Mesh Analysis, Network Topology-Formation of Incidence Matrix, Tie set and Cutset Matrix formation, Network Theorems-Linearity and Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Milliman, Miller & Tellegan's Theorems. Source Transformation.

UNIT II

RL and RC Circuits: The Source free RL Circuit, The Source free RC Circuit, Properties of Exponential Response, Natural & Forced Response, RLC Circuits, Complete Response of Source free parallel RLC Circuits, Source free Series RLC Circuits. **Sinusoidal Steady State Analysis**: Characteristics of Sinusoids, Forced Response of Sinusoidal Functions, The Complex forcing Function, The Phasor, Phasor relationships for R,L, and C, Impedance, Admittance.

A.C Circuit Power Analysis: Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power, Power Factor, Complex Power. **Circuit Analysis in S-Domain:** Z(S) and Y(S), Poles, Zeros and Transfer Functions, The Complex- Frequency Plane, Natural Response and the S-Plane.

UNIT III

Resonance: Introduction, Definition of 'quality factor **Q**' of inductor and capacitor, Series resonance, Bandwidth of the series resonant circuits, Parallel resonance (or anti-resonance), Conditions for maximum impedance, Currents in parallel resonance, Impedance variation with frequency; universal resonance curves, Bandwidth of parallel resonant circuits, General case of parallel resonance circuit, Anti-resonance at all frequencies, variable phase angle circuit, reactance curves, Impedance Transformation.

Magnetically Coupled Circuits: Mutual Inductance, Energy Considerations, The Linear Transformer, The Ideal Transformer

UNIT IV

Two Port Networks: Relationship of two port variables, Short circuit Admitance parameters, Open circuit Impedance parameters, Transmission Parameters, Hybrid Parameters, Relationship between parameter sets, Parallel connection of two port networks, State Variable Networks.

State Variable Analysis: Introduction to state variables – state variables of circuits, state and output equations, advantages of state variable analysis, Circuit state equations, Proper and improper circuits, Equations for proper circuits, Transform solution of state equations, Illustrative problems.

UNIT V

Filters: Introduction, the neper & decibel, Characteristic Impedance of symmetrical networks, Currents & voltage ratios as exponentials; the propagation constant, Hyperbolic trigonometry, Properties of symmetrical networks, Filter fundamentals; pass and stop bands, Behavior of characteristic impedance, The constant – k low pass filter, the constant – k high pass filter, The m-derived T section, The m-derived π section, Variation of characteristic impedance over the pass band, Termination with m-derived half sections, Band-pass filters, Band elimination filters, Illustrative problems.

Text Books:

1. *W H Hayt, J E Kemmerly and S M Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill, 7th edition, 2010.*
2. *Van Valkenburg, "Network Analysis", PHI, 3rd Edition, 2011.*

Reference Books:

1. *John D. Ryder, "Networks, Lines, and Fields," PHI publications, Second Edition, 2012.*
2. *A. Sudhakar & Shyam Mohan S.Pillai "Circuits & Network Analysis & Synthesis", Tata McGraw Hill , 2nd Edition, 1994*
3. *Franklin F. Kuo, "Network Analysis and synthesis", Wiley India Pvt Ltd, 2nd Edition.*
4. *Circuit Theory (Analysis & Synthesis) by A. Chakrabarti, Dhanpat Rai & Sons, 2010.*
5. *K.Chenna Venkatesh, D.Ganesh Rao, "Network Analysis- A Simplified Approach ", Elsevier, 2nd Edition 2010*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year	**L**	**C**
	3	**4**

(13A12102) PROGRAMMING IN C & DATA STRUCTURES LAB

Course Objective:

- *To make the student learn C Programming language.*
- *To make the student solve problems, implement them using C language.*
- *To strengthen the ability to identify and apply the suitable data structure for the given real world problem.*

Learning Outcome:

- *Apply problem solving techniques to find solutions to problems.*
- *Able to use C language features effectively and implement solutions using C language.*
- *Be capable to identity the appropriate data structure for a given problem or application.*
- *Improve logical skills.*

LIST OF EXPERIMENTS/TASKS

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, to read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.
13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms e $^{x}=1+x+x^2/2!+x^3/3!+x^4/4!+$--------
16. Write a program to generate Pascal Triangle.
17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
    i. Find the sum of Diagonal Elements of a matrix.
    ii. Print Transpose of a matrix.
    iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the count of the number of Vowels, Consonants, blank spaces, digits and special characters.
20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.

21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
23. Write a program to merge two files.
24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
25. Write a program to read a set of strings and sort them in alphabetical order.
26. Write a program to sort the elements of an array using sorting by exchange.
27. Write a program to sort the elements of an array using Selection Sort.
28. Write a program to perform Linear Search on the elements of a given array.
29. Write a program to perform Binary Search on the elements of a given array.
30. Write a program to find the number of occurrences of each number in a given array of numbers.
31. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
    i. String length determination ii .Compare Two Strings
    iii. Concatenate them, if they are not equal iv. String reversing
32. Write programs using recursion for Factorial of a number, GCD, LCM, Towers of Hanoi.
33. Write a program to convert infix expression to postfix expression and evaluate postfix expression.
34. Write a program to exchange two numbers using pointers.
35. Write a program to implement stack, queue, circular queue using array and linked lists.
36. Write a program to perform the operations creation, insertion, deletion, and traversing a singly linked list
37. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
38. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
39. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.
40. Write a program to find the square root of a number without using built-in library function.
41. Write a program to convert from string to number.
42. Write a program to generate pseudo random generator.
43. Write a program to remove duplicates from ordered and unordered arrays.
44. Write a program to sort numbers using insertion sort.
45. Write a program to implement quick sort using non-recursive and recursive approaches. Use randomized element as partitioning element.
46. Write a program to search a word in a given file and display all its positions.
47. Write a program to generate multiplication tables from 11 to 20.
48. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.
49. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
50. Write a program for tic-tac-toe game.
51. Write a program to find the execution time of a program.
52. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

***Note**: The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in the Theory on C programming and Data structures. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.*

References:

1. *"Programming with C", Byron Gottfried, Third Edition, Schaum's Outlines, Mc Graw Hill.*
2. *"Fundamentals of Data Structures in C", Horowitz, Sahni, Anderson-freed, Second Edition, Universities Press.*
3. *"How to Solve it by Computer", R.G. Dromey, Pearson.*
4. *"The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, Pearson.*
5. *"Classic Data Structures", Samantha, PHI*
6. *"Let us C", Yeswant Kanetkar, BPB publications*
7. *"Pointers in C", Yeswant Kanetkar, BPB publications*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year	**L**	**C**
	3	**4**

Common to All Branches
(13A99102) ENGINEERING PHYSICS & ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB

LIST OF EXPERIMENTS

Any 10 of the following experiments has to be performed:

1. Determination of wavelengths of various colours of mercury spectrum using diffraction grating in normal incidence method
2. Determination of dispersive power of the prism
3. Determination of thickness of thin object by wedge method
4. Determination of radius of curvature of lens by Newton's Rings
5. Laser : Diffraction due to single slit
6. Laser : Diffraction due to double slit
7. Laser: Determination of wavelength using diffraction grating
8. Determination of Numerical aperture of an optical fiber
9. Meldes experiment: Determination of the frequency of tuning fork
10. Sonometer: Verification of the three laws of stretched strings
11. Energy gap of a material using p-n junction diode
12. Electrical conductivity by four probe method
13. Determination of thermistor coefficients (α, β)
14. Hall effect : Determination of mobility of charge carriers in semiconductor
15. B-H curve
16. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
17. Determination of lattice constant using X-ray spectrum.

ENGINEERING CHEMISTRY LAB

Preamble:
The experiments are designed in a manner that the students can validate their own theory understanding in chemistry by self involvement and practical execution. Thus the execution of these experiments by the student will reinforce his/her understanding of the subject and also provide opportunity to refine their understanding of conceptual aspects. As a result, the student gets an opportunity to have feel good factor at the laboratory bench about the chemical principles that he/she learned in the classroom.

***Course Objective**:*

- *Will learn practical understanding of the redox reaction*
- *Will able to understand the function of fuel cells, batteries and extend the knowledge to the processes of corrosion and its prevention*
- *Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications*
- *Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology*

Learning Outcome:

- *Would be confident in handling energy storage systems and would be able combat chemical corrosion*
- *Would have acquired the practical skill to handle the analytical methods with confidence.*
- *Would feel comfortable to think of design materials with the requisite properties*
- *Would be in a position to technically address the water related problems.*

LIST OF EXPERIMENTS

Any 10 of the following experiments has to be performed:

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Determination of Copper by Iodometry
5. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
6. Determination of Alkalinity of Water
7. Determination of acidity of Water
8. Preparation of Phenol-Formaldehyde (Bakelite)
9. Determination of Viscosity of oils using Redwood Viscometer I
10. Determination of Viscosity of oils using Redwood Viscometer II
11. Conductometric titration of strong acid Vs strong base (Neutralization titration).
12. Conductometric titration of Barium Chloride vs Sodium Sulphate (Precipitation Titration)
13. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
14. Estimation of Chloride ion using potassium Chromite indicator (Mohrs method)

References:

1. *Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et al, Pearson Education, Sixth Edition, 2012.*
2. *Chemistry Practical – Lab Manual by K.B.Chandra Sekhar, G.V. Subba Reddy and K.N.Jayaveera, SM Publications, Hyderabad, 3rd Edition, 2012.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year **L C**
3 4

Common to All Branches
(13A99103) ENGINEERING & I.T. WORKSHOP

ENGINEERING WORKSHOP

Course Objective:
The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students

1. TRADES FOR EXERCISES:

a. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
b. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
c. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
d. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
e. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

2. TRADES FOR DEMONSTRATION:

a. Plumbing
b. Machine Shop
c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

References:

1. *Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009*
2. *Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.*
3. *Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, 4/e Vikas*
4. *Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.*

I.T. WORKSHOP

Course Objective:

- *To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations*
- *To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system*
- *To learn about Networking of computers and use Internet facility for Browsing and Searching.*

Learning Outcome:

- *Disassemble and Assemble a Personal Computer and prepare the computer ready to use.*
- *Prepare the Documents using Word processors*
- *Prepare Slide presentations using the presentation tool*
- *Interconnect two or more computers for information sharing*
- *Access the Internet and Browse it to obtain the required information*
- *Install single or dual operating systems on computer*

Preparing your Computer (5 weeks)

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Operating system features**: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet (4 weeks)

Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.

If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools (6 weeks)

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

Task 9: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

Task 10: Presentations : creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

Optional Tasks:

Task 11: Laboratory Equipment: Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

Task 12: Software: Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software

- MATLAB
- CAD/CAM software
- AUTOCAD

References:

1. *Introduction to Computers, Peter Norton, Mc Graw Hill*
2. *MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI.*
3. *Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.*
4. *Networking your computers and devices, Rusen, PHI*
5. *Trouble shooting, Maintaining & Repairing PCs", Bigelows, TMH*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year	**L**	**C**
	3	**4**

Common to All Branches
(13A52102) ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Objective:

- *To train students to use language effectively in everyday conversations.*
- *To expose the students to a varied blend of self-instructional learner-friendly modes of language learning through computer-aided multi-media instruction.*
- *To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.*
- *To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence*
- *To train students to use language appropriately for interviews, group discussion and public speaking*

Learning Outcome:

- *Becoming active participants in the learning process and acquiring proficiency in spoken English of the students*
- *Speaking with clarity and confidence thereby enhancing employability skills of the students*

PHONETICS
Importance of speaking phonetically correct English
Speech mechanism-Organs of speech
Uttering letters-Production of vowels sounds
Uttering letters -Production of consonant sounds
Uttering words-Stress on words and stress rules
Uttering sentences-Intonation-tone group
LISTENING
Listening as a skill
Listening activities
PRESENTATIONAL SKILLS
Preparation
Prepared speech
Impromptu speech
topic originative techniques
JAM (Just A Minute)
Describing people/object/place
Presentation-
Stage dynamics
Body language
SPEAKING SKILLS
Telephone skills
Role plays
Public Speaking

GROUP ACTIVITIES
Debates
Situational dialogues

MINIMUM REQUIREMENT FOR ELCS LAB:
The English Language Lab shall have two parts:

Computer Assisted Language Learning (CALL) Lab:

- The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
- The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.

System Requirement (Hardware component):

- Computer network with LAN with minimum 60 multimedia systems with the following specifications:
  - P – IV Processor
  - Speed – 2.8 GHZ
  - RAM – 512 MB Minimum
  - Hard Disk – 80 GB
  - Headphones of High quality

SUGGESTED SOFTWARE:

- Clarity Pronunciation Power – Part I (Sky Pronunciation)
- Clarity Pronunciation Power – part II
- K-Van Advanced Communication Skills
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- *DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.*
- Lingua TOEFL CBT Insider, by Dreamtech
- English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
- Cambridge Advanced Learners' English Dictionary with CD.
- Oxford Advanced Learner's Compass, 8th Edition
- Communication Skills, Sanjay Kumar & Pushp Lata. 2011. OUP

References:

1. *Strengthen Your Steps, Maruthi Publicaions, 2012.*
2. *A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd.*
3. *A Textbook of English Phonetics for Indian Students 2nd Ed T. Balasubramanian. (Macmillian),2012.*
4. *Speaking English Effectively, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).*
5. *Listening in the Language Classroom, John Field (Cambridge Language Teaching Library),2011*
6. *A Hand Book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011*
7. *English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009. CUP.*
8. *Basics of Communication in English, Soundararaj, Francis. 2012.. New Delhi: Macmillan*
9. *Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.*
10. *English Pronouncing Dictionary, Daniel Jones, Current Edition with CD.Cambridge, 17th edition, 2011.*

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B.Tech. II - I Sem.	Th	Tu	C
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(13A54302) MATHEMATICS – III

Course Objective:

- *To enable the students to understand the mathematical concepts of special functions & complex variables and their applications in science and engineering.*

Learning Outcome:

- *The student achieves the knowledge to analysis the problems using the methods of special functions and complex variables.*

UNIT I

Special Functions: Gamma and Beta Functions – their properties – Evaluation of improper integrals. Series Solutions of ordinary differential equations (Power series and Frobenius Method).

UNIT II

Bessel functions – Properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue's formula – Recurrence relations – Orthogonality.

UNIT III

Functions of a complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.

Conformal mapping: Transformation of e^z, Inz, z^2, Sin z, cos z, Bilinear transformation - Translation, rotation, magnification and inversion – Fixed point – Cross ratio – Determination of bilinear transformation.

UNIT IV

Complex integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point – Isolated singular point – Pole of order m – Essential singularity.

UNIT V

Residue – Evaluation of residue by formula and by Laurent series – Residue theorem.
Evaluation of integrals of the type

(a) improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

(c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

Text Books:

1. *Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.*
2. *Advanced Engineering Mathematics, Peter V.O'Neil, CENGAGE publisher.*

Reference Books:

1. *Mathematics III by T.K.V. Iyengar, S.Chand publications.*
2. *Engineering Mathematics, Volume - III, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.*
3. *Complex variables by Raisinghania*
4. *Advanced Engineering Mathematics by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, and Oxford.*

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(13A04301) ELECTRONIC DEVICES AND CIRCUITS

Course Objective:

- *To give understanding on semiconductor physics of the intrinsic, p and n materials, characteristics of the p-n junction diode, diode's application in electronic circuits, Characteristics of BJT,FET,MOSFET, characteristics of special purpose electronic devices.*
- *To familiarize students with DC biasing circuits of BJT, FET and analyzing basic transistor amplifier circuits.*

Learning Outcome:

Upon completion of the course, students will:

- *Analyze the operating principles of major electronic devices, its characteristics and applications.*
- *Design and analyze the DC bias circuitry of BJT and FET.*
- *Design and analyze basic transistor amplifier circuits using BJT and FET.*

UNIT- I

PN JUNCTION DIODE & ITS APPLICATIONS:

Review of semi conductor Physics n and p –type semi conductors, Mass Action Law, Continuity Equation, Hall Effect, Fermi level in intrinsic and extrinsic semiconductors, PN Diode Equation, Volt-Ampere (V-I) Characteristics, Temperature Dependence of V-I Characteristics, Ideal Versus Practical Static and Dynamic Resistances, Diode Equivalent circuits, Break down Mechanisms in semiconductor Diodes, Zener Diode Characteristics. PN Junction as a Rectifier, Half wave rectifier, ripple factor, full wave rectifier, Bridge Rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, □- section filter, Use of Zener Diode as a Regulator, Illustrative problems.

UNIT- II

TRANSISTOR AND FET CHARECTERISTICS: Transistor construction, BJT Operation, BJT Symbol, Transistor as an Amplifier, Common Emitter, Common Base and Common Collector Configurations, Limits of Operation, BJT Specifications, The Junction Field Effect Transistor (Construction, Principle of Operation, Symbol) - Pinch-Off Voltage – Volt-Ampere Characteristics, FET as Voltage Variable Resistor, Comparison between BJT and FET, MOSFET- Basic Concepts, Construction, modes(depletion & enhancement), symbol, principle of operation, characteristics.

UNIT-III

BIASING AND STABILISATION: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self Bias, Bias Stability, Stabilization against Variations in $I_{CO}V_{BE}$ and β, Bias Compensation Using Diodes and Transistors, Thermal Runaway, Condition for Thermal Stability in CE configuration, Biasing of FET – Source self bias, Biasing for zero current Drift, Biasing against Devices variation, Illustrative problems.

UNIT- IV

SMALL SIGNAL ANALYSIS OF AMPLIFIERS (BJT & FET):

BJT Modeling using h-parameters, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Analysis of CE, CB and CC configurations using h-Parameters, Comparison of CB, CE and CC configurations, Simplified Hybrid Model, Millers Theorem, Dual of

Millers Theorem. Small Signal Model of JFET & MOSFET ,Small signal analysis of Common Source, and Common Drain Amplifiers using FET, Illustrative problems.

UNIT-V

SPECIAL PURPOSE ELECTRONIC DEVICES:

Principle of Operation, and Characteristics of Tunnel Diode, Varactor Diode, Schottky Barrier Diode, Silicon Control Rectifier, Diac, Triac & Uni-Junction Transistor (UJT),Semiconductor photo devices - LDR, LED, Photo diodes & Photo transistors.

Text Books:

1. J.Millman and Christos.C.Halkias, Satyabrata, "Electronic Devices and Circuits", TMH Third edition, 2012,

2. K .Lal kishore, "Electronic Devices and Circuits", BSP. 2nd edition, 2005,

Reference Books:

1. R.L. Boylestad, "Introductory Circuit Analysis", PEARSON,12th edition, 2013

2. B.P.Singh and Rekha Singh, "Electronic Devices and Circuits", PEARSON, 2nd Edition2013.

3. David A. Bell, "Electronic Devices and Circuits", Oxford University press ,5th Edition, 2008,.

4. Mohammad H.Rashid, "Electronic Devices and Circuits", CENGAGE Learning

5. N.Salivahanan, and N.Suresh Kumar, "Electronic Devices and Circuits", TMH ,3rd Edition, 2012

6. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.

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(13A04302) SIGNALS AND SYSTEMS

Course *Objective*:

- *To study about signals and systems.*
- *To do analysis of signals & systems (continuous and discrete) using time domain & frequency domain methods.*
- *To understand the stability of systems through the concept of ROC.*
- *To know various transform techniques in the analysis of signals and systems.*

***Learning Outcome**:*

- *For integro-differential equations, the students will have the knowledge to make use of Laplace transforms.*
- *For continuous time signals the students will make use of Fourier transform and Fourier series.*
- *For discrete time signals the students will make use of Z transforms.*
- *The concept of convolution is useful for analysis in the areas of linear systems and communication theory.*

UNIT I

Signals and Systems: Continuous-Time and Discrete-Time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, the Unit Impulse and Unit Step Functions, Continuous-Time and Discrete-Time Systems, Basic System Properties, Linear Time-Invariant Systems - Discrete-Time LTI Systems, The Convolution Sum, Continuous-Time LTI Systems - The Convolution Integral, Properties of Linear Time-Invariant Systems, Causal LTI Systems Described by Differential and Difference Equations, Singularity Functions.

UNIT II

Fourier Series Representation of Periodic Signals: The Response of LTI Systems to Complex Exponentials. Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series, Properties of Continuous-Time Fourier Series, Fourier Series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier Series, Fourier Series and LTI Systems, Filtering - Examples of Continuous-Time Filters Described by Differential Equations, Examples of Discrete-Time Filters Described by Difference Equations.

UNIT III

The Continuous-Time Fourier Transform: Representation of Aperiodic Signals, The Continuous-Time Fourier Transform, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, The Convolution Property, Fourier Properties and Basic Fourier Transform Pairs, Systems characterized by Linear constant coefficient differential equations, The Discrete-Time Fourier Transform - Representation of Aperiodic Signals, The Discrete-Time Fourier Transform, The Convolution Property, Fourier Transform Properties and Basic Fourier Transform Pairs, Duality, Systems Characterized by Linear Constant-Coefficient Difference Equations.

UNIT IV

Time & Frequency Characterization of Signals and Systems: The Magnitude-Phase Representation of the Fourier Transform, The Magnitude-Phase Representation of the Frequency Response of LTI Systems, Time-Domain Properties of Ideal Frequency-Selective Filters, Time- Domain and Frequency-Domain

Aspects of Non-ideal Filters, First-Order and Second-Order Continuous-Time Systems, First-Order and Second-Order Discrete-Time Systems, Examples of Time- and Frequency-Domain Analysis of Systems,
Sampling: Representation of a Continuous-Time Signal by Its Samples - Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation. Effect of under sampling: Aliasing, Discrete-Time Processing of Continuous-Time Signals.

UNIT V

Laplace and z-Transforms: The Laplace Transform. The Region of Convergence for Laplace Transforms, The Inverse Laplace Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the Laplace Transform, Some Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform, System Function Algebra and Block Diagram Representations, Unilateral Laplace Transform, The Z-Transform - Region of Convergence for the z-Transform, The Inverse z-Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the z-Transform, Some Common z-Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, Unilateral z-Transforms.

Text Books:

1. *Alan V. Oppenheim, Alan S. Willsky, & S. Hamid, "Signals and Systems," Pearson Higher Education, 2nd Ed., 1997.*
2. *B.P. Lathi, "Principles of LINEAR SYSTEMS and SIGNALS," Oxford Univ. Press, Second Edition International version, 2009.*

Reference Books:

1. *Simon Haykin and B. Van Veen, "Signals & Systems," John Wiley, 2nd Edition, 2003.*
2. *M. E. Van Valkenburg, Network Analysis,PHI Publications, 3rdEdition , 2000.*
3. *Luis F. Chaparro, "Signals and Systems using MATLAB," Academic Press, 2011.*
4. *Narayana Iyer, "Signals and Systems,"CENGAGE Learning, 2011.*
5. *Michel J. Robert, "Fundamentals of Signals and Systems," MGH International Edition, 2008.*
6. *C. L. Philips, J. M. Parr and Eve A. Riskin, "Signals, Systems and Transforms," Pearson education, 4th Edition, 2008.*

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B.Tech. II - I Sem.	Th	Tu	C
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(13A04303) SWITCHING THEORY AND LOGIC DESIGN

Course Objective:

- *To provide fundamental concepts used in the design of digital systems and learn the methods for the design of digital circuits.*

Learning Outcome*:*

- *To introduce basic postulates of Boolean algebra and the methods for simplifying Boolean expressions*
- *To illustrate the concepts and study the procedures for the analysis and design of combinational circuits and sequential circuits*
- *To introduce the concepts of programmable logic devices.*

UNIT I NUMBER SYSTEM & BOOLEAN ALGEBRA

Digital systems, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes. Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, Other logic operations & Logic gates.

UNIT II GATE LEVEL MINIMIZATION

The map method, four variable, K-map, Five variable map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Other two level Implementation, Ex-or Function, Tabular Method- Simplification of Boolean function using tabulation Method.

UNIT III ANALYSIS AND SYNTHESIS OF COMBINATIONAL CIRCUITS:

Combinational circuits, Analysis & Design procedure, Binary Adder-sub tractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers.

UNIT IV ANALYSIS AND SYNTHESIS OF SEQUNTIAL CIRCUITS:

Sequential Circuits, Latches Flips-Flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, other counters.

UNIT V ASYNCHRONOUS SEQUENTIAL LOGIC & PROGRAMMABLE MEMORIES

Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards. Random Access Memory, Memory Decoding Error detection and correction, ROM,PLA, PAL.

Text Books:

1. M.Morris Mano & Michel D. Ciletti, "Digital Design" ,Pearson ,5th Edition.

2. Zvi KOhavi and Nirah K.Jha, "Switching theory and Finite Automata Theory" ,Cambridge,3rd Edition

Reference Books:

1. Subratha Goshal, "Digital Electronics", Cambridge.

2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD.

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(13A03304) ENGINEERING GRAPHICS

Course Objective:

- *By studying the engineering drawing, a student becomes aware of how industry communicates technical information. Engineering drawing teaches the principles of accuracy and clarity in presenting the information necessary about objects.*
- *This course develops the engineering imagination i.e., so essential to a successful design, By learning techniques of engineering drawing changes the way one things about technical images.*
- *It is ideal to master the fundamentals of engineering drawing first and to later use these fundamentals for a particular application, such as computer aided drafting. Engineering Drawing is the language of engineers, by studying this course engineering and technology students will eventually be able to prepare drawings of various objects being used in technology.*

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance-Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice.

a) Conic Sections including the Rectangular Hyperbola- General method only,
b) Cycloid, Epicycloid and Hypocycloid

UNIT II

Projection of Points & Lines: Principles of orthographic projection – Convention – First angle projections, projections of points, lines inclined to one or both planes, Problems on projections, Finding True lengths.

UNIT III

Projections of Planes: Projections of regular plane surfaces- plane surfaces inclined to one or both planes.

Projections of Solids: Projections of Regular Solids with axis inclined to one plane.

UNIT IV

Sections and Developments of Solids: Section Planes and Sectional View of Right Regular Solids-Prism, cylinder, Pyramid and Cone. True shapes of the sections. Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

UNIT V

Isometric and Orthographic Projections: Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes Figures, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

Text Books*:*

1. *Engineering Drawing, N.D. Bhatt, Charotar Publishers*
2. *Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai*

Reference Books*:*

1. *Engineering Drawing, Johle, Tata McGraw-Hill Publishers*
2. *Engineering Drawing, Shah and Rana,2/e, Pearson Education*
3. *Engineering Drawing and Graphics, Venugopal/New age Publishers*

4. *Engineering Graphics, K.C. John, PHI,2013*
5. *Engineering Drawing and Graphics, Venugopal / New age Publishers*
6. *Engineering Drawing, B.V.R. Guptha, J.K. Publishers*

Suggestions:

1. *Student is expected to buy a book mentioned under 'Text books' for better understanding.*
2. *Students can find the applications of various conics in engineering and application of involute on gear teeth. The introduction for drawing can be had on line from:*
   - *Introduction to engineering drawing with tools – youtube*
   - *Http-sewor. Carleton.ca /- g kardos/88403/drawing/drawings.html*
   - *Conic sections-online. red woods.edu*

The skill acquired by the student in this subject is very useful in conveying his ideas to the layman easily.

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(13A02303) ELECTRICAL TECHNOLOGY

Course Objective:

- *This course introduces the concepts of three phase circuits and basics of the DC and AC Machines which facilitates to study of the performance of Generators, motors, Transformers etc.*

UNIT I THREE PHASE CIRCUITS

Phase Sequence- Star and Delta Connection-Relation Between Line and Phase Voltages and Currents in Balanced Systems-Analysis of Balanced Three Phase Circuits- Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Analysis of Three Phase Unbalanced Circuits-Loop Method- Application of Millman's Theorem- Star Delta Transformation Technique – Two Wattmeter Method of Measurement of Three Phase Power.

UNIT II DC MACHINES

DC Generators : Principle of Operation of DC Machines, EMF Equation, Types of Generators, Magnetization and Load Characteristics of DC Generators.

DC Motors : DC Motors, Types of Motors, Characteristics of DC Motors, Losses and Efficiency, Swinburne's Test, Speed Control of DC Shunt Motor, Flux and Armature Voltage Control Methods.

UNIT III TRANSFORMERS

Principle of Operation of Single Phase Transformers-Types - Constructional Details. Emf Equation - Operation on No Load and On Load - Phasor Diagrams. Equivalent Circuit, Losses and Efficiency, Regulation. OC and SC Tests - Predetermination of Efficiency and Regulation (Simple Problems)

UNIT IV 3-PHASE INDUCTION MOTORS

Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines-Production of a Rotating Magnetic Field - Principle of Operation – Slip - Rotor Emf and Rotor Frequency - Rotor Reactance, Rotor Current and Pf at Standstill and During Operation. Torque Equation- - Expressions for Maximum Torque and Starting Torque - Torque Slip Characteristic

UNIT V SYNCHRONOUS GENERATORS

Principle And Constructional Features of Salient Pole and Round Rotor Machines – Pitch, Distribution, Winding Factors – E.M.F Equation- Synchronous Reactance and Impedance – Experimental Determination – Phasor Diagram – Load Characteristics. Voltage Regulation Methods – E.M.F Method.

Text Books:

1. *Basic Electrical Engineering by D P KOTHARI & I J NAGRATH, Tata McGraw Hill, Second Edition, 2007.*
2. *Electrical Circuit Theory and Technology by JOHN BIRD, Routledge publisher, 4Th Edition, 2011.*

Reference Books:

1. *Electrical & Electronic Technology by Edward Hughes, 10th Edition, Pearson, 2008.*

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(13A04305) ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Course Objective:

- *This Lab provides the students to get an electrical model for various semiconducter devices. Students can find and plot V_I characteristics of all semiconductor devices. Student learns the practical applications of the devices. They can learn and implement the concept of the feedback and frequency response of the small signal amplifier*

Learning Outcome:

- *Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices*

PART A: Electronic Workshop Practice

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

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

1. P-N Junction Diode Characteristics

Part A: Germanium Diode (Forward bias& Reverse bias)
Part B: Silicon Diode (Forward bias only)

2. Zener Diode Characteristics

Part A: V-I Characteristics
Part B: Zener Diode act as a 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 (Output) Characteristics
Part B: Transfer Characteristics

6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

PART C: Equipment required for Laboratory

1. 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
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

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(13A02304) ELECTRICAL ENGINEERING LAB

PART-A

1. Verification of KVL And KCL.
2. Serial and Parallel Resonance – Timing, Resonant Frequency, Bandwidth and Q-Factor Determination for RLC Network.
3. Time Response of First Order RC/RL Network for Periodic Non-Sinusoidal Inputs – Time Constant and Steady State Error Determination.
4. Two Port Network Parameters – Z-Y Parameters, Chain Matrix and Analytical Verification.
5. Two Port Network Parameters – ABCD and H-Parameters.
6. Verification of Superposition and Reciprocity Theorems.
7. Verification of Maximum Power Transfer Theorem. Verification on DC, Verification on AC with Resistive and Reactive Loads.
8. Experimental Determination of Thevenin's and Norton's Equivalent Circuits and Verification by Direct Test.
9. Constant – K Low Pass Filter and High Pass Filter

PART-B

1. Magnetization Characteristics of D.C.Shunt Generator. Determination of Critical Field Resistance.
2. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
3. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
4. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at Given Power Factors and Determination of Equivalent Circuit).
5. Load Test on Single Phase Transformer.

Note: Any 12 of the above Experiments are to be conducted

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(13A52301) HUMAN VALUES & PROFESSIONAL ETHICS (AUDIT COURSE)

Course Objective:
This course deals with professional ethics which includes moral issues and virtues, social responsibilities of an engineer, right, qualities of Moral Leadership.

UNIT I
ENGINEERING ETHICS
Senses of 'Engineering Ethics' – Variety of Moral Issues – Types of Inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's Theory – Gilligan's Theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II
ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as Responsible Experimenters – Research Ethics – Codes of Ethics – Industrial Standards – A Balanced Outlook on Law – The Challenger Case Study

UNIT III
ENGINEER'S RESPONSIBILITY FOR SAFETY
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk – Chernobyl Case Studies and Bhopal

UNIT IV
RESPONSIBILITIES AND RIGHTS
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality– Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights –Intellectual Property Rights (IPR) – Discrimination

UNIT V
GLOBAL ISSUES
Multinational Corporations – Business Ethics – Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty –Moral Leadership – Sample Code of Conduct

Text Books:

1. *Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York 2005.*
2. *Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.*

Reference Books:

1. *Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.*
2. *John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003.*
3. *Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.*
4. *Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.*
5. *David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003.*

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(13A01403) ENVIRONMENTAL SCIENCE

Course Objective:

- *To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.*

UNIT I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

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

UNIT II

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

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION: Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-soports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wates – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV

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

UNIT V

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

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

Text Books*:*

(1) Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.

(2) Environmental Studies by Palanisamy, Pearson education, 2012.

(3) Environmental Studies by R.Rajagopalan, Oxford University Press, 2nd edition, 2011.

Reference Books:

(1) Textbook of Environmental Studies by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications, 2nd edition, 2012.

(2) Text book of Environmental Science and Technology by M.Anji Reddy, BS Publication, 2009.

(3) Comprehensive Environmental studies by J.P.Sharma, Laxmi publications, 2nd edition, 2006.

(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited, 2nd edition, 1996.

(5) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited, 3rd edition, 2007.

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(13A04401) PULSE AND DIGITAL CIRCUITS

Course Objective:

- *To study various wave shaping circuits and their applications.*
- *To study different circuits that produce non-sinusoidal waveforms(multivibrators) and their applications*
- *To study various voltage time base generators and their applications.*
- *To study different logic families and their comparison.*

Learning Outcome:

- *Students will be able to design different pulse circuits based on the above concepts.*

UNIT I
LINEAR WAVESHAPING
High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. High Pass RC network as Differentiator, Low Pass RC network as integrator, attenuators and its applications as a CRO probe, RL circuits and its response for step input, Illustrative Problem .

UNIT II
NON-LINEAR WAVE SHAPING
Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators, clamping operation, clamping circuits taking source and Diode resistances into account, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Synchronized Clamping.

UNIT III
MULTIVIBRATORS
Transistor as a switch, Break down voltages, Transistor-Switching Times, Triggering circuits. Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger circuit using BJT.

UNIT IV
TIME BASE GENERATORS
General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Transistor Current time base generators, Methods of linearity Improvements.

SYNCHRONIZATION AND FREQUENCY DIVISION
Pulse Synchronization of relaxation Devices, Frequency division in sweep circuit, Stability of relaxation Devices, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals.

UNIT V
SAMPLING GATES
Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Four Diode Sampling Gate, Reduction of pedestal in gate circuits, Six Diode Gate, Application of Sampling Gates.

Digital Logic Circuits: AND, OR, & NOT gates using Diodes, and Transistors, Analysis of DCTL, RTL, DTL, TTL, ECL and CMOS Logic Families, and comparison between the logic families.

Text Books:

1. J.Millman, H.Taub and Mothiki S. Prakash Rao, " Pulse, Digital and Switching Waveforms" ,TMH ,2nd Edition, 2008.
2. David A. Bell, "Solid State Pulse Circuits", PHI, 4th edition, 2002.

Reference Books:

1. Jacob Millman, Christos C. Halkias, "Integrated electronics" Tata McGraw Hill Publication
2. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.
3. Ronald J. Tocci, "Fundamentals of Pulse and Digital Circuits", 3rd edition, 2008.

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(13A04402) ELECTRONIC CIRCUITS ANALYSIS & DESIGN

Course Objective:

- *The aim of this course is to familiarize the student with the analysis and design of multistage amplifiers with compound connections, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers .To study and analyze the frequency response of amplifier circuits.*

Learning Outcome:

Upon completion of this course, student will be able to :

- *Analyze the frequency response of the BJT amplifiers at low and high frequencies.*
- *Analyze and design multistage amplifiers with compound connections, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers.*

UNIT I

MULTISTAGE AMPLIFIERS

Classification of Amplifiers- Distortion in amplifiers, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Different Coupling Schemes used in Amplifiers- RC Coupled Amplifier, Direct and Transformer Coupled Amplifiers, Design of Single stage RC Coupled Amplifier Using BJT, Analysis of Cascaded RC Coupled BJT Amplifiers, Darlington Pair, Cascode Amplifier, Illustrative design problems.

UNIT II

FREQUENCY RESPONSE

Logarithms, Decibels, General Frequency considerations, Frequency Response of BJT Amplifier, Analysis at Low and High Frequencies, Effect of Coupling and bypass Capacitors, The Hybrid-pi (π)-Common Emitter Transistor Model, CE short Circuit Current gain, Current gain with Resistive Load, Single Stage CE Transistor Amplifier response, Gain-Bandwidth Product, Emitter follower at higher frequencies, Illustrative design problems.

UNIT III

ANALYSIS AND DESIGN OF FEEDBACK AMPLIFIERS AND OSCILLATORS

Concepts of Feedback, Classification of Feedback Amplifiers, General Characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative design Problems.

Conditions for Oscillations, RC and LC type Oscillators, RC-Phase shift and Wien-Bridge Oscillators, Generalized Analysis of LC Oscillators, Hartley and Colpitts Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Illustrative design problems.

UNIT IV

POWER AMPLIFIERS

Classification, Series fed Class A Power Amplifier, Transformer Coupled Class A Amplifier, Efficiency, Push Pull Amplifier- Complementary Symmetry Class-B Power Amplifier, Amplifier Distortion, Power Transistor Heat sinking, Class C and Class D Power amplifiers, Illustrative design problems.

UNIT IV

TUNED AMPLIFIERS

Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading Single Tuned Amplifiers on Bandwidth, Effect of Cascading Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned Amplifiers , Illustrative design problems.

Text Books:

1. *Jacob Millman, Christos C Halkias, "Integrated Electronics", Mc Grawhill.*
2. *K.Lal Kishore, "Electronic Circuit Analysis", BSP,Second Edition.*

Reference Books:

1. *Robert L.Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory",Pearson Education, 9th edition, 2008*
2. *Donald A Neamen, "Electronic Circuits Analysis and Design", Tata McGraw-Hill,Third Edition, 2009.*
3. *sedra, Kenneth, Smith, "Microelectric circuits", Oxford University Press, 5th edition, 2011.*
4. *Mohammad H. Rashid, "Electronic Circuit and Applications" CENGAGE Learning.*
5. *Robert T. Paynter, "Introductory Electronic Devices and Circuits", Pearson Education,7th edition, 2009,*

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(13A04409) PRINCIPLES OF COMMUNICATIONS

Learning Outcome:

On successful completion of the module students will be able to

- *explain the main concepts of analogue and digital communication systems;*
- *analyze and design an AM and FM modulator/demodulator;*
- *explain, discuss, and compare different binary digital modulation techniques;*

explain types of noise & effects of noise on communication system

UNIT I

Introduction: Block diagram of Electrical communication system, Radio communication : Types of communications, Analog, pulse and digital Types of signals, Noise – Types of noise, sources of noise, calculation of noise in Linear systems, and noise figure.

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, Product demodulation for DSB SC & SSB SC.

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

UNIT III

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, Asynchronous Multiplexing.

UNIT IV

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

Digital Modulation: ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

UNIT V

Information Theory : Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding.

Error control coding : Introduction, Error detection and correction codes, block codes, convolution codes.

Text Books:

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.

2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

Reference Books:

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.

2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2nd Ed. 2004.

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(13A10401) SENSORS, TRANSDUCERS & SIGNAL CONDITIONING CIRCUITS

Course Objective:

- *To provide basic knowledge about sensors, transducers and signal conditioning circuits used in Process industry, manufacturing industry and Automated plants.*

Learning Outcome:

- *Upon completion of the subject, students shall be able to understand the sensors, transducers and signal conditioning circuits used in Process control industry, manufacturing industry and Automation plants.*

UNIT I
CHARACTERISTICS OF SENSORS

Classification of sensors, Static characteristics of measurement systems- Range, resolution, linearity, accuracy, precision, sensitivity, repeatability, hysteresis, impedance, temperature effects and estimation of error.

Dynamic characteristics – Zero order, first order and second order measurement systems and response.

UNIT II
SENSORS

Resistive sensors- Potentiometer, strain gauges, resistive temperature detectors, thermistor, magneto resistors, light dependent resistors. Reactance variation sensors- Capacitive sensors, inductive sensors, reluctance, eddy current LVDT, magneto elastic, electromagnetic, Hall Effect. Self generating sensors- Thermocouple, piezoelectric, pyroelectric, photovoltaic, electrochemical.

UNIT III
TRANSDUCERS

Construction and principle of operation of RTD probe, thermocouple probe, pressure gauge, capsule gauge, pressure transmitter

UNIT IV
SIGNAL CONDITIONING CIRCUITS FOR REACTANCE VARIATION SENSORS

Measurement of resistance, voltage dividers, Potentiometers, Applications to thermistor, Dynamic measurements, Amplifiers for voltage dividers, Wheatstone bridge: Balance and deflection measurements, Sensitivity and Linearity, Analog Linearization of resistivity sensor bridges, sensor bridge calibration and balance , Difference and average measurements and compensation, Power Supply of Wheatstone bridges, Detection methods for Wheatstone bridges, Differential and Instrumentation Amplifiers, Differential amplifiers, Instrumentation amplifier based on two op amps and three amps , Interference : Interference types and reduction , Signal Circuit grounding, Shield Grounding, Isolation Amplifiers.

UNIT V
SIGNAL CONDITIONING CIRCUITS FOR REACTANCE VARIATION AND SELF GENERATING SENSORS

DC and AC bridges, Sensitivity and linearity, Capacity bridge analog linearization, ac amplifiers and power supply decoupling , Electrostatic shields and driven shields, ac/dc signal converters , Carrier

Amplifiers and Coherent Detection. Application to LVDTs, Specific Signal Conditioners for Capacitive sensors ,low-drift amplifiers, Offset and drifts in op amps, Electrometer and Trans impedance Amplifiers, chopper amplifier, charge amplifiers.

Text Books:

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

2. *Instrument Transducers, an introduction to their performance and design – Hermann K P Neubert. Oxford Publishers, 2nd edition.*

Reference Books:

1.Sensor Technology Hand Book – Jon Wilson, Newne 2004.

2 Instrument Transducers – An Introduction to their Performance and design – by Herman K.P.Neubrat, Oxford University Press.

3Measurement system: Applications and Design – by E.O.Doeblin, McGraw Hill Publications.

4 Process Control Instrumentation Technology – D. Johnson, John Wiley and sons.

Electronic Instrumentation by H.S.Kalsi

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

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(13A01409) FLUID MECHANICS AND STRENGTH OF MATERIALS

Course Objective:

- *To provide basic knowledge about fluid dynamics and strengths of different materials which are used in Engineering Applications.*

Learning Outcome:

- *Student shall be able to use knowledge of Fluid Mechanics & strength of materials while designing in any Industry*

UNIT I

DEFORMATION OF SOLIDS AND BENDING OF BEAMS: Concept of stress and strain– Normal and shear stresses – Simple and compound Stresses - Elasticity and elastic moduli –Poisson's ratio – Concept of Shear Force and Bending Moment – Bending moment and shearforce diagrams for simply supported, cantilever and over hanging beams.

UNIT II

SHAFTS AND SPRINGS: Torsion – Shear stresses in circular solid and hollow shafts - Torque and power – Helical and leaf springs – Load, deflection, stress and stiffness relationships.

UNIT III

FLUID PROPERTY AND FLOW CHARACTERISTICS : Fluid Property - Newton's law ofViscosity – Fluid pressure and its measurement – Types of Flow– Reynolds number – Continuity equation - Euler's Equation of Motion.

UNIT IV

FLOW DYNAMICS AND PIPE FLOW: Bernoulli's Equations –Venturi meter and orifice meter - Pressure losses along the flow –Major and minor losses - Flow through circular pipes –Friction factor – Pipes in series and parallel - Hydraulic gradient.

UNIT V

TURBINES AND PUMPS: Introduction and Classification of Turbines – Specific Speed – Turbine characteristics, Speed Governance – Classification of Centrifugal Pumps – Pump characteristics – Efficiency – Reciprocating Pumps –Air vessels.

Text Books:

1. *R. K. Rajput, Strength of Materials, S. Chand & Company Ltd., 2008.*
2. R. K. Rajput, Fluid Mechanics and Hydraulic Machineries, S. Chand & Company Ltd., 2008

Reference Books:

1. R.K., Bansal, Strength of Materials, M/s. Lakshmi Publications (P) Ltd, 2008.
2. R.K., Bansal, A text book on Fluid Mechanics & Hydraulic Machinery,- M/s. Lakshmi Publications (P) Ltd, 2008.
3. Srivatsav, "Strength of materials" PHI Learning, 2007

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(13A04405) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

List of Experiments (12 experiments to be done):

Course Objective:

- *Help students make transition from analysis of electronic circuits to design of electronic circuits.*
- *To understand the Analysis of transistor at high frequencies.*
- *To understand the concept of designing of tuned amplifier.*
- *The student will construct and analyze voltage regulator circuits.*
- *To understand the circuit configuration and the principle operation of converters, including diode rectifiers, controlled AC-DC converters and DC choppers*

Learning Outcome:

- *The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.*
- *Designing and analyzing the transistor at high frequencies.*
- *Determine the efficiencies of power amplifiers.*
- *Determine Frequency response and design of tuned amplifiers.*
- *Able to Analyze all the circuits using simulation software and Hardware*.

I) Design and Simulation in Simulation Laboratory using Any Simulation Software. (Minimum of 6 Experiments):

1. Common Emitter Amplifier
2. Common Source Amplifier
3. A Two Stage RC Coupled Amplifier.
4. Current shunt and Voltage Series Feedback Amplifier
5. Cascade Amplifier
6. Wien Bridge Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistors
8. Class A Power Amplifier (Transformer less)
9. Class B Complementary Symmetry Amplifier
10. High Frequency Common base (BJT) / Common gate (JFET) Amplifier.

I) Testing in the Hardware Laboratory (6 Experiments)

Any Three circuits simulated in Simulation laboratory

Any Three of the following

Class A Power Amplifier (with transformer load)
Class C Power Amplifier
Single Tuned Voltage Amplifier
Hartley & Colpitt's Oscillators.
Darlington Pair.
MOSFET Amplifier

III) Equipments required for Laboratories:

For software simulation of Electronic circuits

- Computer Systems with latest specifications.
- Connected in LAN (Optional).
- Operating system (Windows XP).
- Suitable Simulations software.

For Hardware simulations of Electronic Circuits

- Regulated Power Supply (0-30V)
- CRO's
- Functions Generators.
- Multimeters.
- Components.

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(13A04406) PULSE & DIGITAL CIRCUITS LAB

Course Objective:

- *To generate Different types of non-sinusoidal signals.*
- *To generate and processing of non-sinusoidal signals.*
- *To learn about Limiting and storage circuits and their applications.*
- *To learn about Different synchronization techniques, basics of different sampling gates and their uses.*
- *To obtain Basics of digital logic families.*

Learning Outcome:

- *Student understands the various design and analysis to generate various types of signals.*
- *Student can design various digital circuits based on the application and specifications*.

Minimum Twelve experiments to be conducted:

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clamper's.
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.
14. Constant Current Sweep Generator using BJT.

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multi Meters

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(13A02402) CONTROL SYSTEMS ENGINEERING

Course Objective:

In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT I CONTROL SYSTEMS CONCEPTS

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

UNIT II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional, integral, derivative Controllers, Design of P, PD, PI, PID Controllers.

UNIT III STABILITY ANALYSIS IN FREQUENCY DOMAIN

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

UNIT IV FREQUENCY RESPONSE ANALYSIS

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

Compensation techniques – Lag, Lead, Lead-Lag Compensators design in frequency Domain.

UNIT V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from Schematic models, differential equations, Transfer function, block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models.

Text Books:

1. *Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5th edition, 2010.*
2. *Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.*

Reference Books:

1. *Control Systems Engineering - by NISE 5th Edition – John wiley & sons, 2010.*
2. *Control Systems – by – A. Nagoor Kani- First Edition RBA Publications, 2006.*
3. *Automatic Control Systems– by B. C. Kuo and Farid Golnaraghi – John wiley and son's, 8th edition, 2003.*

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(13A04508) LINEAR & DIGITAL IC APPLICATIONS

Course Objective: *To provide basic knowledge about Linear and Digital Integrated Circuits*

Learning Outcome: *Student shall be able to use knowledge of Linear and Digital Integrated Circuits for practical applications*

UNIT I

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

LINEAR APPLICATIONS OF OP- AMP:

Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers

UNIT II

NON-LINEAR APPLICATIONS OF OP- AMP: Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log amplifiers, Precision rectifiers.

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.

UNIT III

LOGIC FAMILIES & INTERFACING: Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families.Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families, Familiarity with standard 74XX and CMOS 40XX series-ICs – Specifications.

UNIT IV

THE VHDL HARDWARE DESCRIPTION LANGUAGE: Design flow, program structure, types and constants, functions and procedures, libraries and packages. Structural design elements, data flow design elements, behavioral design elements, time dimension and simulation synthesis.

UNIT V

COMBINATIONAL & SEQUENTIAL LOGIC DESIGN: Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, EX-OR gates and parity circuits, comparators, adders & subtractors, ALUs, Combinational multipliers. VHDL modes for the above ICs.Latches and flip-flops, PLDs, counters, shift register, and their VHDL models, synchronous design methodology, impediments to synchronous design.

Text Books:

1. *Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.*
2. *Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.*
3. *Digital System Design Using VHDL – Charles H. Roth Jr., Cengage Publications, 1st Edition.*

Reference Books:

1. *Op amps & Linear Integrated Circuits Concepts & Applications, James M.Fiore Cengage 2009.*
2. *Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2003.*
3. *VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.*

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(13A10501) INDUSTRIAL INSTRUMENTATION

Course Objective:

To study the various parameter like vacuum, pressure, temperature, floe, level, force, torque, velocity torque, nuclear radiation, used in process industry, power plants manufacturing and automation plants.

Learning Outcome:

Upon completion of the subject, the students shall be able to understand how the various process parameters are measured.

UNIT I

PRESSURE AND TEMPERATURE MEASUREMENT

Vacuum and low pressure measurement using Monometer, McLeod Gage, Knudsen Gage, Ionization Gases, Thermal conductivity. Pressure measurement using bourdon gages, capsule gages, bellows, pressure transmitter, dead weight tester, force balance, vibration cylinder, dual gage techniques, and calibration.

Temperature standards, fixed points, filled system thermometers, bimetallic thermometer, types of thermocouple, laws of thermocouples, cold junction compensation, RTD, 2wire,3wire, 4wire connections, thermistor and linearization, IC sensors, optical and radiation pyrometers, calibration.

UNIT II

FLOW AND LEVEL MEASUREMENT

Solid flow measurement, Flow equation, flow measurement in pipelines, liquid and gas rotameter, head type, positive displacement, vortex type, hotwire anemometer, electromagnetic type, ultrasonic type, laser Doppler velocimeter, mass flow meter, gas flow meter, selection criteria, calibration.

Solid level measurement, visual technique, float operated devices, displacer devices, pressure gage method, diaphragm type, differential pressure method, boiler drum level, electrical methods, conductive sensor, capacitive sensor, ultrasonic type, purging techniques.

UNIT III

FORCE AND TORQUE MEASUREMENT

Force measurement, different methods, gyroscopic method, vibrating wire sensor, strain gage type, calibration.

Definition of torque, different methods, dynamometer, gyroscope, calibration.

UNIT IV

VELOCITY AND ACCELERATION MEASUREMENT

Relative velocity, translational and rotational velocity measurement, velocity of rotating machinery, speed measurement using tachometer, electrical and magnetic types, revolution counter, proximity type, photo electric type, stroboscope. Acceleration- accelerometer- different types-measurement in rotating machinery- calibration.

UNIT V

OTHER MEASUREMENTS

Nuclear radiation fundamentals, radiation detector, sound level meter, microphone, hydrophone, humidity and moisture measurement, overview of density measurement, measurement of chemical composition, smoke measurement, pollution measurement, clean room and measurement of particles.

Text Books:

1.Measurement systems-Application and Design- by Doeblin, 4/e, McGraw Hill International, 1990.
2. Mechanical measurements by A.K Shawney, Khanna publishers.
3. Instrumentation by C.S.Rangan, Mani and Sharma, Tata McGraw Hill publishing.

Reference Books:

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

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(13A05401) COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objective:

- *To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design*
- *To make the students understand the structure and behavior of various functional modules of a computer.*
- *To understand the techniques that computers use to communicate with I/O devices*
- *To study the concepts of pipelining and the way it can speed up processing.*
- *To understand the basic characteristics of multiprocessors*

Learning Outcome:

- *Ability to use memory and I/O devices effectively*
- *Able to explore the hardware requirements for cache memory and virtual memory*
- *Ability to design algorithms to exploit pipelining and multiprocessors*

UNIT I

Introduction to Computer Organization and Architecture

Basic Computer Organization – CPU Organization – Memory Subsystem Organization and Interfacing – I/O Subsystem Organization and Interfacing – A Simple Computer Levels of Programming Languages, Assembly Language Instructions, Instruction Set Architecture Design, A simple Instruction Set Architecture

UNIT II

CPU Design and Computer Arithmetic

CPU Design: Instruction Cycle – Memory – Reference Instructions – Input/output and Interrupt – Addressing Modes – Data Transfer and Manipulation – Program Control.

Computer Arithmetic: Addition and Subtraction – Multiplication Algorithms – Division Algorithms – Floating-Point Arithmetic Operations – Decimal Arithmetic unit.

UNIT III

Register Transfer Language and Design of Control Unit

Register Transfer: Register Transfer Language – Register Transfer – Bus and Memory Transfers – Arithmetic Micro operations – Logic Micro operations – Shift Micro operations.

Control Unit: Control Memory – Address Sequencing – Micro program Example – Design of Control Unit.

UNIT IV

Memory and Input/output Organization

Memory Organization: Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory.

Input/output Organization: Input-Output Interface – Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt – Direct Memory Access (DMA).

UNIT V

Pipeline and Multiprocessors

Pipeline: Parallel Processing – Pipelining – Arithmetic Pipeline – Instruction Pipeline.

Multiprocessors: Characteristics of Multiprocessors – Interconnection Structures – Inter Processor Arbitration – Inter Processor Communication and Synchronization.

Text Books:

1. *"Computer Systems Organization and Architecture", John D. Carpinelli, PEA, 2009.*
2. *"Computer Systems Architecture", 3/e, M. Moris Mano, PEA, 2007.*

Reference Books:

1. *"Computer Organization", Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5/e, MCG, 2002.*
2. *"Computer Organization and Architecture", 8/e, William Stallings, PEA, 2010.*
3. *"Computer Systems Architecture a Networking Approach", 2/e, Rob Williams.*
4. *"Computer Organization and Architecture" Ghoshal, Pearson Education, 2011.*
5. *"Computer Organization and Architecture", V. Rajaraman, T. Radakrishnan.*
6. *"Computer Organization and Design", P. Pal Chaudhuri, PHI*
7. *"Structured Computer Organization", Andrew S. Janenbaum, Todd Austin*
8. *"Computer Architecture" Parahmi, Oxford University Press*

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(13A10502) ANALYTICAL INSTRUMENTATION

Course Objective:

Provide a solid background in the fundamental concepts and methods of spectroscopy, chromatography & environmental pollution and an appreciation of issues in each of these fields in current research.

Learning Outcome:

On successful completion of the module students will be able to:

- *Acquire knowledge about the interaction of electromagnetic radiations with matter and apply analytical techniques to accurately determine the elements present in the given sample.*
- *Select Instrument for a particular analysis with come idea of its merits, demerits and limitations*
- *Learn specific technique employed for monitoring different pollutants in air and water.*
- *They can understand the applications and usage of chromatography in real time industrial environments*

UNIT I

Electromagnetic radiation – different regions, their wavelengths, frequencies and energies - interaction of EM radiations with matter – atomic, molecular, electronic interaction - Basic principles of spectroscopy – emission and absorption ofradiations – resonance - radiation sources – dispersing and resolving techniques – detectors - typical atomic emission and absorption spectrographs in the UV and visible region.

UNIT II

Molecular spectra – electronic, vibrational and rotational energies and spectra characteristic bands of radicals, OH, CH, CO, etc., - IR absorption - spectroscopy – single and double beam spectrophotometers - instrumentation techniques for analyzing solid, liquid and gaseous samples – sample handling techniques.

UNIT III

Microwave spectroscopy – NMR, ESR and EPR spectroscopy – basic principles – instrumentation techniques and applications - principles of ion optics – ion sources – single focusing and double focusing mass spectrometers – principles and application

UNIT IV

Principles of X-ray fluorescence spectrometry and flame photometry – detection of Xrays and nuclear radiations – ionization chamber - proportional counter – GM counter - scintillation counter - solid state detector - gamma ray spectrometers – isotope dilution and tracer techniques for quantitative estimation and analysis.

UNIT V

Electrochemical methods – electrical conductivity of liquids conductivity and water purity – practical measurements and application – sulphur dioxide monitor – determination of pH – oxygen analyzers. Principles of gas and liquid chromatography – process chromatography– operation of typical process chromatography.

Text Books:

1. H.H. Willard, L.L. Merrit, J.A. Dean and F.A. Settle, Instrumental methods of Analysis, 6th edition - CBS Publishers and Distributers, 1986.

2 B.E.Noltingk (Edtr,) Jone's Instrument Technology, Vol. 2, Fourth Edition, Butterworths, 1986 (chapters 4 &5 for unit 5)

Reference Books:

1. D.A. Skoog and D.M. West, Principles of Instrumental Analysis, 2 nd edition, Holt-Saunders, 1980.

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(13A10503) ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Course Objective: *To provide the knowledge required to understand and analyze the Instruments used for measurement of various electrical parameters*

Learning Outcome:
The student is expected to apply the knowledge that they acquired during their course in EDC, ECA and PDC to study and design electronic instruments.

UNIT 1
SINE-WAVE, SQUARE-WAVE AND PULSE TESTING OF LINEAR SYSTEMS
Mathematical Background, Gain or Loss Measurement, The Measurement of Phase, Automatic Network Analyzers, Measurement of Delay Distortion, The Measurement of Loop Gain, The Measurement of Nonlinearity, Precautions in Sine-wave Testing.Tools and Techniques, Relations between Transient and Sinusoidal Responses, Response to Generalized Inputs, Effect of Low-end Cutoffs on Square-wave Response, Time-domain Reflectometry.

UNIT II
DIRECT-CURRENT INSTRUMENT AMPLIFIERS
Direct-current Amplifier Considerations, Direct-current Amplifier with Automatic Reset, Differential Amplifiers, Chopper Amplifiers.

UNIT III
VOLTAGE AND CURRENT MEASUREMENTS
Introduction to DVMs, Non-integrating Types of DVMs, Digital Voltmeters with Counting Circuitry, Normal-mode Rejection, Common-mode Rejection, Principles of AC Voltage Measurements, Average-responding Detectors, Peak-responding Detectors, Peak-to-peak Detection, Root-mean-square—responding Detectors, Other Detection Methods, Sampling Voltmeters, Synchronous Detection, Direct-current Probes, Alternating-current Probe

UNIT IV
IMPEDANCE MEASUREMENT
Definitions and Formulas, Components and Standards –Resistors, Capacitors, Inductors, Meter Methods to Measure Impedance -Direct—current meter, Capacitance and Inductance Meters, Complex Impedance Meters, Resistance and Impedance Comparators, Direct-current Bridges-The Wheatstone Bridge, Measurement of Low-valued Resistors, Measurement of High-valued Resistance

UNIT V
BRIDGES, TRANSMITTERS AND RECEIVERS
Low-frequency Bridges- General, Classification of Four-arm Bridges, Bridges with Inductively Coupled Ratio Arms, Special-purpose Bridges, Automatic and Semiautomatic Bridges, Radio-frequency Impedance Measurements, Problems at Radio Frequency, Radio-frequency Bridges, T Networks, Resonance Methods, The RF Meter Methods, Precision Measurements- Standardization of Impedance Unit, Methods of Precision Measurements.\
General-performance Characteristics, Basic Measurements, Special System Measurements, Measurements on Receiving Systems, Sensitivity, Modulation-acceptance Bandwidth, Correlation of Sensitivity with Noise Figure, Automatic-gain-control Characteristics, Measurements on Transmitting

Systems, Radio Equipment Specifications, Microwave Transistor Oscillators, Solid-state Microwave Amplifiers, Other Solid-state Microwave Sources.

Text Books:

1. *Electronic Measurement and Instrumentation –Oliver and Cage –TMH.*
2. *Electronic Instrumentation and Measurements - David A. Bell—Oxford- 2nd Edition.*

Reference Books:

1. *Principles of measurement systems, John P. Bentley: 3rd edition, Addison Wesley Longman, 2000.*
2. *Measuring Systems, Application and Design by E.O. Doebelin, McGraw Hill.*
3. *Electrical and Electronic Measurements by Shawney, Khanna Publ.*
4. *Electronic Instrumentation and measurements by David A. Bell, 2nd Edition,PHI, 2003.*
5. *Electronic instruments and instrumentation Technology by M.M.S. Anand: Prentice-Hall of India,2004.*

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(13A04509) LINEAR & DIGITAL IC APPLICATIONS LAB

Course Objective:
To provide exposure to the student about use of Linear and Digital Integrated Circuits

Learning Outcome:
The student will be able to use Linear and Digital Integrated Circuits for different practical applications

Minimum Twelve Experiments to be conducted:
Part A (IC Application Lab):
1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Active Filter Applications – LPF, HPF (first order).
3. Function Generator using OP AMPs.
4. IC 555 Timer – Monostable and Astable Operation Circuit.
5. IC 566 – VCO Applications.
6. Voltage Regulator using IC 723.
7. 4 bit DAC using OP AMP.

Part B (ECAD Lab):
Simulate the internal structure of the following Digital IC's using VHDL / VERILOG and verify the operations of the Digital IC's (Hardware) in the Laboratory
1. Logic Gates- 74XX.
2. Half Adder, Half Subtractor, Full Adder, Full Subtractor & Ripple Carr Adder.
3. 3-8 Decoder -74138 & 8-3 Encoder- 74X148. y
4. 8 x 1 Multiplexer -74X151 and 2x4 Demultiplexer-74X155.
5. 4 bit Comparator-74X85.
6. D Flip-Flop 74X74.
7. JK Flip-Flop 74X109.
8. Decade counter-74X90.
9. Universal shift register -74X194.

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, IC566, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

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

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(13A10504) INSTRUMENTATION LAB

Course Objective:
Hands on experience in industrial instrumentation

Learning Outcome:
The students are expected to acquire practical knowledge of the instruments used in any industry.

(Minimum TEN experiments should be performed**)**

1. Extension of Range of DC Ammeter, Voltmeter
2. Extension of Range of AC Voltmeter, Ammeter
3. Construction of series & shunt type ohm meters using PMMC
4. RLC and Q measurement using Q-meter
5. Study of strain gauges using any one application
6. Measurement of temperature using RTD
7. Measurement of linear displacement using LVDT
8. Study of capacitive transducers
9. Measurement of resistance using wheat stone bridge / Kelvin bridge
10. Measurement of capacitance using shearing bridge
11. Measurement of inductance using maxwell's bridge
12. Characteristics of Opto- Electric Transducers (photo transistor, photo diode, LDR)
13. Piezoelectric transducers
14. Bourdon tube
15. Acceleration transducers

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(13A52501) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objective:

The objectives of this course are to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to enrich analytical skills in helping them take sound financial decisions for achieving higher productivity.

UNIT I

INTRODUCTION TO MANAGERIAL ECONOMICS

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

UNIT II

THEORY OF PRODUCTION AND COST ANALYSIS

Production Function – Short-run and long- run production - Isoquants and Isocosts, MRTS, least cost combination of inputs - Cobb-Douglas production function - laws of returns - Internal and External economies of scale - **Cost Analysis**: Cost concepts - Break-Even Analysis (BEA) - Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems)

UNIT III

INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT

Market structures: Types of Markets - Perfect and Imperfect Competition - Features, Oligopoly - Monopolistic competition. Price-Output determination - Pricing Methods and Strategies. Forms of Business Organization – Sole Proprietorship- Partnership – Joint Stock Companies – Public Sector Enterprises – New Economic Environment- Economic systems – Economic Liberalization – Privatization and Globalization

UNIT IV

CAPITAL AND CAPITAL BUDGETING

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

UNIT V

INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS

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

Learning Outcome: The thorough understanding of Managerial Economics and Analysis of Financial Statements facilitates the Technocrats – cum – Entrepreneurs to take-up decisions effectively and efficiently in the challenging Business Environment.

Text Books:

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

Reference Books:

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

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(13A04601) MICROPROCESSORS AND MICROCONTROLLERS

Course Objective:

- *To understand the architecture of8086 MICROPROCESSOR.*
- *To learn various 8086 Instruction set and Assembler Directives.*
- *To become skilled in 8086 Assembly Language programming.*
- *To understand programmable peripheral devices and their Interfacing.*
- *To understand and learn 8051 microcontroller.*
- *To learn 8051 assembly Language programming*

Learning Outcome:

- *Becomes skilled in various 8086 Instruction set and Assembler Directives*
- *Able to write8086 Assembly Language programs.*
- *Able to understand programmable peripheral devices and their Interfacing.*
- *Able to write 8051 assembly Language programs.*

UNIT I
8085 ARCHITECTURE
Introduction-8085 Architecture-Block Diagram, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagram, Instruction Set of 8085- Instruction & Data Formats- Addressing Modes-Instructions.

UNIT II
8086 ARCHITECTURE
8086 Over View-Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration, Physical Memory Organization, General Bus Operation- Minimum and Maximum Mode Signals, Timing Diagrams - Interrupts Of 8086.

UNIT III
INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMMING OF 8086
Instruction Formats -Addressing Modes-Instruction Set, Assembler Directives-Macros, Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions - String Manipulations-Simple ALPs.

UNIT IV
INTERFACING DEVICES
8255 PPI- Block Diagram, Various Modes of Operation-Programmable Interval Timer 8254-Architecture,Operating Modes – Key Board/Display Controller 8279- Architecture, Modes of Operation, Command Words and Key Code and Status Data Formats-Programmable Communication Interface8251 USART-Architecture, Description Of Operating Modes-DMA Controller 8257- Internal Architecture and Signal Description .

UNIT V
INTRODUCTION TO MICRO CONTROLLERS 8051
Introduction, Architecture, Registers, Pin Description, Connections, I/O Ports, Memory Organization, Addressing Modes, Instruction Set, Architectural features of Intels 16 bit Micro Controller.

Text Books:

1. *A.K.Ray and Bhurchandi, "Advanced Microprocessors and Peripherals", 2nd Edition, TMH Publications.*
2. *Ajay V. Deshmukh, "Microcontrollers, Theory and applications", Tata McGraw-Hill Companies – 2005*

Reference Books:

1. *Douglas V.Hall, "Microprocessors and Interfacing", 2nd Revised Edition, TMH Publications.*
2. *Liu & Gibson, "Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design", 2nd ed., PHI*
3. *Kenneth j.Ayala, Thomson, "The 8051 Microcontrollers", Asia Pte.Ltd*
4. *Krishna Kant, "Microprocessors and Microcontrollers", PHI Publishers*

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(13A04602) DIGITAL SIGNAL PROCESSING

Course Objective*:*

- *To use Z transforms and discrete time Fourier transforms to analyze a digital system.*
- *To design and understand simple finite impulse response filters*
- *To understand stability of FIR filters*
- *To know various structures used in the implementation of FIR and IIR filters*
- *Window method design structure for implementation.*

Learning Outcome*:*

At the end of the course, the student should be able to:

- *Describe the Sampling Theorem and how this relates to Aliasing and Folding.*
- *Determine if a system is a Linear Time-Invariant (LTI) System and Take the Z-transform of a LTI system.*
- *Find the frequency response of FIR and IIR filters through analysis.*
- *Understand the relationship between poles, zeros, and stability and determine the spectrum of a signal using the DFT, FFT, and spectrogram.*
- *Design, analyze, and implement various digital filters.*

UNIT I

Introduction: Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.

Discrete Fourier Transform: Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Linear filtering methods based on DFT, Frequency analysis of signals using the DFT.

UNIT II

Fast Fourier Transform Algorithms (FFTA): Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, A linear filtering approach to computation of the DFT- the Goertzel, and the Chirp-z transform algorithms, Quantization errors in the computation of DFT.

UNIT III

Implementation of Discrete-Time Systems: Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Frequency sampling, and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, Conversion from Lattice structure to direct form, lattice –Ladder structure.

UNIT IV

Design of Digital Filters: General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR

filters by the frequency sampling method, Design of optimum equi-ripple linear phase FIR filters, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

UNIT V

Multirate Digital Signal Processing: Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of bandpass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

Text Books:

1. *John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4th ed., 2007.*
2. *Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3rd edition, 2009.*

Reference Books:

1. *A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.*
2. *B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.*
3. *Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.*
4. *Andreas Antoniou, "Digital Signal Processing," TATA McGraw Hill, 2006.*
5. *Schaum's outlines M H Hayes, "Digital Signal Processing," TATA Mc-Graw Hill, 2007.*
6. *A. Anand Kumar, "Digital Signal Processing," PHI Learning, 2011.*

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(13A10601) PROCESS CONTROL

Course Objective:
To provide the students with the knowledge on process characteristics and different control schemes for different process

Learning Outcome: .

- *To study the characteristics of various process characteristics*
- *To understand the functions of process Control elements*
- *To study the Characteristics of PID controller, Automanual transfer and tuning methods.*
- *To study the various control schemes.*
- *To understand the Multivariable Control*

UNIT I
PROCESS CHARACTERISTICS: Terms and Objectives, Incentives for process Control – design aspects of a Process Control System- Classification of variables. Process Equation, Process variables, Degrees of freedom. Characteristics of liquid system, gas system, thermal system. Mathematical modelling of processes. Self regulating-Servo and Regulatory, Interacting and Non-Interacting process – inverse response.

UNIT II
PROCESS CONTROL ELEMENTS: Signal conversion - I/P, P/I Converters, Pneumatic and Electric actuators, Valve Positioner-Control Valve – Characteristics of Control Valves-Types of control valves-control valve sizing- cavitation and flashing. Dynamics of batch and Continuous process.

UNIT III
CONTROLLER: - Basic control actions – Discontinuous control mode, Continuous control mode- Proportional, Single speed floating, Integral and Derivative– Composite control modes – P+I, P+D and P+I+D control modes. Response of controller for different types of test inputs –Integral windup – Auto manual transfer. Selection of control mode for different processes – Typical control schemes for level flow, pressure and temperature.
CONTROLLER TUNING: – Zeigler and Nichols open and Closed loop methods, Performance indices –Based on evaluation criteria – ISE, IAE, ITAE.

UNIT IV
VARIOUS CONTROL SYSTEMS : Feed Forward Control ,Cascade control , Ratio control,Over ride control, Split range control , Selective control ,Adaptive control, Inferential control.

UNIT V
MULTIVARIABLE CONTROL: Introduction -Control loop interaction –motivation –general pairing problem- relative gain array-properties- application of RGA- RGA sensitivity zeros and performance limitation –scaling consideration-block diagram analysis- decoupling design of non interacting control loops Piping and Instrumentation Diagram, Instrument terms and Symbols. Introduction to Intelligent controllers.

Text Books:

1. C.Stephanopoulos, "Chemical process control", Prentice Hall of India. 1998.
2. Singh, ' Process Control" PHI Learning, 2009

Reference Books:

1. D.P. Eckman, "Automatic Process Control", Wiley Eastern Ltd., 1972.
2. D.R. Coughanowr, "Process System Analysis and Control", Second Edition, McGraw Hill 1991.
3. K. Ogata, "Modern Control Engineering", Prentice Hall of India, 1982.

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(13A10602) POWER PLANT INSTRUMENTATION

Course Objective:
Able to introduce various methods of power generation and specially provide the knowledge of instrumentation and control in thermal power plants.
Learning Outcome:
Upon completion of this course the student shall be able to apply his knowledge and understand how instrumentation system designed for a power plant.

UNIT I OVERVIEW OF POWER GENERATION
Brief survey of methods of power generation-Hydro, thermal, nuclear, solar, wind, ocean etc. Importance of Instrumentation and control in power generation, piping and instrumentation diagram, Cogeneration of power, Control Rooms.

UNIT II BOILER MANAGEMENT SYSTEM
Building block for boiler, boiler feed water circulation, measurements in water circuits, boiler drum level control, superheated steam temperature control, steam pressure control, feed water treatment, air-fuel circuit, measurement of pressure temperature flow level in air fuel circuit, combustion control, furnace draft control, deaerator control.

UNIT III TURBO SUPERVISORY SYSTEM
Principles of steam turbine and gas turbine, condenser vacuum control, inlet and outlet measurements, governors, gland steam exhaust pressure control, speed vibration shell temperature monitoring and control, lubricating oil temperature control, generator cooling.

UNIT IV POWER PLANT MANAGEMENT
Introduction, Master Control, Combustion Process, Boiler Efficiency, Maintenance of Measuring Instruments, Intrinsic and Electrical Safety, Interlocks for Boiler Operation, Computer based Control and Data Logging Systems, Distributed Control Systems.

UNIT V ANALYZERS IN POWER PLANTS
Impurities in raw water, fuel analyzers, pH meter, conductivity meter, chromatography, oxygen measurement in flue gas, measurement of exhaust gas temperature, carbon dioxide measurement, combustion analyzer , infrared flue gas analyzer, smoke detector, dust monitor, pollution monitoring instruments.

Text Books:
1. *Power Plant Instrumentation by K. Krishnaswamy, M. Ponni Bala, M. Ponni Bala PHI Learning Pvt. Ltd., 2011.*
2. *Modern Power station practice, vol. 6, Instrumentation, controls and testing, Pergamon press, Oxford, 1971.*

Reference Books:
1. *Power-Plant Control and Instrumentation: The Control of Boilers and Hrsg Systems, David Lindsey IET, 2000.*
2. *Pow Plant Engg, Nag, Tata McGraw-Hill Education, 07-Aug-2008.*

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(13A10603) MODERN MEASUREMENT TECHNIQUES

Course Objective:

- *Provide the students with an integrative and multidisciplinary experience by building a complete multi-sensor intelligent system*
- *Allow the students to develop instrumentation, data acquisition software using modern equipments and software tools.*

Learning Outcome:

On successful completion of the module students will be able to:

- *Understand different digital methods of measurement, Signal acquisition principles.*
- *Able to comprehend the fundamental concepts of virtual instrumentation.*
- *Can gain expertise in Instrument control and become competent to use state of art VI tools.*

UNIT I

DIGITAL METHODS OF MEASUREMENTS :Review of A/D, D/A techniques – F/V and V/F conversion techniques – Digital voltmeters and multimeters – Automation and accuracyof digital voltmeters and multimeters – Digital phase meters – Digital tachometers – Digitalfrequency, period and time measurements – Low frequency measurements – Automatic time andfrequency scaling – Sources of error – Noise – Inherent error in digital meters, hiddenerrors in conventional ac measurements – RMS detector in digital multimeters –Mathematical aspects of RMS - Digital storage Oscilloscope.

UNIT II

CURRENT TRENDS IN DIGITAL INSTRUMENTATION: Introduction to special function add on cards – Resistance card – Input and output cards –Digital equipment construction with modular designing; interfacing to microprocessor, micro controllers and computers - Computer aided software engineering tools (CASE) – Use of CASE tools in designand development of automated measuring systems – Interfacing IEEE cards – design of GPIB Systems - Intelligent and programmable instruments using computers-Data networks
CAN Bus, SMART/HART protocols

UNIT III

VIRTUAL INSTRUMENTATION: Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow,comparison with conventional programming. Development of Virtual Instrument using GUI. VIprogramming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, caseand sequence structures, formula nodes, local and global variables, string and file I/O,Instrument Drivers, Publishing measurement data in the web.

UNIT IV

DATA ACQUISITION & VI CHASSIS REQUIREMENTS : Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O,counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. Common Instrument Interfaces: Current loop, RS 232C/RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications,VISA and IVI.

UNIT V

VI TOOLSETS, DISTRIBUTED I/O MODULES: Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

Text Books:

1. Bouwens, A.J., "Digital Instrumentation", McGraw Hill, 1984.
2. John Lenk, D., "Handbook of Micro computer based Instrumentation and Control", PHI,1984.
3. Gary Johnson, LabVIEW Graphical Programming , Second edition, McGraw Hill,Newyork, 1997.
4. Lisa K. wells & Jeffrey Travis, LabVIEW for everyone, Prentice Hall, New Jersey, 1997.

Reference Books:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement,Instrumentation and Control, Newnes, 2000.
2. Doebelin, 'Measurement System, Application & Design', IV Ed,McGraw-Hill, 1990.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III - II Sem. L C
3 2

(13A10604) PROCESS CONTROL LAB

Course Objective:
To understand practical aspect of process industries

Learning Outcome:
Students can understand the closed loop control of various processes

1. Modeling of single capacity level process from experimental Reactive curve. Obtain PID Turing parameters from the model.
2. Modeling of Two capacity level process.
3. Modeling of two capacity interacting level process by semi log method.
4. Modeling of Thermal process from reaction curve and obtain tuning parameters from the model.
5. Modeling of Thermal process.
6. Closed loop control of flow process.
7. Closed loop control of level process.
8. Closed loop control of Thermal Process.
9. Closed loop control of Pressure process.
10. Inherent and Installed characteristic study of linear, equal percentage and quick opening valves.

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B.Tech. III - II Sem.	L	C
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(13A10605) MODERN MEASUREMENT TECHNIQUES LAB

Course Objective:
To know how to develop instrumentation systems using modern equipments and software tools

Learning Outcome:
Students can expertise in virtual instrumentation tools

1. Graphical Programming using Lab VIEW
2. SCPI - Instrument interfacing using GPIB communication
3. RS232 communication for Instrument Interfacing.
4. Design of Programmable Digital Voltmeter Hardware
5. Design of Programmable Digital Function Generator Hardware
6. Design of Distributed Measurement using Ethernet by Lab VIEW
7. Design of Digital Filters using Lab VIEW
8. Design of Virtual Voltmeter and Function Generator
9. Design of Digital & Virtual Frequency meters.
10. Design of Programmable Motion Drives.

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B.Tech. III - II Sem.

(13A52502) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
(Audit Course)

Introduction:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- *Gathering ideas and information to organise ideas relevantly and coherently.*
- *Engaging in debates.*
- *Participating in group discussions.*
- *Facing interviews.*
- *Writing project/research reports/technical reports.*
- *Making oral presentations.*
- *Writing formal letters.*
- *Transferring information from non-verbal to verbal texts and vice-versa.*
- *Taking part in social and professional communication.*

Course Objective:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- *To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.*
- *Further, they would be required to communicate their ideas relevantly and coherently in writing.*
- *To prepare all the students for their placements.*

Learning Outcome:

- *Accomplishment of sound vocabulary and its proper use contextually*
- *Flair in Writing and felicity in written expression.*
- *Enhanced job prospects.*
- *Effective Speaking Abilities*

The following course content to conduct the activities is prescribed for the Advanced English Language Communication Skills (AELCS) Lab:

UNIT I

COMMUNICATIVE COMPETENCY:

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose
4. Spotting errors

UNIT II

TECHNICAL WRITING

1. Report writing
2. Curriculum vitae
3. Covering letter
4. E-mail writing

UNIT III

PRESENTATIONAL SKILLS

1. Oral presentation
2. Power point presentation
3. Poster presentation
4. Stage dynamics

UNIT IV

CORPORATE SKILLS

1. Dress code
2. Telephonic skills
3. Net Etiquettes

UNIT V

GETTING READY FOR JOB

1. Group discussions
2. Interview skills
3. Psychometric tests

MINIMUM REQUIREMENT:

The Advanced English Language Communication Skills (AELCS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- *Spacious room with appropriate acoustics.*
- *Round Tables with movable chairs*
- *Audio-visual aids*
- *LCD Projector*
- *Public Address system*
- *P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ*
- *T. V, a digital stereo & Camcorder*
- *Headphones of High quality*

SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

K-VAN SOLUTIONS-Advanced communication lab

1. ***DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.***
2. ***TOEFL & GRE****(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)*
3. ***Train2success.com***

References:

1. ***Objective English For Competitive Exams****, Hari Mohana Prasad, 4th edition, Tata Mc Graw Hill.*
2. ***Technical Communication*** *by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.*
3. *Books on* ***TOEFL/GRE/GMAT/CAT/ IELTS*** *by Barron's/DELTA/Cambridge University Press.2012.*
4. ***Soft Skills for Everyone,*** *Butterfield Jeff, Cengage Publications, 2011.*
5. ***Practice Psychometric Tests****: How to familiarize yourself with genuine recruitment tests, 2012.*
6. ***Management Shapers Series*** *by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.*
7. ***Handbook for Technical Writing*** *by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.*
8. ***English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.***
9. ***Word Power Made Handy,*** *Shalini Verma, S Chand Publications, 2011.*
10. ***Effective Technical Communication,*** *Ashrif Rizvi, TataMcGrahill, 2011.*

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B.Tech. IV- I Sem.	Th	Tu	C
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(13A52601) MANAGEMENT SCIENCE

Course Objective:

The objectives of this course are to equip the student the fundamental knowledge of Management Science and its application to effective management of human resources, materials and operations of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management.

Learning Outcome:

This course enables the student to know the principles and applications of management knowledge and exposure to the latest developments in the field. This helps to take effective and efficient managerial decisions on physical and human resources of an organization. Besides, the knowledge of Management Science facilitates for his/her personal and professional development.

UNIT 1

INTRODUCTION TO MANAGEMENT

Definition of Management- Function of Management- Management as a Science and Art-Management as a Profession- Universality of Management- Henri Faylo's Administrative Theory –Elton Mayo's Human Relations Movement- Systems theory – Contingency theory- Monetary and non-monetary incentives to motivate work teams- Leadership –Definition- Qualities of successful leaders- Different leadership styles.

UNIT II

ORGANIZATION DESIGN AND STRUCTURE

Organization design and structure- Principles—Types of organization structure-Mechanic and Organic Structures- Line organization- Line & Staff organization- Functional Organization – Matrix organization structures- merits and demerits- Departmentation and Decentralization-Power and Authority- Delegation of authority-Principles for effective delegation of authority.

UNIT III

HUMAN RESOURCE AND MATERIALS MANAGEMENT

Concept of HRM-functions – Human Resource Planning-Job Analysis-Recruitment and Selection-Training and Development- Performance appraisal –methods- Wage and Salary Administration-Grievances handling Procedure-Material Management- Need for Inventory control- Economic order quantity- ABC analysis- Management of purchase, stores and stores records.-Marketing Management – Concept- Channels of distribution- Marketing mix and product mix.

UNIT IV

MANAGEMENT OF OPERATIONS & PROJECT MANAGEMENT

Nature of organizational control- Marketing control- HR control- effective control systems- Operations Management- Essentials of operations management- Trends in operational management- Designing operation system for effective management of an organization-Project Management –Network Analysis-PERT and CPM-Project crashing (Simple problems)

UNIT V

CONTEMPORARY MANAGEMENT ISSUES

Strategic Management-Concept- Mission-Vision-Core values-Setting objectives-Corporate planning – Environmental scanning-SWOT analysis- Steps in strategy formulation & implementation- Management

Information System (MIS)- Enterprise Resource Planning (ERP)-Just-in-Time (JIT)- Total Quality Management (TQM) – Supply Chain Management-Six Sigma-Business Process Outsourcing (BPO).

Text Books:

1. *Stoner, Freeman, Gilbert, Management, Pearson, Six Edition 2008*
2. *Aryasri: Management Science, Fourth Edition TMH, 2012.*

Reference Books:

1. Vijay Kumar & Apparo, Introduction to Management Science, Cengage, 2011.
2. Kotler Philip & Keller Kevin Lane: Marketing Management, 14th Edition, Pearson, 2012.
3. Aswathappa, Human Resource Management, Himalaya, 2012.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2011.
5. Schermerhorn, Capling, Poole & Wiesner: Management, Wiley, 2012.
6. Joseph M Putti, Management Principles, Mc Millan Publishers, 2012.

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B.Tech. IV - I Sem.	Th	Tu	C
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(13A04701) VLSI DESIGN

Course Objective:

- *To understand VLSI circuit design processes.*
- *To understand basic circuit concepts and designing Arithematic Building Blocks.*
- *To have an overview of Low power VLSI.*

Learning Outcome:

- *Will be able to do VLSI circuit design.*
- *Will be able to do basic circuit concepts and designing Arithematic Building Blocks.*

UNIT I

Introduction: Brief Introduction to IC technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies – Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and Capacitors.

Basic Electrical Properties of MOS and BiCMOS Circuits: $\mathbf{I_{ds} - V_{ds}}$ relationships, MOS transistor threshold Voltage, $\mathbf{g_m}$, $\mathbf{g_{ds}}$, figure of merit $\boldsymbol{\omega_0}$; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT II

Basic Circuit Concepts: Sheet Resistance R_s and its concepts to MOS, Area Capacitance calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out.

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2µm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT III

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits.

Physical Design: Floor-Planning, Placement, routing, Power delay estimation, Clock and Power routing

UNIT IV

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

VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices.

UNIT V

VHDL Synthesis: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.

Test and Testability: Fault-modeling and simulation, test generation, design for testability, Built-in-self-test.

Text Books*:*

1. *Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, "Essentials of VLSI circuits and systems", PHI, 2013 Edition.*
2. *K.Lal Kishore and V.S.V. Prabhakar, "VLSI Design", IK Publishers*

Reference Books:

1. *Weste and Eshraghian, "Principles of CMOS VLSI Design", Pearson Education, 1999.*
2. *Wayne Wolf, "Modern VLSI Design", Pearson Education, 3rd Edition, 1997.*
3. *John P. Uyemura, "Chip Design for Submicron VLSI: CMOS layout and Simulation", Thomson Learning.*
4. *John P. Uyemura, "Introduction to VLSI Circuits and Systems", John wiley, 2003.*
5. *John M. Rabaey, "Digital Integrated Circuits", PHI, EEE, 1997.*

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B.Tech. IV- I Sem.	Th	Tu	C
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(13A04703) EMBEDDED SYSTEMS

Course Objective:

- *To understand the fundamental concepts of Embedded systems.*
- *To learn the kernel of RTOS, architecture of ARM processor.*
- *To know various embedded Tools.*

Learning Outcome:

- *Learns the fundamental concepts of Embedded systems.*
- *Learns the kernel of RTOS, architecture of ARM processor*
- *Becomes aware of various embedded Tools.*

UNIT I

Introduction to Embedded Systems: Embedded Systems, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded software in a system, Examples of embedded systems, Embedded system-on-chip (Soc), Design process in embedded systems, Formalization of embedded systems, Classification of embedded systems, Skills required for an embedded system designer.

UNIT II

8051 Microcontroller: Architecture: Hardware and Features of 8051; Addressing modes of 8051, Instruction set of 8051, Assembly language programming of 8051, External memory interfacing with 8051, 8051 Parallel I/O Ports, 8051 Interrupts, Timer and Counter Programming.

UNIT III

Advanced Processors: ARM7 Processor:-Architecture, Features; SHARC Processor:-Architecture, Features.

Devices and Communication Buses for Devices and Network: I/O types and examples, serial communication devices, parallel port devices, wireless devices, Timer and Counting devices, Watchdog timer, Real time clock.

UNIT IV

Device Drivers and Interrupts Service Mechanism: Programmed I/O Busy-wait Approach without Interrupt service mechanism, ISR Concept, Interrupt Sources, Interrupt handling mechanism, Multiple Interrupts, DMA, Device driver programming.

Interprocess Communication and Synchronization of Process, Threads and Tasks: Multiple process in an application, Multiple threads in an application, Tasks, Task states, Task and Data, Clear cut distinction between functions, ISRS and tasks by their characteristics.

UNIT V

Real Time Operating Systems: OS Services, Process Management, Timer functions, Event functions, Memory management, Device file and I/O Management, Interrupt Routines in RTOS environment and Handling of Interrupt Source Calls, Real Time Operating Systems, Basic Design using an RTOS, RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues.

Text Books:

1. *Raj Kamal, "Embedded Systems", Tata Mcgraw Hill(TMH) Second Edition.*
2. *Kenneth J.Ayala Penram, "The 8051 Microcontroller", International (PI) Second Edition*

Reference Books:

1. *Frank Vahid, Tony D. Givargis, "Embedded System Design – A Unified Hardware/Software Introduction", John Wiley, 2002.*

2.*KVKK Prasad, "Embedded / Real Time Systems" Dreamtech Press, 2005****.***

3. Jonathan W. Valvano, Brooks / Cole, "Embedded Microcomputer Systems", Thompson Learning.

4. David E. Simon, "An Embedded Software Primer", Pearson Ed., 2005.

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B.Tech. IV- I Sem.	Th	Tu	C
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(13A10701) COMPUTER CONTROL OF PROCESS

Course Objective:

To provide the students with good knowledge on modeling and identification of process and different digital control algorithms

Learning Outcome: .

- *To understand the sampled data control system*
- *To study various digital control algorithm*
- *To study the modeling and identification of Process*
- *To study various control schemes*
- *To study Adaptive and Model predictive control*

UNIT I

ANALYSIS OF SAMPLED DATA CONTROL SYSTEM: Continuous and discrete systems sample data system- Z transform –inverse Z transform- selection of sampling period – mathematical representation of sampler- transfer function of zero order hold and first order hold device-Pulse transfer function – –open loop and closed response of linear sample data control system for step input – stability analysis: Jury's test and bilinear transformation-State space representation of sample data systems

UNIT II

DIGITAL CONTROL ALGORITHMS – Deadbeat Algorithm – Dahlin's method – ringing – Kalman's approach – discrete equivalent to an analog Controller – design for load changes. PID Algorithms – tuning techniques. Selection of sampling time. Dead time Compensation – Smith Predictor Algorithm.

UNIT III

SYSTEM MODELING AND IDENTIFICATION – mathematical model for processes – first order. Second order processes without and with pure delay higher order systems – process modeling form step test data – pulse testing for process identification – time – domain identification – linear least square algorithm.

UNIT IV

Robust Control, Intelligent Controllers, Optimal Control.

UNIT V

ADAPTIVE CONTROL: Introduction- types- MFA control- single loop MFA control multivariable MFA control-model reference adaptive control.

MODEL PREDICTIVE CONTROL: Introduction- optimization problems- dynamic matrix control-DMC for first order process – quadratic DMC.

Text Books:

1. P.B. Deshpande and RH. Ash, "Elements of Computer Process Control", Instrument Society of America. 1981.

Reference Books:

1. B.W.Bequette. "Process control" Prentice Hall Inc. 2006(unit IV)
2. C.L. Smith, "Digital Computer Process Control", Intext Educational Publishers, 1972.
3. Vance Vandoren" Techniques for Adaptive Control" BH publishers.,2003 (unit –V)

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B.Tech. IV- I Sem.	Th	Tu	C
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(13A10702) SYSTEM DESIGN USING MICROCONTROLLERS
(Elective-II)

Course Objective:

- *To introduce system design concepts to students using microcontrollers with foundational concepts of microcontroller architecture and programming .*
- *To introduce hardware and software integration for real time systems using microcontrollers and thereby imparting real time system design knowledge to students.*

Learning Outcome:

- *Foundational knowledge in activating and using a generic microcontroller. Preliminary design considerations for system level implementation.*
- *Knowledge of 8051 Microcontroller hardware features and internal peripherals.*
- *Programming knowledge of 8051 microcontrollers.*
- *Knowledge of PIC Microcontroller hardware features and internal peripherals.*
- *Programming knowledge of PIC microcontrollers.*
- *Software design techniques to be followed for embedded system designing.*
- *Using real time operating systems for embedded systems.*

UNIT I

REVIEW OF MICROCONTROLLERS: Features of Typical Microcontroller – on Board peripherals – Processor Selection criteria – Microcontroller Design Specifications – Word length – Performance Issues - Power consumption – Package Types – Electrical requirements – Reset Hardware – oscillator Design – power Consideration - Development Tools –Firmware Development options – Assembly Language Vs High level Language Programming.

UNIT II

MCS51 MICROCONTROLLER AND INTERFACING: Intel MCS51 Architecture – Derivatives - Special Function Registers (SFR), I/O pins, ports and circuits, Instruction set, Addressing Modes, Assembly Language Programming, Timer and Counter Programming, Serial Communication, Connection to RS 232, Interrupts Programming, External Memory interfacing ,Introduction to 16 bit Microcontroller

UNIT III

PIC MICROCONTROLLER AND INTERFACING: Introduction, CPU architecture, registers, instruction sets addressing modes Loop timing, timers, Interrupts, Interrupt timing, I/O Expansion, I 2C Bus Operation Serial EEPROM, Analog to digital converter, UART-Baud Rate-Data Handling-Initialization, Special Features - serial Programming-Parallel Slave Port.

UNIT IV

SOFTWARE DEVELOPMENT AND TOOLS: Embedded system evolution trends. Round -Robin, robin with Interrupts, function-One-Scheduling Architecture, Algorithms. Introduction to-assembler-compiler-cross compilers and Integrated Development Environment (IDE). Object Oriented Interfacing, Recursion, Debugging strategies, Simulators.

UNIT V

REAL TIME OPERATING SYSTEMS: Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Message queues-Timer Function-Events-Memory Management, Interrupt Routines in an RTOS environment, basic design Using RTOS. System Design Issues – Design of Industrial Control System.

Content beyond the Syllabus:

Introduction to ARM processors and programming NXP LPC2148 microcontroller.

Text Books:

1. David E Simon, " An embedded software primer ", Pearson education Asia, 2001.
2. Mohammed Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded System", Pearson Education Asia, New Delhi, 2006.

Reference Books:

1. Burns, Alan and Wellings, Andy, " Real-Time Systems and Programming Languages ", Second Edition. Harlow: Addison-Wesley-Longman, 1997.
2. Raymond J.A. Bhur and Donald L.Bialey, " An Introduction to real time systems: Design to networking with C/C++ ", Prentice Hall Inc. New Jersey, 1999.
3. Grehan Moore, and Cyliax, " Real time Programming: A guide to 32 Bit Embedded Development. Reading " Addison-Wesley-Longman, 1998.

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(13A10703) TELEMETRY & TELECONTROL
(Elective-II)

Course Objective:

- *The subject Telemetry and Telecontrol enables the students to understand how various process parameters in the industry are transmitted and controlled from remote place.*

Learning Outcome:

- *The students shall apply the knowledge of transducers, communications, optical communications and satellite communication in understanding the subject. The students understand how process industry and automation plants are controlled from remote place*

UNIT I
TELEMETRY PRINCIPLES

Introduction, Functional blocks of telemetry, Classification of telemetry, design factors considered in selection of telemetry, cable telemetry-2 wire-3 wire-4 wire, pneumatic telemetry, hydraulic telemetry, mechanical telemetry, distance considerations, limitations, telemetry through power line carrier.

UNIT II
WIRELESS TELEMETRY

Functional block, frequency consideration, IRIG standard, line and channel coding, modulation codes, intersymbol interference, frequency division multiplexing-frequency modulation- FM and PM circuits, time division multiplexing- TDM/PAM-PAM/PM-TDM/PCM-PCM system, transmitter circuits, receiver circuits, PCM reception, interference, noise consideration. Bio telemetry. Study of migration of birds using telemetry. Case study.

UNIT III
SATELLITE TELEMETRY

Principle of satellite telemetry, block diagram, selection of frequency, telemetry tracking and command system, noise consideration, ship to shore telemetry using satellite, analog and digital transmission. Example of satellite telemetry system.

UNIT IV
OPTICAL TELEMETRY

Principle of optical telemetry, block diagram, advantages, optical fiber cable, types of fiber cables, light transmission, sources and detector, transmission and receiving circuits, coherent optical fiber communication, power and link budget, losses, Case study.

UNIT V
TELECONTROL

Principle of Telecontrol, block diagram, design aspects, telecontrol instruments, analog and digital techniques in telecontrol, telecontrol using information theory. Remote adjustments, guidance and regulation. Example of Telecontrol system.

Text Books:

1. Telemetry principles by D. Patranabis, TMH.
2. Telecontrol Methods and Applications of telemetry and Remote control by G.Swoboda, Reinhold Publishing Corporation, London, 1991.

Reference Books:

1. Handbook of Telemetry and Remote control by L.Gruenberg, McGraw Hill, New York, 1987.
2. Telemetry Engineering by R.E.Young, Little Books Ltd, London, 1988.
3. Data Communication and Teleprocessing System by T. Housley, PH Intl, Englewood Cliffs, New Jersey, 1987.

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B.Tech. IV- I Sem.	Th	Tu	C
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(13A10704) PETRO CHEMICAL INSTRUMENTATION
(Elective-II)

Course Objective:

- *To understand the exploration of petroleum, separation of petroleum products, manufacture of petroleum derivatives, control and instrumentation associated.*

Learning Outcome:

- *The students understand how petroleum is explored, various separation techniques, manufacturing methods, purification methods, control loops involved*

UNIT 1
PETROLEUM PROCESSING
Petroleum exploration, recovery techniques, separation of oil and gas, processing of wet gases, refining of crude oil.

UNIT II
UNIT OPERATIONS IN PETROLEUM INDUSTRY
Thermal cracking, catalystic cracking, catalystic reforming, polymerization, alkylation, isomerization, manufacture of ethyelene acetylene and propylene from petroleum.

UNIT III
CHEMICALS FROM PETROLEUM PRODUCTS
Chemicals from petroleum, methane derivatives, acetylene derivatives, ethylene derivatives, propylene derivatives, other products.

UNIT IV
MEASUREMENT IN PETROCHEMICAL INDUSTRY
Parameters to be measured in refinery and petrochemical industry, selection and maintenance of measuring instruments, calibration of instruments, intrinsic safety, hazards in petrochemical industry, control architecture, PLC, SCADA, DCS.

UNIT V
CONTROL LOOPS IN PETROCHEMICAL INDUSTRY
Process control in refinery and petrochemical industry, control of distillation column, control of catalytic crackers and pyrolysis unit, automatic control in polyethylene manufacture, control of vinyl chloride, control in PVC manufacture.

Text Books:

1. Chemicals from Petroleum by A.L.Waddams, Butter and Janner Ltd, 1968.
2. Process control structures and applications by J.G.Balchan and K.I.Mumme, Van Nostrand Reinhold Company, New York, 1988.

Reference Books:

1. Chemical Process Industries by Austin G.T.Shreeves, McGraw Hill International, Singapore, 1985.
2. Instrumentation in process industries by B.G.Liptak, Chilton Company, 1994.

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B.Tech. IV - I Sem. L C
3 2

(13A10705) COMPUTER CONTROL OF PROCESS LAB

Course Objective:

- *Students can understand the importance of computerization of process industries*

Learning Outcome

- *Students can capable to use computers and PLC's in process systems*

1. Programming a PLC to demonstrate control of a device using one push button, Generating square wave etc.
2. Programming a PLC to demonstrate an operation of Batch process.
3. Configuring and Implementation of programmable PID controllers.
4. Control of a process using dead beat algorithm using simulation.
5. Control of a process using Dahlings algorithm using simulation.
6. PC based control of flow process.
7. PC based control of level process.
8. PC based control of presence process.
9. PC based control of Thermal process.
10. Online Identification of process parameters from experimental data by least square estimate method.

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B.Tech. IV- I Sem. L C
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(13A10706) MICROPROCESSORS & EMBEDDED SYSTEMS LAB

Course Objective:

- *To provide practical knowledge of Microcontrollers and concept Embedded Systems*

Learning Outcome:

- *Student shall be able to design and implement any Electronic Circuit with Micro Controller*

Embedded systems lab Experiments using 8051

1) To develop program for basic mathematical operations.
2) To develop a program for block operations
3) To develop a program to generate square wave over port pins.
4) To develop a program to read keyboard and code
5) To develop a program to drive stepper motor
6) To develop a program for temperature indicator using ADC

Experiments using PIC Microcontroller

1) Asynchronous serial communication
2) Pulse Width Modulation (PWM) using CCP module
3) DC motor control

Microprocessors & Embedded Systems Lab Experiments

Phase1:

Normal programming

Phase 2:

Interfacing

Phase 1:

1) Design an assembly language program to perform the different arithmetic operations on the operands
2) Design a program for conversion of binded data to un-binded data.
3) Write a program which accepts input from key board and perform the factorial of the given input using interrupts.
4) Design a program which defines locality of the operands.
5) Write a program to reverse a given string.
6) Write a program to search a character in the given string.

Phase 2:

1) Write an ALP to generate Sinusoidal Wave Using 8255
2) Interface 8251 (USART) with 8086.

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(13A10801) BIOMEDICAL INSTRUMENTATION

Course Objective:

To learn the physiology of the human body and the Instrumentation related to Biomedical Systems.

Learning Outcome: .

On successful completion of the module students will be able to:

- *To introduce the concepts of physiology and the Electrical Components of a Biomedical System.*
- *To discuss the measurement of physiological parameters.*
- *To understandhe concepts of Imaging System and Telemetry ad the various Therapeutic Equipments used in Medicine.*

UNIT I

ELECTRO PHYSIOLOGY: Review of Physiology and anatomy – sources of Bioelectric Potentials – Resting and Action Potentials – Propagation of Action Potentials –Electrodes theory – Bio potential electrodes – Bio chemical transducers – Transducers for Bio Medical applications.

UNIT II

BIOMEDICAL RECORDERS AND CARDIOVASCULAR MEASUREMENT: Physiology of cardiovascular and nervous system – ECE-EEE-EME – Foetal ECE- Phonocardiography –Vector Cardiography – Holtel monitoring – BP – Blood flow – cardiac output – ICCU – Bedside unit and central monitoring unit.

UNIT III

PULMONARY MEASUREMENT AND BIO TELEMETRY: Physiology of respiratory system –Respiratory rate measurement – wine and wireless Biotelemetry – Telemetering multiple information – implanted transmitters – sauces of electrical hazards and safety techniques.

UNIT IV

MEDICAL IMAGING SYSTEM: Ultrasound scanner – Echo cardiography – Coloar Doppler system – CAT and CT scan – MRI Imaging – Cine angiogram – LASER Imaging –Endoscope.

UNIT V

THERAPEUTIC UNITS: Physiotheraphy and Electrotheraphy - Short ware, Microwave diathermy –Defibrillators – Cardio vector – Hearing aid – dialysis machine.

Text Books:

1. R.Anandanatarajan, "Biomedical Instrumentation", PHI Learning, 2011.

Reference Books: .

1. *Leshie Cromwell, Fred. J. Weibell and Erich. A. Pfeiffer, "Biomedical Instrumentation and Measurements", 2nd Edition, PHI, 2003.*
2. *R.S. Khandpar, "Hand Book of Biomedical Instrumentation and measurement", McGraw Hill publishing Co., 1990.*
3. *Aston, "Principles of Biomedical Instrumentation and measurements", McGraw Hill publishing Co., 1990.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. IV- II Sem.	Th	Tu	C
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(13A10802) OPTO ELECTRONICS & LASER INSTRUMENTATION

Course Objective:

To make the students understand the application of Opto Electronics and Lasers in instrumentation industries.

Learning Outcome:

Upon completion of this course the student shall be able to apply his instrumentation knowledge and understand how light and LASER can be used for measurements.

UNIT I

OPTICAL FIBERS AND THEIR PROPERTIES

Introduction to optical fiber , fiber characteristics, principles of light propagation through a fiber, Different types of fibers and their properties, Losses in the optical fiber, Dispersion, advantages and limitations of optical fibers

UNIT II

OPTO-ELECTRONIC COMPONENTS

Optical sources- LED- LD, Optical detectors- PIN- APD, Electro-optic, Magneto optic and Acousto-optic Modulators.

.

UNIT III

INDUSTRIAL APPLICATIONS OF OPTICAL FIBERS

Interferometer method of measurement of length – Moire fringes – Measurement of pressure, Temperature, Current, Voltage, Liquid level and strain - fiber optic Gyroscope – Polarization maintaining fibers – Applications

UNIT IV

LASER FUNDAMENTALS

Introduction to lasers - Laser characteristics – Laser configuration – Three level and four level lasers – Q-switching – Mode locking – Types of lasers: Gas lasers, Solid lasers, Liquid lasers and Semiconductor lasers

UNIT V

INDUSTRIAL APPLICATIONS OF LASER

Industrial applications of lasers – Lasers for measurement of distance, length, velocity, acceleration, current, voltage. Bio-medical applications. Holography- Principle, Methods. Holographic Interferometers and applications.

Text Books:

1. Optical Fiber Communication – Principles and Practice, J.M. Senior, , Prentice Hall of India, 1985.

2. Introduction to Opto Electronics, J. Wilson and J.F.B. Hawkes, Prentice Hall of India, 2001.

Reference Books:

1. Understanding Fiber Optics, 4th or 5th edition; Jeff Hecht; Prentice Hall publishers

2. Optical Fibre Communication and Sensors, M. Arumugam, Anuradha Agencies, 2002.

3.Optical Fibre Communication, G. Keiser, McGraw Hill, 1995.

4. Lasers: Theory and Applications – by Thyagarajan K. and Ghatak A.K., Plenum Press

5. Monte Ross, Laser Applications, McGraw Hill, 1968.

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(13A10803) AERO SPACE INSTRUMENTATION
(Elective-III)

Course Objective:
To describe the principle and working of aircraft and spacecraft systems and instruments used in them.

Learning Outcome:
The students understand the working of aircraft and satellites. They also understand the instrumentation and controls involved.

UNIT I AIRCRAFT SYSTEMS
Basic principle of aircraft, fully powered flight controls, Power actuated systems, Modern control systems, Digital fly by wire systems, Auto pilot system, active control Technology, Hydraulic systems, Brake system, Pneumatic power system, Landing Gear systems, lubricating systems for piston and jet engines,

UNIT II AIRCRAFT INSTRUMENTS
Flight Instruments and Navigation Instruments, Gyroscope, Accelerometers, Air speed Indicators, TAS, EAS, Mach Meters, Altimeters, Study of various types of engine instruments - Tachometers - Temperature gauges - Pressure gauges, landing instruments

UNIT III OVERVIEW OF SPACE AND SATELLITES
Basic satellite system, laws governing satellite motion, satellite path, orbital parameters, orbital perturbations, station keeping, satellite launch vehicle, launching of satellites, mission control of satellites.

UNIT IV SATELLITE SYSTEMS AND SUBSYSTEMS
Space craft sub systems, design considerations, power estimates, electric power supply, attitude control systems, orbit control systems, propulsion sub system, telemetry and monitoring system, tracking system, command system, structure system, thermal control system, reliability of subsystem.

UNIT V SATELLITE INSTRUMENTATION
Sensors and instrumentation in remote sensing, power supply, block diagram of power subsystem, solar array, chemical batteries, regulators, three axis stabilization, sensing the attitude, sun sensors, infrared sensing, station keeping, telemetry and telecomm.

Text Books:

1. *McKinley, J.L., and Bent, R.D., Aircraft Maintenance & Repair, McGraw-Hill, 1993.*
2. *General Hand Books of Airframe and Powerplant Mechanics, U.S. Dept. of Transportation, Federal Aviation Administation, The English Book Store, NewDelhi1995.*
3. *Dennis Rody, Satellite communications, McGraw Hill,2001*
4. *K.N.Raja Rao, Fundamentals of Satellite Communications, Prentice Hall of India Private Limited, New Delhi, 2004*

Reference Books:

1. *Mekinley, J.L. and Bent, R.D., "Aircraft Power Plants", McGraw-Hill, 1993.*
2. *Pallet, E.H.J., "Aircraft Instruments & Principles", Pitman & Co., 1993.*
3. *Treager, S., "Gas Turbine Technology", McGraw-Hill, 1997.*
4. *A.P.Crackness and L.W.B.Hayes, Introduction to Remote Sensing, Taylor & Francis Ltd, London, 2003*
5. *M.Richharia, Satellite Communication Systems,- Design Principles, Macmillian, London, 2003*

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(13A10804) AUTOMOTIVE ELECTRONICS
(Elective-III)

Course Objective:
To make the students to understand the basic principle of conventional automobile and its replacement by modern electronic system.

Learning Outcome:
The students understand how the conventional automotive subsystems are replaced by modern electronic systems , their relative advantages and comfort.

UNIT I
INTRODUCTION TO AUTOMOTIVE INDUSTRY AND MODERN AUTOMOTIVE SYSTEMS
Vehicle classifications and specifications, Introduction to modern automotive systems and need for electronics in automobiles, Application areas of electronics in the automobiles, Sensors and actuators, Possibilities and challenges in the automotive industry, Enabling technologies and industry trends

UNIT II
SPARK AND COMPRESSION IGNITION ENGINES
Ignition systems, Fuel delivery systems, Engine control functions, Fuel control, Calculation of injector pulse width and injection strategies, Ignition timing control, Lambda control, Engine control modes, Engine control diagnostics

UNIT III
TRANSMISSION CONTROL, BRAKING AND ELECTRONIC STABILITY CONTROL
Automotive transmissions- Transmission fundamentals- Types- Components,
Introduction to electronic transmission control- Shift point control- Lockup control-torque converter clutch- Engine torque control during shifting, Safety and diagnostic functions, Improvement of shift quality, vehicle braking fundamentals, Vehicle dynamics during
Braking, brake system components, introduction to antilock braking systems, components and control logic, electronic stability and other technologies

UNIT IV
STEERING CONTROL:
Steering system basics, fundamentals of electronically controlled power steering
types, electronically controlled hydraulic system, electric power steering

UNIT V
AUTOMOTIVE ELECTRONICS FOR PASSENGER SAFETY AND CONVENIENCE
Air bag and seat belt pretension systems- sensor functions, distributed front air bag sensing systems- single-point sensing systems- side-impact sensing- future occupant protection systems, tire pressure monitoring systems, configuration of systems such as power seats-
power windows-remote keyless entry systems, types of hybrid vehicles- configurations- main components of hybrid Vehicles.

Text Books:

1. Tom Denton, "Automobile Electrical and Electronics Systems", Edward Arnold Publishers, 2000.
2. William B. Ribbens, "Understanding Automotive Electronics", 5th edition, Newnes Publishing, 2000.

Reference Books:

1. Barry Hollembeak, "Automotive Electricity, Electronics & Computer Controls", Delmar Publishers, 2001.
2. "Fuel System and Emission controls", Check Chart Publication, 2000.
3. Ronald. K. Jurgon, "Automotive Electronics Handbook", McGraw-Hill, 1999.

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B.Tech. IV- II Sem.	Th	Tu	C
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(13A10805) NEURAL NETWORKS, FUZZY LOGIC & GENETIC ALGORITHMS
(Elective-III)

Course Objective*:*
To expose the students to the concepts of feed forward neural networks, feedback neural networks, the concept of fuzziness involved in various systems, fuzzy set theory, fuzzy logic control ,genetic algorithm.

Learning Outcome:
The students understand the concepts involved in Neural networks, Fuzzy logic and genetic algorithm and apply the principle in solving advanced complex problems.

UNIT I
ARCHITECTURE OF NEURON
Introduction – Biological neuron – Artificial neuron – Neuron modeling – Learning rules – Single layer – Multi layer feed forward network – Back propagation – Learning factors.

UNIT II
NEURAL NETWORKS FOR CONTROL
Feed back networks – Discrete time hop field networks – Transient response of continuous time networks – Applications of artificial neural network - Process identification – Neuro controller for inverted pendulum.

UNIT III
FUZZYSYSTEMS
Classical sets – Fuzzy sets – Fuzzy relations – Fuzzification – Defuzzification – Fuzzy rules. Membership function – Knowledge base – Decision-making logic – Optimisation of membership function using neural networks – Adaptive fuzzy system – Introduction to genetic algorithm.

UNIT IV
APPLICATION OF FLC
Fuzzy logic control – Inverted pendulum – Image processing – Home heating system – Blood pressure during anesthesia – Introduction to neuro fuzzy controller.

UNIT V
GENETIC ALGORITHMS
Fundamentals of genetic algorithm, brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithm, genetic modeling, comparison of GA and traditional search methods, Genetic Algorithm in problem solving, genetic algorithm in engineering and optimization, implementing a genetic algorithm, applications of genetic based machine learning

Text Books:
1. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home, 2002.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Tata McGraw Hill, 1997.
3. Melanie Mitchell- 'An introduction to Genetic Algorithm'- Prentice-Hall of India- New Delhi- Edition: 2004

Reference Books:

1. *Laurance Fausett, Englewood cliffs, N.J., 'Fundamentals of Neural Networks', Pearson Education, 1992.*
2. *H.J. Zimmermann, 'Fuzzy Set Theory & its Applications', Allied Publication Ltd., 1996.*
3. *Simon Haykin, 'Neural Networks', Pearson Education, 2003.*
4. *John Yen & Reza Langari, 'Fuzzy Logic – Intelligence Control & Information', Pearson Education, New Delhi, 2003.*
5. *David-E-Golberg- 'Genetic algorithms in search- optimization and machine learning'- Addision-Wesley-1999*
6. *S-Rajasekaran and G-A Vijayalakshmi Pai-'Neural Networks- Fuzzy logic and Genetic Algorithms- Synthesis and Applications'- Prentice Hall of India- New Delhi-2003*

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(13A10806) INSTRUMENTATION BUSES AND DATA NETWORKS
(Elective-IV)

Course Objective:
To learn more about the industrial data communication protocols.
Learning Outcome:
Students will get knowledge on basic data networks, basics of internetworking, various communication protocol, and industrial data communication

UNIT I DATA NETWORK FUNDAMENTALS
Network hierarchy and switching – Open System Interconnection model of ISO– Data link control protocol: - HDLC – Media access protocol – Command/response – Token passing – CSMA/CD,TCP/IP

UNIT II INTER NETWORKING
Bridges – Routers – Gateways –Standard ETHERNET and ARCNET configuration- special requirement for networks used for control.

UNIT III HART AND FIELDBUS
Introduction- Evolution of signal standard – HART communication protocol – Communication modes – HART networks – HART commands – HART applications.
Fieldbus: – Introduction – General Fieldbus architecture – Basic requirements of Field bus standard – Fieldbus topology – Interoperability – Interchangeability – Introduction to OLE for process control (OPC).

UNIT IV MODBUS AND PROFIBUS PA/DP/FMS AND FF
MODBUS protocol structure – function codes – troubleshooting
Profibus: Introduction – profibus protocol stack – profibus communication model – communication objects – system operation – troubleshooting – review of foundation field bus.

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION
Industrial Ethernet : Introduction – 10Mbps Ethernet, 100Mbps Ethernet.
Radio and wireless communication : Introduction – components of radio link – the radio spectrum and frequency allocation – radio modems.

Text Books:

1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, 'Practical Industrial Datanetworks Design, Installation and Troubleshooting', Newnes publication, Elsevier First edition, 2004.
2. William Buchanan 'Computer Busses', CRC Press, 2000.

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall of India Pvt. LTD, 2003
2. Theodore S. Rappaport, 'Wireless communication: Principles & Practice', 2nd Edition, 2001 Prentice Hall of India
3. William Stallings, ' Wireless Communication & Networks' 2nd Edition, 2005, Prentice Hall of India

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(13A10807) ROBOTICS & AUTOMATION
(Elective-IV)

Course Objective:

- *Introduction to the design of multi degree-of-freedom robots and mobile platforms.*
- *Review of the latest technology available to design robotic systems.*
- *Use of professional engineering tools to design robots.*
- *Programming of microcontrollers to control a robotic system.*
- *Hands-on experience to design a robotic system.*

Learning Outcome:

- *Students will be able to design a robot starting with the conceptual design, develop the concept into a model, analyze the model on computer using engineering software packages, complete the structural design, and be able to build a prototype, present results in terms of a Power Point resentation, develop an engineering report and demonstrate the robot's Performance.*

UNIT I

INTRODUCTION: Robotics – Basic components – Classification – Performance characteristics – Actuators- Electric actuator- DC motor horse power calculation, magnetostrictive hydraulic and pneumatic actuators. Sensors and vision systems: Different types of robot transducers and sensors – Tactile sensors – Proximity and range sensors –ultrasonic sensor-touch sensors-slip sensors-sensor calibration- vision systems – Image processing and analysis – image data reduction – segmentation feature extraction – Object recognition.

UNIT II

ROBOT CONTROL: Control of robot manipulators- state equations-constatnt solutions-linear feedback systems-single axis PID control- PD gravity control- computed torque control- variable structure control-Impedance control.

UNIT III

END EFFECTORS: End effectors and tools– types – Mechanical grippers – Vacuum cups –Magnetic grippers – Robot end effectors interface, work space analysis work envelope workspace fixtures-pick and place operation- continuous path motion-interpolated motion-straight line motion.

UNIT IV

ROBOT MOTION ANALYSIS: Robot motion analysis and control: Manipulator kinematics –forward and inverse kinematics- arm equation-link coordinates-Homogeneous transformations and rotations and Robot dynamics.

UNIT V

ROBOT APPLICATIONS: Industrial and Non industrial robots, Robots for welding, painting and assembly – Remote Controlled robots – Robots for nuclear, thermal and chemical plants – Industrial automation – Typical examples of automated industries.

Text Books:

1. Mikel P. Grover , et. Al. "Industrial Robots – Technology Programming and Applications", McGraw Hill, 1980.
2. Robert J.Schilling, Fundamentals of Robotics-Analysis and Control, PHI,2007. (Unit-II and Unit-III)

Reference Books:

1. K.S.Fu,R.C.Gonzalez, CSG. Lee, Robotics,control sensing vision and Intelligence, Tata Mcgraw-Hill, 2008

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(13A10808) PLC AND DISTRIBUTED CONTROL SYSTEMS
(Elective-IV)

Course Objective:

- *To study the fundamentals of Data Acquisition system*
- *To teach the concept of PLC and the Programming using Ladder Diagram*
- *To understand the basics of DCS and communication standards*

Learning Outcome:

- *Students will have the knowledge of data acquisition System*
- *Students will be able to write Programs using ladder diagrams*
- *Students will have the knowledge of DCS, communication standards and various network protocol*

UNIT I

PLC Fundamentals – Discrete state vs continuous state control-Evolution of modern day PLCs building blocks of PLCs-Communication in PLCs.

UNIT II

PLC Applications-Programming methods- Relay & logic ladder diagrams-Boolean logic-High level languages-Graphical representation- programming examples - Comparative study of industrial PLCs.

UNIT III

Elements of DCS –Evolution of DCS - Building blocks- Detailed descriptions and functions of field control units-Operator stations and data highways-Redundancy concepts.

UNIT IV

Case studies in DCS-Comparative study of industrial DCS-Reliability calculations – intrinsically safe instrumentation –Case studies

UNIT V

Communications in DCS - Basics of Computer networks - Special requirements of network used for control - Communication protocols-link access mechanism-Manufactures automation protocols - Field bus and Smart transmitters.

Text Books:

1. Lukcas M.P., Distributed control systems, Van Nostrand Reinhold co., Newyork,1986.
2. Huges T, Programmable Logic Controllers, ISA press,1994.

Reference Books:

1. Moore, Digital Control Devices, ISA press, 1986.
2. Tanaenbaum A.S., Computer networks, Prentice Hall, 1998.