PONDICHERRY ENGINEERING COLLEGE, PUDUCHERRY – 605 014

CURRICULUM AND SYLLABI FOR AUTONOMOUS STREAM

B.TECH. (ELECTRONICS AND INSTRUMENTATION ENGINEERING) COURSES

(FOR STUDENTS ADMITTED FROM ACADEMIC YEAR 2014-15 ONWARDS)

CURRICULUM[a]

I SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
MA101	Mathematics I	TB	3	1	-	40	60	100	4
PH101	Engineering Physics	TA	4	-	-	40	60	100	4
CY101	Engineering Chemistry	TA	4	-	-	40	60	100	4
BE101	Basic Civil and Mechanical Engineering	TC	4	-	-	40	60	100	4
CE101	Engineering Mechanics	TB	3	1	-	40	60	100	4
HS101	Communicative English	TA	4	-	-	40	60	100	4
PH103	Physics Laboratory	LB	-	-	3	60	40	100	2
CY103	Chemistry Laboratory	LB	-	-	3	60	40	100	2
ME103	Workshop Practice	LB	-	-	3	60	40	100	2
Total Credits									**30**

II SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
MA102	Mathematics II	TB	3	1	-	40	60	100	4
PH102	Material Science	TA	4	-	-	40	60	100	4
CY102	Environmental Science	TA	4	-	-	40	60	100	4
BE102	Basic Electrical and Electronics Engineering	TC	3	1	-	40	60	100	4
ME101	Engineering Thermodynamics	TA	3	1	-	40	60	100	4
CS101	Computer Programming	TA	3	1	-	40	60	100	4
ME102	Engineering Graphics	EGD	2	-	3	50	50	100	4
CS102	Computer Programming Laboratory	LB	-	-	3	60	40	100	2
BE103	Basic Electrical and Electronics Laboratory	LB	-	-	3	60	40	100	2
Total									**32**

CA – Continuous Assessment, **SE** – Semester Examination, **TM** – Total Marks

* **TA** – Theory Category A, **TB** – Theory Category B, **TC** – Theory Category C,
LB – Laboratory**, EGD** – Engineering Graphics / Drawing
POD – Practice Oriented Design, **TCP** – Theory Combined with Practice, **PR** - Practice

[a] ***Approved in 3rd Academic Council Meeting***

III SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
MA103	Mathematics III	TB	3	1	-	40	60	100	4
EI101	Circuit Theory	TA	3	1	-	40	60	100	4
EI102	Electronic Circuits	TA	3	1	-	40	60	100	4
EE134	Electrical Machines	TA	4	0	-	40	60	100	4
CS144	Data Structures and Object oriented Programming	TA	3	1	-	40	60	100	4
EI103	Electronic Circuits Laboratory	LB	-	-	3	60	40	100	2
CS145	Data Structures and Object oriented Programming Laboratory	LB	-	-	3	60	40	100	2
EE135	Electrical Machines Laboratory	LB	-	-	3	60	40	100	2
Total									**26**

IV SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
MA106	Partial differential Equations and Numerical Methods	TB	3	1	-	40	60	100	4
EI104	Linear Integrated Circuits	TA	3	1	-	40	60	100	4
EI105	Digital Logic Theory and Design	TA	3	1	-	40	60	100	4
EI106	Sensors and Transducers	TA	4	0	-	40	60	100	4
---	Programme Elective-I/General Elective –I	TX@	-	-	-	40	60	100	4
EI107	Linear and Integrated Circuits Laboratory	LB	-	-	3	60	40	100	2
EI108	Sensors and Transducers Laboratory	LB	-	-	3	60	40	100	2
EI109	Simulation Laboratory	LB	-	-	3	60	40	100	2
Total									**26**

TX@ - Theory Course (Category TA/ TB/ TC /TCP)

V SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
EI110	Control Systems Engineering	TA	3	1	-	40	60	100	4
EI111	Electrical and Electronic Instruments	TA	4	0	-	40	60	100	4
EI112	Microprocessor and its Applications	TA	3	1	-	40	60	100	4
---	Programme Elective –II	TX@	-	-	-	40	60	100	4
---	Programme Elective-III/General Elective –II	TX@	-	-	-	40	60	100	4
EI113	VLSI Design Laboratory	LB	-	-	3	60	40	100	2
EI114	Instrumentation Systems Design Laboratory	LB	-	-	3	60	40	100	2
EI115	Microprocessor and Applications Laboratory	LB	-	-	3	60	40	100	2
Total									**26**

VI SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
EI116	Process Control	TA	4	-	-	40	60	100	4
EI117	Industrial Instrumentation	TA	4	-	-	40	60	100	4
EI118	Digital Signal Processing	TA	3	1	-	40	60	100	4
---	Programme Elective –IV	TX@	-	-	-	40	60	100	4
---	Programme Elective-V/ General Elective –III	TX@	-	-	-	40	60	100	4
EI119	Process Control Laboratory	LB	-	-	3	60	40	100	2
EI120	Embedded System Design Laboratory	LB	-	-	3	60	40	100	2
EI121	Virtual Instrumentation Laboratory	LB	-	-	3	60	40	100	2
HS102	General Proficiency	PR	-	-	3	100	---	100	1
Total									**27**

TX@ - Theory Course (Category TA/ TB/ TC /TCP)

VII SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
EI122	PLC and DCS	TA	4	-	-	40	60	100	4
EI123	Analytical Instrumentation	TA	4	-	-	40	60	100	4
ME135	Maintenance and Safety Engineering	TA	4	-	-	40	60	100	4
---	Programme Elective-VI	TX@	-	-	-	40	60	100	4
---	Programme Elective-VII/General Elective –IV	TX@	-	-	-	40	60	100	4
EI124	Industrial Measurement and Control Laboratory	LB	-	-	3	60	40	100	2
EI125	Project Work (Phase I)	PR	-	-	3	100	--	100	2
EI126	Professional Ethics and Practice	PR	-	-	3	100	--	100	1
Total									**25**

VIII SEMESTER

Subject Code	Subject	Category*	Periods			Marks#			Credits
			L	T	P	CA	SE	TM	
---	Programme Elective –VIII	TX@	-	-	-	40	60	100	4
---	Programme Elective-IX	TX@	-	-	-	40	60	100	4
---	Programme Elective X /General Elective-V	TX@	-	-	-	40	60	100	4
EI127	Comprehensive Test and Viva-Voce	PR	-	-	3	60	40	100	1
EI128	Project Work (Phase II)	PR	-	-	9	60	40	100	6
---	Professional Development Courses (*3 one credit courses*)	PR	-	-	-	100	-	300	3
Total									**22**

TX@ - Theory Course (Category TA/ TB/ TC /TCP)

LIST OF PROGRAMME ELECTIVES

Subject Code	Subject	Category*
EIP01	Visual Programming for Instrumentation Engineers	TA
EIP02	Embedded System Design	TA
EIP03	Web based Instrumentation	TA
EIP04	Instrumentation Buses and Data Networks	TA
EIP05	Applied Soft Computing	TA
EIP06	Power Plant Instrumentation	TA
EIP07	Digital Image Processing	TA
EIP08	Computer Networks	TA
EIP09	Design of Process Control System Components	TA
EIP10	Fiber Optics and Laser Instrumentation	TA
EIP11	Instrumentation and Control in Petrochemical Industries	TA
EIP12	System Identification and Adaptive Control	TA
EIP13	Virtual Instrumentation	TA
EIP14	Advanced Control Theory	TA
EIP15	Advanced Digital Signal Processing	TA
EIP16	Biomedical Instrumentation	TA
EIP17	VLSI Design	TA
EIP18	Robotics and Automation	TA
EIP19	Industrial Electronics	TA
EIP20	Digital Control Systems	TA
EIP21	Signals and Systems	TA
EIP22	Network Analysis and Synthesis	TA
EIP23	Product Design and Development	TA

LIST OF GENERAL ELECTIVES

Sl. No.	Subject Code	Subject	Category
1	**CEG01**	Entrepreneurship Development	TA
2	**CEG02**	Finite Element Analysis	TB
3	**CEG03**	Fluid Mechanics and Machines	TB
4	**CEG04**	Building Maintenance	TA
5	**CEG05**	Building Physics	TA
6	**CEG06**	Non Destructive Testing Methods	TA
7	**CEG07**	Building Automation and Smart Structures	TA
8	**CEG08**	Heath Monitoring of Structures	TA
9	**CEG09**	Remote Sensing and GIS	TA
10	**CEG10**	Experimental Stress Analysis	TA
11	**CEG11**	Environment Impact Assessment	TA
12	**CEG12**	Industrial Waste Disposal and Treatment	TA
13	**CEG13**	Project Management	TA
14	**CEG14**	Fluid Mechanics and Strength of Materials	TB
15	**MEG01**	Elements of Project Management	TA
16	**MEG02**	Fluid and Thermal machines	TA
17	**MEG03**	Industrial Automation	TA
18	**MEG04**	Industrial Refrigeration and Air-Conditioning	TA
19	**MEG05**	Quantitative Techniques for Engineers	TA
20	**MEG06**	Renewable energy	TA
21	**ECG01**	Consumer Electronics	TA
22	**ECG02**	Communication Theory	TA
23	**ECG03**	CMOS VLSI Design	TA
24	**ECG04**	Communication for Engineers	TA
25	**ECG05**	Avionics	TA
26	**CSG01**	Hardware and Troubleshooting	POD
27	**CSG02**	JAVA Programming	TCP
28	**CSG03**	Fundamentals of Operating Systems	TA
29	**CSG04**	Object Oriented Programming using C++	TA
30	**CSG05**	Microprocessors and its Applications	TA
31	**EEG01**	Electrical Machines and Utilizations	TA
32	**EEG02**	Soft Computing Techniques	TA
33	**EEG03**	Power Generation Systems	TA
34	**EIG01**	System Design Using Advanced Microcontrollers	TA

35	**EIG02**	Measurement and Instrumentation	TA
36	**EIG03**	Process Instrumentation	TA
37	**EIG04**	PLC and Industrial Automation	TA
38	**EIG05**	Micro-Electro Mechanical Systems	TA
39	**EIG06**	Neural Networks and Fuzzy logic	TA
40	**CHG01**	Process Engineering Principles	TA
41	**CHG02**	Fundamentals of Momentum, Heat and Mass Transfer	TA
42	**CHG03**	Heat Transfer Analysis	TA
43	**ITG01**	Bio-Informatics	TA
44	**ITG02**	Principles of Programming Languages	TA
45	**ITG03**	Introduction to Operating Systems	TA
46	**ITG04**	Introduction to Database and Oracle	TA
47	**ITG05**	Business Process	TA
48	**MAG01**	Linear Algebra	TA
49	**MAG02**	Queuing Theory and Networks	TA
50	**MAG03**	Optimization Techniques	TA
51	**PHG01**	Introduction to Nanoscience and Nanotechnology	TA
52	**PHG02**	Nanotechnology and Nanoelectronics	TA
53	**PHG03**	Non Destructive Testing	TA
54	**PHG04**	Smart Materials and Structures	TA
55	**CYG01**	Cheminformatics	TA
56	**CYG02**	Instrumental Methods of Chemical Analysis	TA
57	**HSG01**	Soft skill and Personality Development	TA
58	**HSG02**	Engineering Economics and Management	TA

CONSOLIDATED CREDIT DISTRIBUTION

Sl.No.	Course Type	Credits		
		Theory	**Lab/ Practice**	**Total**
1	Basic Sciences (Mathematics, Physics, Chemistry)	32	4	36
2	Basic Engineering Courses	32	10	42
3	Programme Core Courses	56	22	78
4	Programme Electives	32	-	32
5	General Electives	08	-	08
6	Project Work and Comprehensive Viva-voce	-	09	09
7	Humanities and Social Sciences	04	-	04
8	General Skill Development Courses			
	(a) Soft skill Development	-	01	01
	(b) Professional Development and Ethics	-	04	04
	(c) Mandatory Courses		*3 zero credits*	*3 zero credits*
Total Credits		**164**	**50**	**214**

SYLLABUS (Core Subjects)

Department: Mathematics			**Programme:** B.Tech.					
Semester : One			**Category :** TB					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
MA101	Mathematics I	3	1	-	4	40	60	100

Prerequisite	-
Objectives	• To introduce the ideas of differential and integral calculus • To familiarize students with functions of several variables • To introduce methods for solving differential equations
Outcome	• Understands Calculus • Functions of several variables • Able to solve differential equations

UNIT – I	**Hours: 09**
Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.	
UNIT – II	**Hours: 09**
Partial derivatives, Total derivative, Differentiation of implicit functions, Change of variables, Jacobians and their properties, Partial differentiation of implicit functions, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.	
UNIT – III	**Hours: 09**
Multiple Integrals, change of order of integration in double integrals, Applications: Plane areas (double integration), Change of variables (Cartesian to polar), volumes by solids of revolution, double and triple integrations (Cartesian and polar) – Center of mass and Gravity (constant and variable densities).	
UNIT – IV	**Hours: 09**
Exact equations, First order linear equations, Bernoulli's equation, orthogonal trajectories, growth, decay and geometrical applications. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	
UNIT – V	**Hours: 09**
Linear differential equations of higher order - with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients, simultaneous linear differential equations, solution by variation of parameters method.	

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes:**	**Total Hours: 60**

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics (9th Ed), John Wiley & Sons, New Delhi, 2011.
2. Venkataraman M.K., Engineering Mathematics, Vol. I&II, National Publishing Company, Chennai, 2007.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

Reference Books:

1. Sundaram V. et al, Engineering Mathematics, Vol. I& II, Vikas Publications, 6th Edition, 2007.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Bali N. and Goyal M., Advanced Engineering Mathematics, Laxmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2011.

Department : Physics				**Programme :** B.Tech.				
Semester : One				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
PH101	Engineering Physics	4	-	-	4	40	60	100
Prerequisite	-							
Objectives	• To provide a bridge between basic Physics and Engineering courses. • To introduce the concepts and applications of Ultrasonics, Optics, Lasers, Optical Fibers, and wave mechanics and fundamentals of crystal structure.							
Outcome	• At the end of the course, Students would have adequate exposure to the concepts of the various topics of this Engineering Physics course and their real life applications.							
UNIT – I	**Acoustics and Ultrasonics**				**Hours: 12**			
Acoustics: Factors affecting Acoustics of Buildings and their Remedies - Sabine's formula for Reverberation Time – sound absorption coefficient & its determination; **Ultrasonics:** Ultrasonic Waves- Properties-Production by Piezoelectric & Magnetostriction methods. Detection-acoustic grating and piezoelectric transducer methods. Applications of ultrasonic waves-Industrial applications, Medical application-sonogram. Flaw detection by ultrasonic NDT -Ultrasonic Pulse Echo Method.								
UNIT – II	**Optics**				**Hours: 12**			
Interference: Air Wedge – Michelson's Interferometer – Types of fringes- Determination of Wavelength of a light source– Antireflection Coatings -Interference Filter; **Diffraction:** Concept of Resolution of Spectral lines-Rayleigh's criterion -Resolving Power of Grating, Prism & Telescope; **Polarisation :** Basic concepts of Double Refraction and Optical Rotation- Quarter and Half Wave Plates – Specific Rotatory Power – Laurent's Half Shade Polarimeter-polarizing filters								
UNIT – III	**Crystal Structure and Lattice Defects**				**Hours: 12**			
Crystal structure: Space Lattice**,** Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices- Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, HCP structures – Miller Indices- Powder X Ray Diffraction Method; **Lattice Defects**: Qualitative ideas of point, line, surface and volume defects and their influence on properties of solids								
UNIT – IV	**Wave Mechanics**				**Hours: 12**			
Matter Waves – de Broglie hypothesis – Uncertainty Principle – Schrodinger Wave Equations – Time Dependent – Time Independent – Application to Particle in a One Dimensional potential Box –Concept of Quantum Mechanical Tunneling (without derivation) – Applications of tunneling (qualitative) to Alpha Decay, Tunnel Diode, Scanning Tunneling Microscope.								
UNIT – V	**Lasers and Fiber Optics**				**Hours: 12**			
Lasers : Principles of Laser – Spontaneous and Stimulated Emissions - Einstein's Coefficients – population Inversion and Laser Action –optical resonators(qualitative)- Types of Lasers – Nd:YAG, CO_2 laser, GaAs Laser**-** Industrial & Medical applications of Lasers; **Fiber Optics**: Principle and Propagation of light in optical fiber– Numerical aperture and acceptance angle – Types of optical fibers-based on Material, refractive index profile, Modes of propagation(single & Multimode Fibres) -Qualitative ideas of attenuation in optical Fibers-Applications of Optical Fibers- Fibre Optic communication (Schematic), Active and passive fibre optic sensors, Endoscope								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. Avadhanulu M N , Engineering Physics, S. Chand & Co, 2007.
2. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011.

Reference Books:

1. Ajoy Ghatak, Optics, 5th Edition TMH, New Delhi, 2012.
2. K.R.Nambiar**,** Lasers, New Age International, New Delhi, 2008.
3. K. Thyagarajan and Ajoy Ghatak, Lasers Fundamentals and Applications, 2nd Edition, Springer 2010.
4. V Raghavan , Materials Science and Engineering- A First Course, 5th Edition, Prentice Hall of India, 2008.
5. Arthur Beiser, Concepts of Modern Physics, 6th Edition, TMH, New Delhi 2008.
6. A.S. Vasudeva, Modern Engineering Physics, S. Chand & Co, 2006.

Department : Chemistry			**Programme :** B.Tech					
Semester : One			**Category :** TA					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CY101	Engineering Chemistry	4	-	-	4	40	60	100
Prerequisite	-							
Objectives	• To know the importance of chemistry in engineering education • To understand the chemistry of industrial processes • To apply the knowledge of chemistry to solve engineering problems							
Outcome	• Students will be able to understand and appreciate usefulness of chemistry concepts in the design, fabrication and maintenance of materials for engineering applications. • Students will gain knowledge about the chemistry background of some of the important industrial processing techniques. • With the knowledge gained in conceptual chemistry, engineering students will be able to approach confidently the design and development of futuristic materials to meet the requirement of industry and society.							
UNIT – I	**Water Treatment**				**Hours: 12**			
Hardness of water – units and calcium carbonate equivalent. Determination of hardness of water- EDTA method. Disadvantages of hard water-boiler scale and sludge, caustic embrittlement, priming and foaming and boiler corrosion. Water softening methods – internal and external conditioning – lime-soda process, zeolite process and ion exchange process. Desalination – reverse osmosis and electro dialysis. Specifications for drinking water, BIS and WHO standards.								
UNIT – II	**Industrial Polymers**				**Hours: 12**			
Classification, types of polymerization reactions - mechanism of free radical, ionic and Ziegler-Natta polymerizations. Polymer properties - chemical resistance, crystallinity and effect of temperature. Polymer molecular weight - Mn and Mw. Thermoplastics and thermosets. Rubbers – vulcanization. Synthetic rubber - Buna S, Buna N, Silicone and Butyl rubber. Conducting polymers – classification and applications. Moulding constituents of plastic. Biodegradable polymers – preparation, properties and applications of PLA, PCL and PGA. Liquid crystalline polymers.								
UNIT – III	**Electrochemical Cells**				**Hours: 12**			
Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes – hydrogen, calomel, Ag/AgCl and glass electrodes. Batteries - primary and secondary batteries, Laclanche cell, lead acid storage battery, Ni-Cd battery and alkaline battery. Fuel cells - H_2-O_2 fuel cell.								
UNIT – IV	**Corrosion and Control**				**Hours: 12**			
Chemical and electrochemical corrosion – Galvanic, pitting, stress and concentration cell corrosion. Factors influencing corrosion. Corrosion control methods - cathodic protection and corrosion inhibitors. Protective coatings - types of protective coatings - metallic coating - tinning and galvanizing, cladding, electroplating and anodizing.								
UNIT – V	**Engineering Materials**				**Hours: 12**			
Abrasives – Natural and artificial abrasives. Refractories – classification, properties and manufacture. Refractory bricks – silica bricks, fire clay bricks, high alumina bricks and silicon carbide bricks. Glass and ceramics – properties, manufacture and types of glass, ceramics – clays - types, fabrication of ceramic ware. Composite materials – classification. Processing of fibre-reinforced composites, applications. Glazing.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai and Sons, New Delhi, 2004.
2. S.S. Dara and S.S Umare, A Textbook of Engineering Chemistry, S. Chand & Co., Ltd. New Delhi, 2013.

Reference Books:

1. B. K. Sharma, Engineering Chemistry, Krishna Prakashan Media (P) Ltd., Meerut, 2001.
2. P.Kannan,A.Ravikrishnan, Engineering Chemistry, Sri Krishna Hi-tech. Publishing Company Pvt.Ltd, Chennai, 2009.
3. V.R. Gowariker, N.V. Viswanathan and J. Sreedhar, Polymer Science, New Age Intl (P) Ltd, Chennai, 2006.

Department : Civil Engineering / Mechanical Engineering					**Programme :** B.Tech			
Semester : One					**Category :** TC			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
BE101	Basic Civil and Mechanical Engineering	4	-	-	4	40	60	100
Prerequisite								

Objectives	• To be able to differentiate the types of buildings according to national building code. • To understand building components and their functions as well as different types of roads, bridges and dams • To convey the basics of Mechanical Engineering • To establish the necessity of basics of Mechanical Engineering to other engineering disciplines • To explain the concepts of thermal plants used in power systems being a common issue • To narrate the methods of harnessing renewable energies and their working principles • To explain the role of basic manufacturing processes • To develop an intuitive understanding of underlying working principles of mechanical machines and systems.
Outcome	• Parallels are drawn between the subject and the student's everyday experience so that this course may be related to what the students already know. • Students are made to understand the principles of Mechanical Engineering based on theories. • Students are encouraged to make engineering judgments, to conduct independent exploration of topic of renewable energy systems and to communicate the findings in a professional manner. • Students are made to develop natural curiosity to explore the various facets of mechanical equipment and machines. • While emphasizing basic principles, students are provided with explanations used in real time engineering systems.

UNIT – I	**Buildings and Building Materials**	**Hours: 10**
Buildings-Definition-NBC Classification - plinth area, floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses. Impact of manufacture and use of building materials on the environment.		
UNIT – II	**Buildings and their Components**	**Hours: 10**
Buildings: Types and Behaviour. Foundation: Soil classification – functions and types of foundations. Masonry: Types and uses. Floors: Types and functions. Roofs-Types and functions. Concepts of green building.		
UNIT – III	**Basic Infrastructure**	**Hours: 10**
Surveying-Types, general principles, uses, instruments used. Roads - Components, types and their merits and demerits. Bridges-components and types of bridges. Dams-Purpose, types of dams and its components. Water supply-sources and quality requirements. Rainwater harvesting.		
UNIT – IV	**IC Engines and Steam Generators**	**Hours: 10**
IC engines – Classification – Working principles - Diesel and petrol engines: two stroke and four stroke engines – Merits and demerits. Steam generators (Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories – Merits and demerits - Applications.		
UNIT – V	**Conventional and Non-conventional Power Generation**	**Hours: 10**
Power Generation Systems – Convectional and Non-Conventional: Hydraulic – Thermal – Nuclear power plants – Schemes and layouts (Description Only) Solar – wind –Geothermal - Wave – Tidal and Ocean Thermal Energy Conversion systems – Basic power plant schemes and layouts (Description only).		

UNIT – VI	Introduction to Manufacturing Technology		Hours: 10
Machines: Lathe – Drilling machine – Grinding machine (Description only) Machining Processes: Turning – Planning – Facing – Taper turning – Knurling – Chamfering – Drilling – Grinding Moulding: Pattern making – Green and dry sand moulding – casting. Metal Joining – Arc and Gas welding – Brazing – Soldering (process description only).			
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. Natarajan, K V, Basic Civil Engineering, 11th Edition, Dhanalakshmi Publications, Chennai, 2011. (*For Units I to III*)
2. Lindberg, R.A.Process and Materials of Manufacture, PHI, 1999.
3. H.N.Gupta, R.C.Gupta and Arun Mittal, Manufacturing Processes, New Age Publications, 2001.
4. Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.

Reference Books:

1. Purushothama Raj.P., Basic civil engineering, 3rd Edn., Dhanam Publications, Chennai, 2001.
2. Punmia, B.C., et.al Building Construction, Laxmi Publishers, New Delhi, 2012.
3. El.Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co., 1985.
4. Hajra Choudhry, et. al., Workshop Technology Vol. I and II, Media Promoters Publishers Pvt. Ltd., Bombay, 2004.

Web sites:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/
2. http://ocw.mit.edu/courses/mechanical-engineering/

Department : Civil Engineering		**Programme :** B.Tech.						
Semester : One		**Category :** TB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CE101	Engineering Mechanics	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To explain the importance of mechanics in the context of engineering. • To understand the static equilibrium of particles and rigid bodies in two dimensions • To introduce the techniques for analyzing the forces in the bodies. • To study the motion of a body and to write the dynamic equilibrium equation.							
Outcome	• On successful completion of the course, a student would be able to identify and analyze the problems by applying the principles of engineering mechanics, and to proceed to advanced study on mechanical systems.							
UNIT – I	**Fundamentals of Mechanics**				**Hours: 09**			
Mechanics and its relevance, Force System, Definition- Force, Moment and Couple -Principle of Transmissibility, laws of mechanics, Resultant of force system – Concurrent and non-concurrent coplanar forces, Conditions of static equilibrium for coplanar force system, stability and equilibrium, concept of free body diagrams.								
UNIT – II	**Application of Force System**				**Hours: 09**			
Types loads and supports – simply supported beams, cantilever beams and plane trusses – reactions (Introduction only). Friction: Laws of friction, Static dry friction, simple contact friction problems, body on inclined planes, ladders, wedges, simple screw jack.								
UNIT – III	**Properties of Surfaces**				**Hours: 09**			
Properties of sections – centroids, center of gravity, area moment of inertia, product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia. Principle of virtual work – work done – application to simple structural arrangements.								
UNIT – IV	**Kinematics and Kinetics of Particles**				**Hours: 09**			
Introduction of Dynamics – Types of Motion – D Alembert's principle – work energy method – work energy equation for translation and – Motion of connected bodies – work done by a spring – Impulse momentum equation – conservation of momentum – Impact of elastic bodies – oblique impart – Loss of kinetic energy.								
UNIT – V	**Kinematics and Kinetics of Rigid Bodies**				**Hours: 09**			
Circular Motion of Rigid bodies – Acceleration during circular motion – Rotation of rigid bodies – Angular motion – Relationship between Angular and linear motion – Kinetics of Rigid body rotation – General plane of motion – Kinematics – Instantaneous Axis of rotation – kinetics of Rolling bodies – Kinetics of General plane motion.								
Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. Bhavikatti,S.S and Rajashekarappa,K.G., Engineering Mechanics, New Age International (P) Ltd, New Delhi, 2013.

Reference Books:

1. Timoshenko, S., Young, D.H., Rao, J.V. and Sukumar Pati, Engineering Mechanics, Fifth edition, McGraw Hill Education (India) Pvt. Ltd., 2013.
2. Beer, F.P and Johnson Jr. E.R, Vector Mechanics for Engineers, Vol. 1 Statics and Vol. 2 Dynamics, McGraw – Hill International Edition, 1997.

Department : Humanities and Social Sciences			**Programme** : B.Tech.					
Semester : One			**Category :** TA					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
HS101	Communicative English	4	-	-	4	40	60	100
Prerequisite								
Objectives	• To improve the LSRW skills of I. B.Tech students • To instill confidence and enable the students to communicate with ease • To equip the students with the necessary skills and develop their language prowess							
Outcome	On successful completion of the module students should be able to: • communicate effectively in English • get rid of their inhibitions • possess effective language skills • improve their career prospects							
UNIT – I	**Basic Concepts of Communicative English**				**Hours: 12**			
Definition – Importance – Process – Channels and Types – Barriers – Strategies for Effective Communicative – Listening Skills.								
UNIT – II	**Comprehension and Analysis**				**Hours: 12**			
Comprehension of Technical and Non – Technical Passages – Skimming. Scanning, Inferring – Note-making, Predicting and responding to context –Intensive Reading and Reviewing.								
UNIT – III	**Writing**				**Hours: 12**			
Paragraph and Essay – Report – Memorandum – Instructions – Job Application Letters – Resume – E-Mail Writing.								
UNIT – IV	**Oral Communication**				**Hours: 12**			
Basics of Phonetics- Presentation Skills- Group Discussions –Extempore- Debates- Role Plays.								
UNIT – V	**Vocabulary and Language Through Literature**				**Hours: 12**			
Analysis of 1. "English in India", R.K. Narayan 2. "Toasted English", R.K. Narayan 3. "Politics and the English Language", George Orwell Contextual variations of language – interpretation of literary language – vocabulary building – nuances of language (grammar, pronunciation, spelling) – developing critical framework.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			
Text Books:								
1. Ashraf M. Rizvi. Effective Technical Communication. New Delhi: Tata McGraw, 2005. 2. George Orwell. Essays. Penguin Books, 2000. 3. R.K.Narayan. A storyteller's World. Penguin Books, 1989.								
Reference Books:								
1. Daniel Jones. English Pronouncing Dictionary. Cambridge University Press, 2003. 2. Sanjay Kumar and Pushpalata. Communication Skills. New Delhi: OUP, 2011. 3. Nory Sankar Mukerjee. Business Communication: Connecting at Work. New Delhi: OUP, 2013.								

Department : Physics	**Programme :** B.Tech.

Semester : One		**Category** : LB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
PH103	Physics Laboratory	-	-	3	2	60	40	100
Prerequisite								
Objectives	To provide a practical understanding of some of the concepts learnt in the theory course on Physics and Materials Science.							
Outcome	The Students would have gained practical experience about some of the Theoretical concepts learnt in the Physics and Materials Science courses.							

List of Experiments:

(Any 10 experiments including a maximum of 2 Demonstration experiments are to be performed.)

1. Radius of curvature of a Lens - Newton's rings
2. Thickness of a thin object by Air – wedge
3. Spectrometer – Resolving power of a Prism
4. Spectrometer – Resolving power of a Transmission grating
5. Determination of wavelength of a Laser source using transmission grating, reflection grating (vernier calipers) & particle size determination
6. Determination of numerical aperture & Accptance angle of an optical fiber.
7. Laurent's Half shade polarimeter – Determination of specific rotatory power*
8. Spectrometer - Hollow prism / Ordinary & Extraordinary rays by Calcite Prism*
9. Determination of optical absorption coefficient of materials using laser*
10. Coefficient of Thermal conductivity - Radial flow method
11. Coefficient of Thermal conductivity – Lee's Disc method
12. Jolly's Bulb Apparatus experiment – determination of α
13. Magnetism: I – H curve
14. Field along the axis of a coil carrying current
15. Vibration magnetometer – calculation of magnetic moment & pole strength
16. Electrical conductivity of semiconductor – two probe / four probe method*
17. Hall effect in a semiconductor*
18. Michelson's Interferometer*

*Demonstration Experiments.

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Reference Book:

1. Physics Practical Observation Manual Book issued by Dept. of Physics, Pondicherry Engineering College.

Department : Chemistry		**Programme :** B.Tech.						
Semester : One		**Category** : LB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CY103	Chemistry Laboratory	-	-	3	2	60	40	100
Prerequisite	-							
Objectives	• To educate the principles involved in chemical analysis. • To provide practical knowledge of handling chemicals and chemical analysis. • To understand the importance of chemical analysis in various fields.							
Outcome	• Students will be able to understand chemical analysis and its usefulness in engineering, industry and other fields. • Students will gain laboratory skills and that will give confidence in analyzing samples in engineering, industry and other fields.							

	• Students will gain knowledge about the principles and methods of listed methods of quantitative analyses.

List of experiments: (Any 10 experiments)

1. Determination of total, permanent and temporary hardness of water by EDTA method.
2. Determination of magnesium in water by complexometry.
3. Determination of calcium in lime stone by complexometry.
4. Determination of alkalinity of water.
5. Determination of percentage of acetic acid in vinegar.
6. Determination of ferrous ion in Mohr's salt.
7. Determination of lead dioxide by permanganometry.
8. Determination of ferrous and ferric ions in a solution by dichrometry.
9. Determination of iron by spectrophotometry.
10. Determination of dissolved oxygen in water.
11. Determination of COD of water sample.
12. Determination of available chlorine in bleaching powder.
13. Determination of chloride content in water by argentometry.
14. Determination of lead in polluted water by conductometry.
15. Preparation of potash alum from scrap aluminium.

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Text Books:

1. Lab Manual, Department of Chemistry, Pondicherry Engineering College, Puducherry, 2014.

Reference Books:

1. V. Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, 2001.
2. J. Mendham, R.C. Denney, J.D. Barnes and M. Thomas, Vogel's Text Book of Quantitative Chemical Analysis, Pearson Education, New Delhi, 2002.

Department : Mechanical Engineering		**Programme :** B.Tech.						
Semester : One		**Category :** LB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
ME103	Workshop Practice	-	-	3	2	60	40	100
Prerequisite	-							
Objectives	• To convey the basics of mechanical tools used in engineering • To establish hands on experience on the working tools • To develop basic joints and fittings using the hand tools • To establish the importance of joints and fitting in engineering applications • To explain the role of basic workshop in engineering • To develop an intuitive understanding of underlying physical mechanism used in							

	mechanical machines.
Outcome	• Parallels are drawn between the subject and the student's everyday experience so that this course may be related to what the students already know. • Students are introduced to basic hand tools used in various mechanical cutting operations. • Students are encouraged to make simple joints and fittings. • Students are made to develop natural curiosity to explore the various facets of basic cutting operations. • While emphasizing basic operations, students are provided with modern hand tools to use in real time engineering jobs. • Students are exposed to make objects like tray, welded joints.

UNIT – I	**Fitting**	**Hours: 11**

1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting
4. Obtuse angle fitting

UNIT – II	**Welding**	**Hours: 11**

1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3. Single V butt welding (Arc)
4. Corner joint (Arc)

UNIT – III	**Sheet Metal**	**Hours: 11**

1. Study of tools and machineries
2. Funnel
3. Waste collection tray
4. Rectangular Box

UNIT – IV	**Carpentry**	**Hours: 12**

1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint
4. Dovetail joint

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Text Books:

1. Hajra Choudhry, et al., Workshop Technology Vol. I and II, Media Promoters Publ. Pvt. Ltd., Bombay, 2004.
2. H.N.Gupta, R.C.Gupta and Arun Mittal, Manufacturing Processes, New Age Publications, 2001.

Web sites:

1. http://en.wikipedia.org/wiki/Category:Carpentry_tools
2. http://en.wikipedia.org/wiki/Welding

Department : Mathematics				**Programme:** B.Tech.				
Semester : Two				**Category : TB**				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
MA102	Mathematics II	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To acquaint with theory of Matrices • Hyperbolic functions and theory of equations • Vector calculus and statistics							
Outcome	• Understands Matrix theory • Solving techniques of equations • Understands Vectors and statistics							

UNIT – I		**Hours: 09**
Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values. Cayley-Hamilton Theorem, Diagonalisation of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation and nature of quadratic forms.		
UNIT – II		**Hours: 09**
Trigonometry: Hyperbolic and circular functions, logarithms of complex number, resolving real and imaginary parts of a complex quantity. Theory of equations: Relation between roots and coefficients, reciprocal equations, transformation of equations and diminishing the roots.		
UNIT – III		**Hours: 09**
Finite differences: Definitions and relation between operators (Δ, ∇, δ, E, μ, D), Solution of difference Equations, Solving Boundary value problems for ordinary differential equations using finite difference method.		
UNIT – IV		**Hours: 09**
Gradient, divergence and curl, their properties and relations. Stoke's theorem and Gauss divergence theorem (without proof). Simple applications involving cubes, sphere and rectangular parallelepipeds.		
UNIT – V		**Hours: 09**
Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.		
Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**	**Total Hours: 60**
Text Books:		
1. Erwin Kreyszig, Advanced Engineering Mathematics (9th Ed), John Wiley & Sons, New Delhi, 2011. 2. Venkataraman M.K., Engineering Mathematics, Vol II&III, National Publishing Company, Chennai, 2011. 3. Kandasamy P. et al, Numerical Methods, S. Chand & Co., New Delhi, 2012.		
Reference Books:		
1. Grewal B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41stEdition, 2011. 2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 3. Bali N. and Goyal M., Advanced Engineering Mathematics, Laxmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2011.		

Department : Physics		**Programme:** B.Tech.						
Semester : Two		**Category :**TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
PH102	Material Science	4	-	-	4	40	60	100
Prerequisite:	-							
Objectives:	• To impart knowledge to the Engineering students about the significance of Materials Science and its contribution to Engineering and Technology • To introduce the Physical concepts and properties of Different category of materials and their modern applications in day-to-day life.							
Outcome:	• Engineering Students would have gained fundamental knowledge about the various types of							

	materials and their applications to Engineering and Technology.	
UNIT – I	**Dielectric Materials**	**Hours: 12**
Dielectric Polarization and its Mechanisms – Calculation of Polarizabilities (for electronic and ionic polarizations only) - Temperature dependence of polarization-Internal Field in solids - Clausius-Mossotti relation.– Elementary ideas of Piezo-, Pyro- and Ferro-electric materials and Applications. NLO materials and piezoelectric actuators (introductory concepts).		
UNIT – II	**Magnetic Materials and Superconductors**	**Hours: 12**
Magnetic Materials: Origin of atomic magnetic moment – Bohr magneton-classification of magnetic materials (Dia, Para, Ferro, antiferro&Ferri) – Domain Theory of Hysteresis – Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – Applications. Magnetic Hard Disk. Ferro-fluids and applications. **Superconductors**: Basic concepts – properties of superconductors –Meissner effect – Type I and II superconductors – BCS theory (qualitative) - High Temperature Superconductors– Qualitative ideas of Josephson effect, quantum interference and SQUID – their applications.		
UNIT – III	**Semiconductors**	**Hours: 12**
Semiconductors –Concept of Fermi Distribution Function, Fermi Energy Level- Derivation of Carrier concentration in intrinsic Semiconductors –Basic ideas of Electrical conductivity in intrinsic and extrinsic semiconductors - temperature dependence of carrier concentration and electrical conductivity in semiconductors (qualitative ideas), Hall effect in Semiconductors -- Application of Hall Effect. Basic Ideas of Compound Semiconductors (II-VI & III-V). Photovoltaic Effect-Solar photovoltaic cells.		
UNIT – IV	**Nuclear Reactors & Materials**	**Hours: 12**
Mass Defect & Binding Energy of Nucleus - Disintegration in fission –Nuclear Reactors: BWR – FBR. Materials used in Nuclear Reactors; Materials for Moderator, coolant, reactor control elements containment shell. Nuclear Fuel materials and Fuel processing - Fuel enrichment. Nuclear fusion reactions for fusion reactors-D-D and D-T reactions, Basic principles of Nuclear Fusion reactors		
UNIT – V	**Smart Materials and Nanomaterials**	**Hours: 12**
Smart Materials: Introduction –definitions. Shape Memory alloys (SMA): One way and two way Shape memory effect, pseudoelasticity, Properties and applications of SMA- features of Ni-Ti SMA alloy. Liquid Crystals : Types – nematic, cholesteric, smectic- Application to Display Devices Metallic Glasses: preparation by melt spinning. Properties and applicationsNanomaterials : Introduction to Nano materials–Methods of synthesis (CVD, Laser Ablation, Solgel, Ball-milling Techniques), Properties and applications of nanomaterials.C_{60}-Buck Minister Fullerence, carbon nanotubes– synthesis (Plasma arc, Pulsed Laser evaporation methods) Properties and applications.		
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. Avadhanulu M N, Engineering Physics, Vol.-II, S. Chand & Co, 2009.
2. Arthur Beiser, Concepts of Modern Physics, 6th Edition, TMH, New Delhi 2008. (For Unit V only)

Reference Books:

1. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011.
2. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, and James Murday, Text book of Nanoscience and Nanotechnology, Universities Press, Hyderabad 2012.
3. Ali Omar M, Elementary Solid State Physics, Addison Wesley Publishing Co., 2009.
4. Pillai S.O, Solid State Physics, 6th Edition – New Age International, 2005.
5. Vijayamohanan K Pillai and MeeraParthasarathy, Functional Materials, Universities Press Hyderabad, 2012.
6. C.M. Srivastava and C. Srinivasan, Science of Engineering Materials, 2nd Edition, New Age Int. (P) Ltd, New Delhi, 1997.

Department : Chemistry		**Programme:** B.Tech.						
Semester : Two		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CY102	Environmental Science	4	-	-	4	40	60	100
Prerequisite:	-							
Objectives:	• To widen the knowledge of environmental awareness and pollution • To educate the importance of preserving the earth's resources and ecosystem • To highlight the modern techniques and regulations to monitor and control pollution							
Outcome:	• Students will be able to understand about the environment and natural resources we are blessed with.							

	• Students will become aware of environmental issues like pollution, dwindling natural resources and degrading ecosystem. • Students will be inspired to act as environmentally friendly and work for sustainable development of the humanity.	
UNIT – I	**Ecosystem and Biodiversity**	**Hours: 12**
Concept of an ecosystem-structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grassland, desert and aquatic (fresh water, estuarine and marine) ecosystem. Biodiversity-definition-genetic species and ecosystem diversity. Value of biodiversity–consumptive use, productive use, social, ethical, aesthetic and option values. Hotspots of biodiversity. Threats to biodiversity-habitat loss, poaching of wildlife, human-wildlife conflicts. Wildlife protection act and Forest conservation act. Endangered and endemic species. Conservation of biodiversity - in-situ and ex-situ conservation of biodiversity.		
UNIT – II	**Air Pollution**	**Hours: 12**
Environmental segments-lithosphere, hydrosphere, biosphere and atmosphere. Atmospheric layers. Pollution-definition and classification. Pollutants-classification. Causes, sources, effects and control measures of air pollutants-oxides of nitrogen, oxides of sulphur, oxides of carbon, hydrocarbon, chloroflurocarbons and particulates. Green house effect-causes and effects on global climate and consequences. Ozone depletion-causes, mechanism and effect on the environment. Smog-sulfurous and photochemical smog-effect on the environment. Acid rain-theory of acid rain and effects. Environmental protection act-air (prevention and control of pollution) act.		
UNIT – III	**Water and Land Pollution**	**Hours: 12**
Water resources. Water pollution-causes and effects of organic water pollutants-pesticides and detergents. Causes and effects of inorganic water pollutants-heavy metal pollution due to Hg, Pb, Cr and Cu. Thermal pollution. Analysis of DO, BOD, COD and TOC. Water (prevention and control of pollution) act. Land pollution-Solid waste management-causes, effects and control measures of urban and industrial wastes. Radioactive pollution.		
UNIT – IV	**Instrumental Pollution Monitoring**	**Hours: 12**
Classification of instrumental techniques. Electromagnetic radiation, properties, emission and absorption of radiation. Principle and Instrumentation of atomic absorption and emission spectrometry. Beer-Lamberts law. UV–visible spectrophotometry-Principle and instrumentation. IR spectroscopy – Principle and instrumentation. Chromatography–Introduction, Principle and Instrumentation of gas chromatography. Conductometry and potentiometry. Analysis of air pollutants-NOx, SOx and COx.		
UNIT – V	**Energy and Environment**	**Hours: 12**
Energy resources-growing energy needs. Renewable and non-renewable energy resources and use of alternate-energy sources. Green Chemistry - Significance. Basic components of green chemistry – alternative starting materials, reagents, reaction conditions and final products. Atom economy. Industrial applications of green chemistry. From unsustainable to sustainable development. Role of an individual in prevention of pollution.		
Total contact Hours: 60	**Total Tutorials:**	**Total Practical Classes:**	**Total Hours: 60**

Text Books:

1. Anubha Kaushik and C.P. Kaushik, Environmental Science and Engineering, New Age International (P) Ltd, New Delhi, 2009. (Unit I)
2. S.S. Dara,AText Bookof Environmental Chemistry and Pollution Control, S. Chand and Company Ltd, New Delhi, 2008. (Unit II, III, & V)
3. C.N. Sawyer, P.L. McCarty And G.F. Parkin, Chemistry for Environmental Engineering and Science, Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2004. (Unit IV)

Reference Books:

1. K. Raghavan Nambiar, Text Book of Environmental Studies, Scitech Publications India Pvt. Ltd, Chennai, 2008.
2. A.K. De, Environmental Chemistry, New Age International (P) Ltd, New Delhi,2006.
3. B.K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut, 2001.
4. G.S. Sodhi, Fundamental Concepts of Environmental Chemistry, Narosa Publishing House, New Delhi, 2013.

Department : Electronics and Communication Engineering / Electrical and Electronics Engineering		**Programme:** B.Tech.						
Semester : Two		**Category :** TC						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
BE102	Basic Electrical and Electronics Engineering	3	1	-	4	40	60	100
Prerequisite:	-							
Objectives:	• To apply Kirchhoff's law to simplify the given circuit. • To understand the concept of AC circuit and to simplify the given RL, RC, RLC series and parallel circuits. • To understand the principle of electromagnetic induction and the working principle of							

	electrical machines. • The students understand the working principle of transistor, FET, MOSFET, CMOS and their applications. • To design adders, subtractors and to gain knowledge on sequential logic circuits. • To understand the need for communication and acquire knowledge on different communication systems. • To have an overview of different emerging technologies in day-to-day applications.
Outcome:	• The students explored the basic terminology, laws and concepts of DC and AC circuits in electrical engineering. • The students know the principle of operation of DC and AC electrical machines and different types of power plants. • Will understand the importance of FET's, MOSFET's, CMOS and their applications. • Will be able to design Combinational and Sequential circuits. • Awareness towards different Communication Systems. • Gain knowledge in the working principle of real time applications used in day today life like ATM, Microwave Oven, Bluetooth, WiFi and Computer Networks.

UNIT – I	**DC Circuits**	**Hours: 07**
Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchoff's law & its applications – Simple Problems - Division of current in Series & parallel circuits - star/delta conversion - Node and mesh methods of analysis of DC circuits.		
UNIT – II	**AC Circuits**	**Hours: 08**
Concepts of AC circuits – rms value, average value, form and peak factors – Simple RL, RC and RLC series and parallel circuits – Concept of real and reactive power – Power factor – Series and parallel resonance - Introduction to three phase system - Power measurement by two wattmeter method.		
UNIT – III	**Electrical Machines and Power Plants**	**Hours: 08**
Law of Electromagnetic induction, Fleming's Right & Left hand rule - Principle of DC rotating machine, Single phase transformer, single phase induction motor and synchronous motor (Qualitative approach only) - Layout of thermal, hydro and nuclear power generation (block diagram approach only). Components of AC transmission and distribution systems – One line diagram.		
UNIT – IV	**Electronics**	**Hours: 07**
Transistor as an Amplifier – RC Coupled Amplifier – Characteristics of JFET – MOSFET – CMOS – Block Diagram of SMPS – LED – LCD – Solar Cells. Combinational Logic – Design of Half Adder - Half Subtractor –Full Adder – Full Subtractor – Sequential Logic – Ripple Counters – Shift Registers.		
UNIT – V	**Communication**	**Hours: 08**
Need for Modulation – Block Diagram of Analog Communication System - AM, FM, PM Definitions & Waveforms – Comparison of Digital & Analog Communication System- Block Diagram of Digital Communication System – Electromagnetic Spectrum. Wired & Wireless Channel – Block Diagram of Communication Systems – Satellite Communication – Cellular Mobile Communication – Fibre Optical Communication System.		
UNIT – VI	**Overview of Emerging Technologies**	**Hours: 07**
Evolution of Mobile Communication Generations (1G, 2G, 2.5G, 3G and Beyond 3G) – Overview of Bluetooth, Wifi, WiMax, Sensor Networks and Wireless LANs — Introduction to VLSI Technology and Embedded Systems – Internet of Things (IOT). Microwave Ovens - RFID - Automated Teller Machines (ATM).		

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

Electrical

1. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, Electrical and Electronics Technology, Pearson Education Limited, New Delhi, 2010.
2. Kothari D P and Nagrath I J, Basic Electrical Engineering, Tata McGraw Hill, 2009.
3. S.K. Sahdev, Fundamentals of Electrical Engineering and Electronics, DhanpatRai& Co, 2013.

Electronics and Communication

4. Jacob Millman and Christos C. Halkias, Electronic Devices and Circuits,Tata McGraw Hill, 2008

5. R.L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, PHI Learning Private Limited, Ninth Edition, 2008
6. Morris Mano, Digital design, PHI Learning, Fourth Edition, 2008.
7. Wayne Tomasi, Electronic Communication Systems- Fundamentals Theory Advanced, Fourth Edition, Pearson Education, 2001.
8. RajendraPrasad, Fundamentals of Electronic Engineering, Cengagelearning, New Delhi, First Edition, 2011.
9. William Stallings, Wireless Communication and Networks, Second Edition, Pearson Education, 2011.

Reference Books:

Electrical

1. R.Muthusubramaniam, S.Salivahanan and K.A. Muraleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw Hill, 2004.
2. Rejendra Prasad, Fundamentals of Electrical Engineering. Prentice Hall of India, 2006.

Electronics and Communication

3. David. A. Bell, Electronic Devices and Circuits, PHI Learning Private Ltd, India, Fourth Edition, 2008.
4. Donald P Leach, Albert Paul Malvino and GoutamSaha, Digital Principles and Applications,6thedition,Tata McGraw Hill Publishing Company Ltd.,New Delhi,2008.
5. Roddy andCollen, Communication Systems, PHI learning, 2001.
6. George Kennedy and Bernard Davis, Electronics communication Systems, Tata McGraw-Hill Ltd, New Delhi, 2007.

Web sites:

1. www.electronics-tutorials.ws
2. www.en.wikipedia.org/wiki/Telecommunication
3. www.nptel.ac.in/courses/IIT-MADRAS/Basic_Electronics.../LECTURE1.pdf

Department : Mechanical Engineering		**Programme:** B.Tech.						
Semester : Two		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
ME101	Engineering Thermodynamics	3	1	-	4	40	60	100
Prerequisite:	-							
Objectives:	• To convey the basics of the thermodynamic principles • To establish the relationship of these principles to thermal system behaviors • To develop methodologies for predicting the system behavior • To establish the importance of laws of thermodynamics applied to energy systems • To explain the role of refrigeration and heat pump as energy systems							

	• To develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world.
Outcome:	• Parallels are drawn between the subject and the student's everyday experience so that this course may be related to what the students already know. • Students are made to understand the principles of thermodynamics and adjudge the viability of operation of any thermal system in real time applications • Students are encouraged to make engineering judgments, to conduct independent exploration of topic of thermodynamics and to communicate the findings in a professional manner. • Students are made to develop natural curiosity to explore the various facets of thermodynamic laws. • While emphasizing basic laws, students are provided with modern tools to use in real time engineering problems.

UNIT – I	**Hours: 09**
Energy conversion and efficiencies of steam and nuclear power plants, internal combustion engines, gas turbine and refrigeration systems- Thermodynamic systems, properties and state - Thermodynamic equilibrium- path and point functions - Temperature - Zeroth law of thermodynamics – Pure substance - P, V and T surface – steam formation-quality-dryness fraction-Thermodynamic property diagrams and charts in common use.	
UNIT – II	**Hours: 09**
The concept of energy, work and heat – reversible work- internal energy -Perfect gas – specific heats – Joules law - enthalpy- Conservation of Energy principle for closed and open systems - First law of thermodynamics – Application of first law to a process (flow and non-flow) – Steady flow energy equation and its engineering application - Calculation of work and heat for different processes.	
UNIT – III	**Hours: 09**
Limitations of first law – Performance of heat engines – Reversible and irreversible processes – Statements of second law of thermodynamics - Carnot principle - Clausius inequality- Entropy – temperature entropy diagram – entropy change for a closed and open systems.	
UNIT –IV	**Hours: 09**
Air standard cycles: The air standard Carnot cycle - Air standard Otto cycle, diesel cycle, dual cycle and their comparison – Gas turbine - Brayton cycles and their efficiencies.	
UNIT – V	**Hours: 09**
Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system – Liquefaction – Solidification (only theory).	

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. Nag, P. K., Engineering Thermodynamics, 5th edition, McGraw - Hill Education India Pvt. Ltd., New Delhi, 2013.
2. Burghardt, M.D. and James A Harbach, Engineering Thermodynamics, 4th edition, Harper Collins college publisher, N.Y.,1993.

Reference Books:

1. Arora, C.P., Thermodynamics, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2003.
2. Wark, K., Thermodynamics, 4th edition,McGraw Hill, N.Y.,1985.
3. Huang, F.F., Engineering Thermodynamics 2nd edition, Macmillan Publishing Co. Ltd., N.Y., 1989.
4. Cengel, Y.A. and Boles, M.A., Thermodynamics - An Engineering Approach, 7th edition, Tata Mc-Graw Hill Education, 2011.

Web sites:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/
2. http://ocw.mit.edu/courses/mechanical-engineering/

Department : Computer Science and Engineering / Information Technology		**Programme:** B.Tech.						
Semester : Two		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CS101	Computer Programming	3	1	-	4	40	60	100
Prerequisite:								
Objectives:	• To introduce the basics of computers and information technology. • To educate problem solving techniques. • To impart programming skills in C language. • To practice structured programming to solve real life problems.							

Outcome:	On successful completion of the course, students will be able to: • Understand the basics of computers and its related components • Have the ability to write a computer program to solve specified problems

UNIT – I	**Hours: 09**

History and Classifications of Computers – Components of a Computer – Working Principle of Computer – Hardware – Software and its Types – Applications of Computers –Network and its Types – Internet and its services – Intranet– Extranet – Generations of Programming Languages – Introduction to Number System – Introduction to MS-Office Package.

UNIT – II	**Hours: 09**

Problem solving techniques – Program development life-cycle – Algorithm – Complexities of Algorithm – Flowchart – Pseudo code.

Introduction to C –C Program Structure – C tokens: Keyword, Identifiers, Constants, Variable, Data types (simple and user-defined) – Operators and its types – Operator Precedence – Expression Evaluation – Type Conversion – Input/output operations.

UNIT – III	**Hours: 09**

Branching Statements – Looping Statements – Arrays – Multidimensional arrays.

Functions: Function Prototype, Passing Arguments to Function – Call by Value and Call by Reference – Nested function call – Library Functions – User-defined Functions – Recursion.

Strings – String I/O functions, String Library functions – Storage classes.

UNIT – IV	**Hours: 09**

Structures – Arrays and Structures – Nested structures – Structure as Argument to functions– Union

Pointers – Declaration, Initialization and Accessing Pointer variable – Pointers and arrays – pointers as argument and return value – Pointers and strings - pointers and structures.

UNIT – V	**Hours: 09**

Introduction to File Concepts in C – File types – I/O operations on files – File modes – Random access to files – Command line arguments.

Dynamic Memory Allocation: MALLOC, CALLOC, FREE, REALLOC

Introduction to preprocessor – Macro substitution directives – File inclusion directives –Compiler Control directives – Miscellaneous directives.

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. J. B. Dixit, Computer Fundamentals and Programming in C, Firewall Media, 2009.
2. Balagurusamy. E, Programming in ANSI C, Tata McGraw Hill, Sixth edition, 2012.

Reference Books:

1. Ashok N Kamthane, Computer Programming, Pearson education, Second Impression, 2008.
2. Venugopal.K and Kavichithra.C, Computer Programming, New Age International Publishers, First Edition, 2007.

Department : Mechanical Engineering			**Programme:** B.Tech.					
Semester : Two			**Category :** EGD					
Course Code	**Course Name**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
ME102	Engineering Graphics	2	-	3	4	50	50	100
Prerequisite:	-							
Objectives:	• To convey the basics of engineering drawing • To explain the importance of an engineering drawing • To teach different methods of making the drawing • To establish the importance of projects and developments made in drawing that are used in real systems							

Outcome:	• From what students have already learnt and know, relation has been brought about how to bring their vision into realities. • Students are made to follow and understand the basic of mechanical drawing • Students are encouraged to make engineering drawing of physical object representing engineering systems. • Students are made to develop natural curiosity to explore the various facets of engineering drawings.
UNIT – 0	**Not for exam**
Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning.	
UNIT – I	**Hours: T-06; P-09**
Projection of Points and Projection of lines	
UNIT – II	**Hours: T-06; P-09**
Projection of Points and Projection of lines	
UNIT – III	**Hours: T-06; P-09**
Projection of solids in complicated positions	
UNIT – IV	**Hours: T-06; P-09**
Sections of solids - Development of Surfaces	
UNIT – V	**Hours: T-06; P-09**
Axonometric Projections: Isometric Projections (simple solids); Perspective Projections (planes and simple solids; Orthographic Projections	

Total contact Hours: 30	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 75**

Text Books:

1. K.R. Gopalakrishna and SudhirGopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.
2. K. Venugopal, Engineering Drawing and Graphics + Auto CAD, 4th edition, New Age International Publication Ltd., 2004.
3. BIS, Engineering Drawing practices for Schools & College, SP 46 : 2003

Reference Books:

1. N.D. Bhatt, Engineering Drawing, 49th edition, Charotar Publishing House, 2006.
2. K.V. Natarajan, A Text Book of Engineering Drawing, Dhanalakshmi Publishers, 2006.
3. David I cook and Robert N McDougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn. 1985.
3. James D Bethune and et. al., Modern Drafting, Prentice Hall Int.,

Web sites:

1. http://www.3ds.com/products/catia/
2. http://en.wikipedia.org/wiki/CATIA

Department : Computer Science and Engineering / Information Technology				**Programme:** B.Tech.				
Semester : Two				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CS102	Computer Programming Laboratory	4	-	-	4	40	60	100
Prerequisite:	-							
Objectives:	• To study and understand the use of OS commands • To get familiarity on MS-Office packages like MS-Word, MS-Excel and MS-PowerPoint • To gain a hands on experience of compilation and execution of 'C' programs							

	• To inculcate logical and practical thinking towards problem solving using C programming.	
Outcome:	On successful completion of the course, students will be able to: • Have the ability to write a computer program to solve specified problems • Problem solving ability will be gained by the students	
Cycle - I	**Fundamentals of Computing** 1. Study of OS commands 2. Use of mail merge in word processor 3. Use of spreadsheet to create Charts (XY, Bar, Pie) with necessary formulae. 4. Use of Power point to prepare a slide show.	**Hours: 09**
Cycle - II	**Programming Using C** 1. Study of Compilation and execution of simple C programs 2. Basic C Programs a. Arithmetic Operations b. Area and Circumference of a circle c. Swapping with and without Temporary Variables 3. Programs using Branching statements a. To check the number as Odd or Even b. Greatest of Three Numbers c. Counting Vowels d. Grading based on Student's Mark 4. Programs using Control Structures a. Computing Factorial of a number b. Fibonacci Series generation c. Prime Number Checking d. Computing Sum of Digit 5. Programs using String Operations a. Palindrome Checking b. Searching and Sorting Names 6. Programs using Arrays a. Sum of 'n' numbers b. Sorting an Array c. Matrix Addition, Subtraction, Multiplication and Transpose 7. Programs using Functions a. Computing nCr b. Factorial using Recursion c. Call by Value and Call by Reference 8. Programs using Structure a. Student Information System b. Employee Pay Slip Generation c. Electricity Bill Generation 9. Programs using Pointers a. Pointer and Array b. Pointer to function c. Pointer to Structure 10. Programs using File Operation a. Counting No. of Lines, Characters and Black Spaces b. Content copy from one file to another c. Reading and Writing Data in File	**Hours: 36**
Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department : Electronics and Communication Engineering / Electrical and Electronics Engineering					**Programme:** B.Tech.			
Semester : Two					**Category :** LB			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
BE103	Basic Electrical and Electronics Engineering Laboratory	-	-	3	2	60	40	100
Prerequisite:	-							
Objectives:	• To understand the basic electrical tools and their applications. • To get trained in using different types of wiring. • To find faults in electrical lamp and ceiling fan.							

	• To understand and apply Kirchhoff's laws to analyze electrical circuits. • To study the operation of CRO and principle of fiber optic communication. • To design adder and subtractors. • To understand the frequency response of RC coupled amplifier.
Outcome:	• The students get exposure on the basic electrical tools, applications and precautions. • The students are trained for using different types of wiring for various purposes in domestic and industries. • The students are taught to find faults in electrical lamp and ceiling fan. • Will be able to learn and use equipments like Signal Generator, Power Supply and CRO. • To apply Kirchhoff's law for simplification of circuits. • To design combinational circuits. • To obtain the frequency response of Amplifiers.
List of Experiments	**Electrical Lab** 1. Electrical Safety, Precautions, study of tools and accessories. 2. Practices of different joints. 3. Wiring and testing of series and parallel lamp circuits. 4. Staircase wiring. 5. Doctor's room wiring. 6. Bed room wiring. 7. Go down wiring. 8. Wiring and testing a ceiling fan and fluorescent lamp circuit. 9. Study of different types of fuses and A.C. and D.C. meters.
List of Experiments	**Electronics and Communication Lab** 1. Study of Kirchoff's Laws. 2. Study of Fiber Optic Communication. 3. Study of Cathode Ray Oscilloscope. 4. Zener Diode as Voltage Regulator. 5. Design of Adder and Subtractor Circuits. 6. Frequency Response of RC Coupled Amplifier.

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department : Mathematics					**Programme :** B.Tech.			
Semester : Three					**Category** : TB			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
MA103	Mathematics - III	3	1	-	4	40	60	100
Prerequisite								
Objectives	• To introduce the ideas of Laplace and Fourier Transforms • To familiarize students with of Complex Analysis • To introduce Fourier series.							
Outcome	• Understands Transform Calculus • Understand Complex Analysis							

	• Able to apply Fourier series	
UNIT – I	**Laplace Transform**	**Hours: 09**
Definition, properties. Transform of derivatives and integrals. Transform of unit step function, Transform of periodic functions. Initial and final value theorems, convolution theorem, Application to differential equations and integral equations. Evaluation of integral by Laplace transforms.		
UNIT – II	**Complex Variable- Analytic Functions**	**Hours: 09**
Analytic functions – Necessary conditions – Cauchy-Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions. Conformal mapping – Simple and standard transformations like w = z+c, cz, z^2 , e^z, sinz 1/z Bilinear transformation. (excluding Schwarz- Christoffel transformation)		
UNIT – III	**Complex Integration**	**Hours: 09**
Complex integration, Cauchy's Integral theorem, Cauchy's integral formula and problems, Taylor's and Laurent's theorem (without proof) Classification of singularities.. Residues and evaluation of residues – Cauchy's Residue theorem – Contour integration Application of residue theorem to real integrals – unit circle and semicircular contour (excluding poles on boundaries).		
UNIT – IV	**Fourier Series**	**Hours: 09**
Dirichlet's conditions – General Fourier series Expansion of periodic function into Fourier series – Fourier series for odd and even functions –Half-range Fourier cosine and sine series – Change of interval – Related problems. Root Mean Square Value – Parseval's theorem on Fourier Coefficients. Complex form of Fourier series – Harmonic Analysis.		
UNIT – V	**Fourier Transform**	**Hours: 09**
Fourier integral theorem (statement only), Fourier transform and its inverse, properties. Fourier sine and cosine transforms, their properties, convolution and Parseval's identity.		
Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**	**Total Hours: 60**
Text Books:		
1. M.K.Venkataraman, Engineering Mathematics, Vol. II & III, National Publishing Co., Madras, 2007. 2. Veerarajan T., Engineering Mathematics for first year, Tata-McGraw Hill,2014.		
Reference Books:		
1. Grewal B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41st Edition, 2011. 2. RamanaB.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 3. Bali N. and Goyal M., Advanced Engineering Mathematics, Laxmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010.		

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Three		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI101	Circuit Theory	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To analyze electrical circuits using KCL and KVL • To learn network theorems and apply them for circuit analysis • To study resonance and coupled circuits • To study two port parameters							

	• To study transient analysis of RC,RL,RLC circuits
Outcome	• Analyse DC And AC circuits • Design resonant and tuned circuits • Find the transient response of RC, RL and RLC circuits • Find the two port parameters of the circuit.

UNIT – I	**BASICS OF CIRCUIT ANALYSIS**	**Hours: 12**
Voltage– Current relationship for passive elements-Review of Kirchhoff's laws- Network reduction techniques, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation-power factor, Real and Reactive powers, Complex and Polar forms of representation, Complex power, Review of three phase systems-Two watt meter method of power measurement.		
UNIT – II	**NETWORK THEOREMS FOR DC AND AC CIRCUITS**	**Hours: 12**
Review of loop and nodal methods of analysis, star-to-delta or delta-to-star transformation, Source transformation, Superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem, compensation theorem, Maximum power transfer theorem, Millman's theorem and Tellegen's theorem applied to dc and ac circuits.		
UNIT – III	**RESONANCE AND COUPLED CIRCUITS**	**Hours: 12**
Resonance – Series and parallel resonance circuits- Concept of band width and Q factor. Coupled Circuits: Faraday's laws of electromagnetic induction – Concept of self and mutual inductance – dot convention – coefficient of coupling.		
UNIT – IV	**TRANSIENT ANALYSIS**	**Hours: 12**
Initial conditions in elements, Transient response of R-L, R-C, R-L-C circuits (Series combinations only) for step and sinusoidal excitations -Solution using Laplace transform .		
UNIT – V	**NETWORK FUNCTIONS AND PARAMETERS**	**Hours: 12**
Network functions: The concept of complex frequency- concept of transformed network- driving point impedance and admittance-transfer function-poles and zeros. RC filters-lowpass, highpass, band pass and band reject filters-frequency response- Z, Y, ABCD, hybrid parameters and their relations– 2-port network parameters using transformed variables.		

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes:**	**Total Hours: 60**

Text Books:

1. P. Ramesh Babu, Circuit theory, Second Edition, Scitech Publications Pvt. Ltd, 2014.
2. M.E.Van Valkenburg, Network Analysis, Third Edition, Prentice-Hall, 1980

Reference Books:

1. William Hayt and Jack E. Kimmerly, Engineering circuit analysis, McGraw Hill Company, 8th edition, 2013.
2. N.C. Jagan & C.Lakshminarayana, Network Theory,B.S Publications, 2006.
3. Kuriakose, Circuit Theory, PHI Learning, 2005

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Three				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI102	Electronic Circuits	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• Understand the working of diodes, transistors. • Understand the application of different electronic devices and electronic circuits.							
Outcome	• This course gives an overview of various semiconductor devices. • At the end of this course, the students will be able to analyze and design amplifier circuits, oscillators and filter circuits employing BJT, FET devices.							

	• Understand the operating principles of major electronic devices, circuit models and connection to the physical operation of device • Be able to apply this knowledge to the analysis and design of basic circuits. • Have the ability to analyze and design discrete or integrated electronic circuits

UNIT – I	**Semiconductor Diodes**	**Hours: 12**

The PN Diode- VI Characteristics of a Diode- Diode Models- Testing a Diode. Applications of Diodes: Half-wave and Full-wave rectifiers-Power Supply Filters and Regulators-Clipping and Clamping Circuits-Voltage Multipliers. Zener Diode- Applications of Zener Diode. Special Diodes : Tunnel Diode-PIN Diode- Varactor Diode-Schottky Diode-Gunn Diode- Light Emitting Diode - Photo Diode.

UNIT – II	**Bipolar Junction Transistors (BJT)**	**Hours: 12**

BJT Operation-Transistor Characteristics- Applications of Transistor as a switch, as an amplifier. The DC Load Line and operating point, Types of BJT Biasing, analysis and Design, Biasing stability, Temperature compensation, Thermal runway. Basic Amplifier Operation, Amplifier AC and DC equivalent circuits, The common Emitter Amplifier, The Common Collector Amplifier, The Common Base amplifier, Multistage Amplifier.

UNIT – III	**Transistor Amplifiers and Frequency Response**	**Hours: 12**

Small signal transistor amplifier circuits: r-parameter and h-parameter representation of a transistor, Analysis of single stage transistor amplifier using r parameter and h-parameters: voltage gain, current gain, Input impedance and Output impedance. BJT Amplifier Frequency Response: The Decibel, Low Frequency Amplifier Response, High Frequency Amplifier Response, Total frequency response of Amplifier, Frequency response of multistage amplifiers.

UNIT – IV	**Feedback and Power Amplifiers**	**Hours: 12**

Concept of feedback, Classification of Negative feedback amplifiers - the oscillator- Barkhausen criteria for oscillations -RC phase shift oscillator, Wien bridge oscillator, Colpitt's oscillator, Hartley oscillator, crystal oscillator. Multivibrators – Astable, Monostable , Bistable modes of operation, Schmitt trigger.

Class A power amplifier, maximum value of efficiency of Class A amplifier, transformer coupled amplifier, Class B and Class AB Push-Pull amplifiers, complimentary symmetry circuits (transformerless class B power amplifier), phase inverters, class C operation.

UNIT – V	**FET and Power Semiconductor Devices**	**Hours: 12**

The JFET- Characteristics and Parameters - JFET Biasing-JFET amplifiers - common source, common Drain, common Gate amplifiers - The MOSFET-Enhancement and Depletion mode MOSFETs - MOSFET characteristics and Parameters - MOSFET biasing and applications. , Basic Four Layer Device - Silicon Controlled Rectifier (SCR)-Applications of SCR- The DIAC and TRIAC, Uni-junction Transistor(UJT).

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes:**	**Total Hours: 60**

Text Books:

1. Floyd, Electronic Devices, Pearson Education, 7th Edition , 2008
2. R.L. Boylestad and Louis Nashelsky , Electronic Devices and Circuits ,Pearson/Prentice Hall, 9th Edition,2006.

Reference Books:

1. J.Millman, C.C.Halkias, and Satyabratha Jit, Electronic Devices and Circuits, Tata McGraw Hill, 2nd Ed., 2007.
2. P. Ramesh Babu, Electronic Devices and Circuits, Scitech Publications Pvt., Ltd., 2008.
3. Nagrath, Electronic Devices and Circuits, PHI Learning, 2006.

Department: Electrical and Electronics Engineering		**Programme :** B.Tech. (EI)						
Semester : Three		**Category :** TA						
Subject Code	**Subject Name**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EE134	Electrical Machines	4	0	-	4	40	60	100

Prerequisite	-
Objectives	• To expose the students to the concepts of various types of electrical machines and applications of electrical machines.
Outcome	The student will know • Constructional details, principle of operation, Performance, starters and speed control of DC Machines

	• Constructional details, principle of operation of Transformers. Constructional details, principle of operation of AC Machines • Constructional details, principle of operation of Special Machines and Utilization of electrical Energy.	
UNIT – I	**Magnetic Circuits**	**Hours: 12**
Magnetomotive force, magnetic field strength-permeability of free space, relative permeability-reluctance-comparison of electric and magnetic circuits-composite magnetic circuit-magnetic leakage and fringing Kirchhoff's Laws for the magnetic circuits-magnetization curve-hysterisis loop-current-ring theory of magnetism- hysterisis loop-minimum volume of a permanent magnet-load line of a permanent magnet-barium ferrite magnets-magnetic field of a long solenoid-magnetic energy in a non-magnetic medium-magnetic pull. Inductance of a coil - determining factors. Magnetic relays and contactors. Earth leakage circuit breakers.		
UNIT – II	**DC Machines**	**Hours: 12**
Construction details of machine-operation of DC generators-EMF equation-characteristics of different types of generators-operation of DC motors-torque equation-characteristics of different types of DC motors. Starters-braking and speed control of DC motors. Applications & selection of DC motors and generators		
UNIT – III	**Transformers**	**Hours: 12**
Principle-types, general constructional features of single phase and three phase transformers-phasor diagram and equivalent circuit-regulation and efficiency-open circuit and short circuit tests-autotransformers. Applications & selection of three phase, single phase and autotransformers.		
UNIT – IV	**Induction Machines**	**Hours: 12**
Types- constructional features- slip- torque characteristics-starters-braking and speed control methods-principle of operation and types of single phase induction motors. Application & selection of single phase and three phase induction motors, AC servomotor		
UNIT – V	**Synchronous Machines**	**Hours: 12**
Principle-types and general constructional features-synchronous generators-characteristics-emf equation-armature reaction-regulation-phasor diagram of synchronous motor –V curve – starting methods. Applications & selection of synchronous generators and motors.		
Total contact Hours: 60	**Total Tutorials:**	**Total Practical Classes:** **Total Hours: 60**
Text Books:		
1. D.P.Kothari and I.J.Nagrath, Electric Machines, McGraw Hill Education (India) Private Limited, 2006 . 2. B.L.. Thereja and Thereja, A text book of Electrical Technology,Vol-I, S.Chand &Co.Ltd., 23rd Revised Edition, 2006 .		
Reference Books:		
1. Stephen.J.Chapman, Electrical machinery Fundamentals, McGraw-Hill Higher Education, 2004, 4th Edition. 2. Bandhopadyay, Electrical Machines, PHI, 2005		

Department: Computer Science and Engineering		**Programme :** B.Tech. (EI)						
Semester : Three		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CS144	Data Structures and Object oriented Programming	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To acquaint students with data structures used when programming for the storage and manipulation of data. • To emphasize the concept of data abstraction and the problem of building implementations of abstract data types.							

	• To understand the concepts of object oriented programming and to expertise the skills through C++ language
Outcome	• Select of relevant data structures and combinations of relevant data structures for the given problems in terms of memory and run time efficiency. • Apply data abstraction in solving programming problems. • An ability to conceptualize the problem in terms of object oriented features • An ability to use the OO programming techniques (C++) in developing applications. • An ability to design and develop a complete object oriented applications

UNIT – I	**Searching and Sorting**	**Hours: 12**

Introduction to Algorithm – Programming principles - Analyzing programs. Arrays: One dimensional - multidimensional. Pointers - Searching: Linear search, Binary Search. Sorting techniques: Internal sorting types - Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Merge Sort and Radix Sort.

UNIT – II	**Stack, Queue and Linked List**	**Hours: 12**

Stacks: Definition – operations - applications of stack. Queues: Definition - operations - Priority queues - De queues – Applications of queue. Linked List: Singly Linked List, Doubly Linked List, Circular Linked List, linked stacks, Linked queues, Applications of Linked List.

UNIT – III	**Dynamic Storage Management**	**Hours: 12**

Trees: Binary tree, Terminology, Representation, Traversals, Applications

Graph: Terminology, Representation, Traversals – Applications - spanning trees, shortest path Introduction to Hash tables.

UNIT – IV	**Principles of Object Oriented Programming**	**Hours: 12**

Principles of Object Oriented Programming - Beginning With C++ - Tokens-Expressions-control Structures – Functions in C++, classes and objects, constructors and destructors ,operators overloading and type conversions .

UNIT – V	**Advanced Object Oriented Programming**	**Hours: 12**

Inheritance: Extending classes, Pointers, Virtual functions and polymorphism, File Handling Operations

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. Ellis Horowitz and SartajSahni, "Fundamentals of Da ta Structures", Galgotia Book Source, Pvt. Ltd., 2004.
2. D. Samanta, Classic Data Structures, Second Edition, PHI Pvt. Ltd., India 2012.
3. E. Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education (India)Private Limited, 6th Edition 2013..

Reference Books:

1. Robert Kruse, C.L. Tondo and Bruce Leung, Data Structures and Program Design in C, Prentice-Hall of India, Pvt. Ltd., Second edition, 2007.
2. Seymour, Data Structures, The McGraw-Hill, 2007.
3. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002.
4. Bjarne Stroustrup, The C++ Programming Language, Addison Wesley, 2000
5. Robert Lafore, Object oriented programming in C++, Galgotia Publication.

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech. (EI)			
Semester : Three				**Category :** LB			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI103	Electronic Circuits laboratory	-	-	3	2	60	40	100

Prerequisite	-
Objectives	• To study characteristics of electron devices like diode, transistor and FET • To study characteristics of Thyristors like SCR,DIAC and TRIAC • To design and test the performance of amplifiers, filters and wave shaping circuits
Outcome	• The students will be able to design simple electronic circuits like amplifiers, filters and wave shaping circuits

	(**LIST OF EXPERIMENTS:** **(Any 10 experiments)** 1. PN Junction diode and zener diode characteristics 2. FET characteristics 3. SCR, DIAC and TRIAC characteristics 4. Measurement of h-parameters of transistors in CB, CE, CC configurations 5. Rectifier with and without filters (Full wave and Half wave) 6. CE Amplifier and CC amplifiers 7. Single stage R-C coupled Amplifier 8. FET amplifier(Common Source) 9. Clippers and clampers 10. RC wave shaping circuits 11. RC oscillators 12. Power Amplifiers 13. Astable multivibrator 14. Monostable multivibrator 15. LC Oscillators	

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department : Computer Science and Engineering			**Programme:** B.Tech. (EI)					
Semester : Three			**Category :** LB					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
CS145	Data Structures and Object Oriented Programming Laboratory	-	-	3	2	60	40	100
Prerequisite	-							
Objectives	• To learn programming in c and c++							
Outcome	• The student will be able to write simple programs in c and c++							
	Data Structures and Object Oriented Programming Lab (The following experiments (1-8) are to be implemented only in C Language)							

	1. Searching Techniques 2. Sorting Techniques 3. Implied Linked List and doubly linked and its applications 4. Stack and its applications 5. Binary tree traversal 6. Graph traversal 7. Spanning Tree 8. Shortest path algorithms (The following experiments (9-12) are to be implemented only in C++) 9. Programs to implement classes and objects with constructors and destructors 10. Programs to implement different types of inheritances like multiple, Multilevel and hybrid. 11. Programs to implement virtual functions to demonstrate the use of run time polymorphism 12. Programs to implement Queue and its applications	

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department : Electrical and Electronics Engineering				**Programme:** B.Tech. (EI)			
Semester : Three				**Category :** LB			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EE135	Electrical Machines Laboratory	-	-	3	2	60	40	100
Prerequisite	-							
Objectives	• To study characteristics of DC motor, DC generator and transformer • To study characteristics of Alternator and induction motor • To study the measurement of power using two watt meter method							
Outcome	• test the characteristics of DC motors, DC Generators and Transformers • test the characteristics of alternator and induction motor							

	• measure the power using two watt meter method
Cycle - I	1. Power measurement using Two wattmeter method for the following: a) load with UPF b) Load with Lagging PF c) Load with Leading PF 2. OCC of Shunt generator. 3. Predetermination of Transformer parameters. 4. Swinburn's Test. 5. Load test on single phase Induction motor. 6. Blocked rotor test on Induction Motor. 7. Load test on single phase Alternator. 8. Load test on three phase transformer. 9. Load test on shunt motor. Variation of starting torque with rotor resistance of a slip ring induction motor.

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Mathematics				**Programme:** B.Tech. (EI)				
Semester : Four				**Category:** TB				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
MA106	Partial Differential Equations and Numerical Methods	3	1	0	4	40	60	100
Prerequisite	Higher secondary Mathematics							
Objective	• To introduce the ideas of Partial Differential Equations • To familiarize students Boundary value problems related to PDE • To solve problems in ordinary and partial differential equations by some basic numerical							

	methods
Outcome	• Understands how to solve first order Partial Differential Equations • Gain knowledge on solving Boundary Value Problems • Will be able to solve ordinary and partial differential equations numerically

UNIT – I	**Solution of Partial Differential Equations**	**Hours: 12**

Formation of PDE by elimination of arbitrary constants and arbitrary functions –General, Singular, Particular and complete integrals – Lagrange's linear first order equation – Higher order differential equations with constant coefficients.

UNIT – II	**Solution of Boundary Value Problems I**	**Hours: 12**

Solution of partial differential equation by the method of separation of variables – Boundary value problems – Fourier series solutions – Transverse vibration of an elastic string.

UNIT – III	**Solution of Boundary Value Problems II**	**Hours: 12**

Fourier series solution for one dimensional heat flow equation – Fourier series solution for two dimensional heat flow equations under steady state conditions (Cartesian and polar forms).

UNIT – VI	**Numerical solution of Ordinary Differential Equation**	**Hours: 12**

Single step methods: Taylor series method, Picard's method, Euler, Modified Euler and Improved Euler methods, Runge-Kutta method of fourth order only. Multistep methods: Milne and Adams - Bashforth methods.

UNIT – V	**Numerical solution of Partial Differential Equations**	**Hours: 12**

Laplace and Poison equations: Liebmann's iterative method. Diffusion equation: Explicit and Crank-Nicholson implicit difference schemes. Wave equation: Explicit difference method.

Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes:**	**Total Hours:60**

Text Books:

1. Veerarajan T., Engineering Mathematics for second year, Tata-McGraw Hill, 2014.
2. M.K.Venkataraman, Engineering Mathematics, Vol. II & III, National Publishing Co., Madras, 2007.
3. P. Kandasamy, K. Gunavathy and K. Thilagavathy, Numerical Methods, S. Chand &Company Ltd, New Delhi, 2014

Reference Books:

1. Bali N. P and Manish Goyal, Text book of Engineering Mathematics, 3rd Edition, Laxmi Publications (p) Ltd., 2012.
2. B.S. Grewal, Numerical methods in Engineering & Science, Khanna Publishers, New Delhi, 2013
3. M.K. Venkataraman, Numerical methods in Science and Engineering, National Publishing Company, Madras, 2013

Web sites:

1. www.math.niu.edu
2. nm.mathforcollege.com

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Four		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI104	Linear Integrated Circuits	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To introduce the basic building blocks of linear integrated circuits. • To teach the linear and non-linear applications of operational amplifiers.							

	• To introduce the theory and applications of analog multipliers and PLL. • To teach the theory of ADC and DAC • To introduce the concepts of waveform generation and introduce some special function ICs
Outcome	• Design simple circuits like amplifiers using Opamps. • Design waveform generating circuits • Design simple filters circuits for particular application. • Gain knowledge in designing stable voltage regulators.

UNIT – I	**Integrated Circuits and Operational Amplifier**	**Hours: 12**

INTEGRATED CIRCUITS: Classification, chip size and circuit complexity, Fundamentals of Monolithic IC technology, basic planar processes, Fabrication of a typical circuit, Active and passive components of ICs, fabrication of FET, Thin and thick film technology.

OPERATIONAL AMPLIFIER: Basic information of Op-amp, ideal and practical Op-amp, Op-amp characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential mode.

UNIT – II	**OP-Amp Applications**	**Hours: 12**

Basic application of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Precision rectifiers, log and antilog amplifiers, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators, Triangular wave generator.

UNIT – III	**Active Filters, Oscillators and Regulators**	**Hours: 12**

Introduction-Low pass and High pass filters- Design of first and second order Butterworth lowpass and high pass filters Band pass, Band reject and all pass filters- Oscillator types and principle of operation – RC phase shift and Wien bridge oscillators - triangular, saw-tooth, square wave generators and VCO- Introduction to voltage regulators, features of 723, Three Terminal IC regulators – Fixed and variable - DC to DC Converter- Switching Regulators-SMPS.

UNIT – IV	**Timers & Phase Locked Loops**	**Hours: 12**

Introduction to 555 timer, functional diagram, monostable, astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565-PLL applications, Analog and digital phase detectors. Programmable timers - XR2240

UNIT – V	**D-A AND A- D Converters**	**Hours: 12**

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC, dual slope ADC and Sigma delta ADC. DAC and ADC specifications. DAC 0800 and ADC 0804 pin diagram and applications.

Total teaching Hours: 45	**Total Tutorials: -15**	**Total Practical Classes:**	**Total Hours: 60**

Text Books:

1. D. Roy Chowdhury, Linear Integrated Circuits, New Age International (p) Ltd, 2011
2. Ramakanth A. Gayakwad, Op-Amps & Linear ICs –PH I, 4th Edition 2004.

Reference Books:

1. R.F. Coughlin & Fredrick F. Driscoll. Operational Amplifiers & Linear Integrated Circuits, PHI, 6th Edition, 2003
2. B.Guptha, Linear Integrated Circuits, S.K.Kataria & sons, 2013

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Four		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI105	Digital Logic Theory and Design	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions							

	• To introduce the methods for simplifying Boolean expressions • To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits • To introduce the concept of memories and programmable logic devices. • To illustrate the concept of synchronous and asynchronous sequential circuits.	
Outcome	• The students will be able to understand and design of digital circuit and its principle • The students will be able to explain the working of various sequential circuits • Understand the digital Logic families and relevant ICs and its usages • The student will understand algorthmic state machines and threshold logic and its usages.	
UNIT – I	**Minimization Techniques and Logic Gates**	**Hours: 12**
Number System and Boolean algebra: Review of Number systems and codes – Error detecting codes –Hamming Code- Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality -Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) –Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization. **Logic Gates:** AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations–Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics –Tristate gates.		
UNIT – II	**Combinational Circuits**	**Hours: 12**
Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor - Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder –Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators - code converters - Magnitude Comparator.		
UNIT – III	**Sequential Circuits**	**Hours: 12**
Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters –Design of Synchronous counters: state diagram- State table – State minimization –State assignment -Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers -Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.		
UNIT – IV	**Synchronous and Asynchronous Sequential Circuits**	**Hours: 12**
Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits Asynchronous Sequential Circuits**:** Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines– Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits.		
UNIT – V	**Memory Devices**	**Hours: 12**
Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM –RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell– Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) –Complex Programmable Logic Device (CPLD)- Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL.		
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes:**	**Total Hours: 45**

Text Books:

1. R.Ananda Natarajan , Digital Design, 1st Edition, PHI Learning Pvt. Limited, New Delhi 2015
2. M. Morris Mano, M.Michael Ciletti , Digital Design, 5th Edition, Pearson Education(Singapore) Pvt. Ltd., New Delhi, 2013.

Reference Books:

1. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006
2. John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002.
3. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.
4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6th Edition, TMH, 2003.
5. William H. Gothmann, Digital Electronics, 2nd Edition, PHI, 1982.
6. Thomas L. Floyd, Digital Fundamentals, 8th Edition, Pearson Education Inc, New Delhi, 2003
7. Donald D.Givone, Digital Principles and Design, TMH, 2003.

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Four		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI106	Sensors and Transducers	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To get the basic idea of measurements and the errors associated with measurement. • To differentiate between the types of transducers available.							

	• To gain information about the function of various measuring instruments and using them	
Outcome	• To get the basic idea of measurements and the errors associated with measurement. • To differentiate between the types of transducers available • To gain information about the function of various measuring instruments and using them	
UNIT – I	**Introduction**	**Hours: 12**
Generalized scheme of a measurement system – basic methods of measurements- Errors in measurements –types of errors-Statistical analysis of measurement data, mean, standard deviation – probability of errors – probable error, limiting errors. Reliability of measurement systems – failure rate – reliability improvement, Availability, redundancy. Different types of noises in measurements and its Suppression methods.		
UNIT – II	**Static and Dynamic Characteristics**	**Hours: 12**
Static characteristics of instruments –generalized mathematical model of measurement systems – dynamic characteristics – Modelling of Transducers – operational transfer function – zero, first and second order instruments – impulse, step, ramp and frequency response of the above instruments.		
UNIT – III	**Active and Passive Transducers**	**Hours: 12**
Resistance potentiometer – loading effect – strain gauges – gauge factor – types of strain gauges – rosettes – semiconductor strain gauges – installation of strain gages – strain measuring circuits - quarter bridge, half bride and full bridge circuits– Resistance thermometers, materials, construction, characteristics – Thermistors and photo resistors (LDR) – hot wire anemometer – constant current and constant temperature operation – Humidity sensors. Signal conditioning circuits for RTD, Thermistor and Thermocouple – Cold junction compensation. Linearization techniques for Thermistors.		
UNIT – IV	**Inductive, Capacitive and Piezoelelctric Transducers**	**Hours: 12**
Inductive transducers – variable reluctance transducers – Inductive proximity pick up and Capacitive proximity pickup– Synchros operation and applications – LVDT construction - signal conditioning circuit, Phase sensitive demodulator circuit – applications – RVDT. Capacitive transducers – variable area type – variable air gap type – variable permittivity type – signal conditioning circuit – Blumlein bridge – Capacitor microphone – frequency response. Piezoelectric transducers – piezoelectric crystals – charge amplifier.		
UNIT – V	**MISCELLANEOUS AND SMART TRANSDUCERS**	**Hours: 12**
Eddy current transducers. Hall effect transducers – Photo electric detector, different types and characteristics – Magneto-strictive Transducer, Optical sensors, IC sensor for temperature – signal conditioning circuits, Introduction to Fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors. Intelligent and smart transducers- principle- design approach, interface design, configuration support, communication in smart transducer networks. SQUID sensors, Film sensors, MEMS – Nano sensors.		
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**
Text Books:		
1. S. Renganathan, Transducers Engineering, Pearson Education, Third Edition, 2008. 2. John. P. Bentley, Principles of Measurement systems, Longman Publishers, 1983.		
Reference Books:		
1. J.W. Dally.W.F. Riley and K.G. Mc Connell, Instrumentation for Engineering measurements, John Wiley & sons Inc., 1993. 2. H.K.P.Nubert, Instruments Transducers: An Introduction to their performance and Design, 1st Edition, 2003. 3. C.D. Johnson, Process Control Instrumentation Technology, PHI, 7th Edition. 4. R.K.Jain, Mechanical measurements, Khanna Publishers, 2002.		

Department : Electronics and Instrumentation Engineering			**Programme :** B.Tech.(EI)						
Semester : Four			**Category :** LB						
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**		
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI107	Linear and Digital Integrated Circuits Laboratory		-	-	3	2	60	40	100
Prerequisite									
Objectives	• To design simple circuits that perform arithmetic operations.								

	• To design active filters using 741 IC. • To design multivibrator circuits and voltage regulators, • To understand the working of DAC, Multiplexers, decoders and Counters
Outcome	• The students get exposure to the basic IC applications • Will be able design signal conditioning circuits required for Instrumentation and control Applications. • Will learn the design of counters, multiplexers and decoders
List of Experiments	(Any 10 Experiments) 1. OPAMP applications, Inverting and Non-inverting Amplifiers, Summer, Differential amplifier, Differentiator and Integrator 2. First order active filters (LPF, HPF and BPF). 3. Astable and Monostable Multivibrators, Schmitt trigger using 741 IC. 4. Comparator, Zero crossing detector and Window detector 5. 555 timer Applications. 6. Voltage Regulator using IC 723, Three Terminal Voltage Regulators – 7805, 7809, 7912. 7. 4 bit DAC using OP AMP. 8. IC 565 PLL Applications. 9. D Flip-Flop 7474 and shift registers-7495. 10. Decade counter-7490. 11. 3-8 Decoder -74138. 12. 4 bit Comparator-7485. 13. 8 x 1 Multiplexer -74151 and 2x4 Demultiplexer-74155 14. Decoder drives for LED. 15. ADC 0809

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department : Electronics and instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Four				**Category :** LB				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI108	Sensors and Transducers Laboratory	-	-	3	2	60	40	100
Prerequisite								
Objectives	• To study the characteristics of different transducers • To measure torque, strain and load using strain gauge							

	• To know the applications of hall effect, optical, , magnetic and electric pickup transducers • To model RTD and thermocouple
Outcome	• Learn the characteristics, working and applications of various transducers used in Instrumentation area.
List of Experiments	(Any 10 Experiments) 1. Characteristic of Temperature transducers (LDR, thermistor and thermocouple). 2. Measurement of Displacement using capacitive transducer, LVDT, inductive transducer and potentiometric transducer. 3. Measurement of strain, Load and Level using strain gauges 4. Measurement of torque and Pressure using strain gauges 5. Measurement of Voltage, current and power using Hall Effect transducer. 6. Characteristics of Optical Transducers (LDR, Phototransistor, Photovoltaic and photoconductive cells) 7. Measurement of speed using Magnetic and photo electric pickup transducers. 8. Ramp response characteristic of filled in system thermometer. 9. Online Modeling of RTD and thermocouple using Data loggers. 10. Characteristics of P/I and I/P converters. 11. Measurement of Pressure and Temperature using ICs (LM 35,LM 335 and AD 590) 12. Measurement of Position using synchro Transmitter and receiver 13. Measurement of pH using single glass electrode. 14. Measurement of Flow, Level and Temperature.

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Electronics and instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Four		**Category :** LB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI109	Simulation Laboratory	-	-	3	2	60	40	100
Prerequisite								
Objective	To design and simulate electrical and electronic circuits using MATLAB, PROTEUS							
Outcome	The student will be able to design and simulate simple electrical and electronic circuits							

List of Experiments	1. Analysis of Transistor biasing circuits (Fixed, Emitter and Collector base bias). 2. Analysis of Transistor as an amplifier and switch. 3. Design of H-bridge circuit using transistor 4. Design of filters and resonance circuits. 5. Design and Analysis of Feedback Amplifiers and Oscillators. 6. Analysis of FET biasing and Amplifier circuits. 7. Analysis of cascade amplifiers. 8. Transient Analysis 9. Fourier Analysis of Electric circuits 10. Frequency response of RL, RC and RL circuits 11. Determining Opamp Characteristics 12. Opamp applications 13. Realization of flip-flops, half adder and full adder 14. Realization of counter circuits, multiplexer, demultiplexer and decoder 15. Multivibrators using 555 timer 16. Design of power circuits 17. PCB Designing

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Electronics and Instrumentation Engineering					**Programme :** B.Tech. (EI)			
Semester : Five					**Category :** TA			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI110	Control Systems Engineering	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To understand the methods of representation of systems and their transfer function models.							

	• To provide adequate knowledge in time response of systems and steady state error analysis. • To give basic knowledge in obtaining the open loop and closed–loop frequency responses of systems. • To understand the concept of stability of control system and methods of stability analysis. • To study the three ways of designing compensators for a control system.
Outcome	• Perform time domain and frequency domain analysis of control systems required for stability analysis. • Design the compensation technique that can be used to stabilize control systems.

UNIT – I	**Introduction to Systems**	**Hours: 12**
Basic elements in control systems – Open and Closed loop systems – Feedback characteristics –Effects of feedback – Mathematical modeling of physical systems:-Mechanical, Thermal, Hydraulic and Pneumatic systems - Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graph – Control system components – Computer simulation (For assignments only).		
UNIT – II	**Time Response Analysis**	**Hours: 12**
Time response – Types of test inputs - I and II order system responses – Error coefficients – Generalized error series - Steady state error - Time domain specifications - PID and ON/OFF controllers - Performance criteria - Selection of controller modes - Computer simulation (For assignments only).		
UNIT – III	**Frequency Response Analysis**	**Hours: 12**
Frequency response - Frequency domain specifications - Bode plot- Polar plot -Determination of phase margin and gain margin - Constant M and N circles – Nichols chart - Determination of closed loop response from open loop response – Computer simulation (For assignments only).		
UNIT – IV	**Stability of Control System**	**Hours: 12**
Concepts of stability – Location of roots in s-plane for stability – Routh Hurwitz criterion – Root locus techniques – Construction – Nyquist stability criterion -Computer simulation(For assignments only). Lag, Lead, and Lag-Lead networks – Compensator design for desired response using Root locus and Bode diagrams.		
UNIT – V	**State-Variable Analysis**	**Hours: 12**
Introduction of state, state variables and state model, derivation of state models from block diagrams, Relationship between state equations and transfer functions- Characteristic equation, eigenvalues, eigenvectors, canonical forms Diagonalization- solving the time invariant state equations- State Transition Matrix. Controllability and observability. Computer simulation (For assignments only).		

Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. R.Anandanatarajan, P.Ramesh Babu, Control Systems Engineering, Scitech Publications, India, Fifth Edition, 2014.
2. I.J.Nagrath, M.Gopal, Control System Engineering, New-age International(P), 4th Edition Ltd., New Delhi, 2009.

Reference Books:

1. M.Gopal, Control Systems, Principles and Design, Tata McGraw-Hill Pub. Co., 2nd Edition, New Delhi, 2006.
2. K.Ogata, Modern Control Engineering, PHI., 5th Edition, New Delhi, 2010.
3. B.C.Kuo, Automatic Control Systems, PHI., New Delhi,2003.

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Five				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI111	Electrical and Electronic Instruments	4	0	-	4	40	60	100
Prerequisite	-							

Objectives	• To study about electrical instruments and measurements • To study about resistance and impedance measuring methods. • To study about signal generators and analyzers • To study about cathode ray oscilloscope, recorders and displays
Outcome	• The students will be able to understand the working principles of different electrical instruments. • The students will understand the need for resistance, capacitance and inductance measurement made by various techniques. • The students will be able to visualize the working of different signal generators, analyzer and recorders.

UNIT – I	**Measurement of Voltage, Current, Power And Energy**	**Hours: 12**

Galvanometers – Ballistic, D'Arsonval galvanometer – Theory, calibration, application –Principle, construction, operation and comparison of moving coil, moving iron meters,dynamometer, induction type & thermal type meter, rectifier type – Extension of range and calibration of voltmeter and ammeter– Errors and compensation Electrodynamometer type wattmeter – Theory & its errors – Methods of correction – LPF wattmeter – Phantom loading – Induction type KWH meter – Calibration of wattmeter, energy meter.

UNIT – II	**Potentiometers, Instrument Transformers & Magnetic Measurements**	**Hours: 12**

DC potentiometer – Basic circuit, standardization – Laboratory type (Crompton's) – AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limtations & applications – Magnetic measurements – Ballistic Galvanometer, Grassot flux meter – testing of ring specimen – method of reversal and step by step method – testing of bar specimen – Hopkinson's permeameter – Iron loss measurement by Lloyd Fisher square. AC test on magnetic materials. Current Transformer and Potential Transformer construction, theory, operation, phasor diagram, characteristics, testing, error elimination – Applications.

UNIT – III	**Resistance and Impedance Measurement**	**Hours: 12**

Measurement of low, medium & high resistance – Ammeter, voltmeter method – Wheatstone bridge – Kelvin double bridge – Series and shunt type ohmmeter –High resistance measurement – Megger – Direct deflection methods – guard wire method – Loss of charge method – Earth resistance measurement. A.C bridges– Measurement of inductance, capacitance – Q of coil – Maxwell Bridge – Wein's bridge – Hay's bridge – Schering bridge – Anderson bridge – Campbell bridge to measure mutual inductance –Introduction to cable fault and eddy current measurement.

UNIT – IV	**Signal Generators and Analyzers**	**Hours: 12**

Sine wave generator – Frequency synthesized sine wave generator – Sweep frequency generator, pulse and square wave generator – Function generator – Wave analyzer –Applications – Harmonic distortion analyzer – Spectrum analyzer – Applications – Audio Frequency generator – Noise generator.

UNIT – V	**Cathode Ray Oscilloscope, Recorders and Displays**	**Hours: 12**

General purpose oscilloscope – Screens for CRT graticules – Vertical & horizontal deflection systems – Delay line – Multiple trace – Dual beam & dual trace – Probes –Oscilloscope techniques – Special oscilloscopes – Storage oscilloscopes – Sampling oscilloscope. X-Y Plottres, magnetic tape recording , direct , FM , digital recording, –Data loggers. Display devices : LED – LCD – Annunciators, Numerics, Alphanumerics.

Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. E.W.Golding & F.C.Widdis, Electrical Measurements & Measuring Instruments, A.H.Wheeler & Co, 1994.
2. Albert D. Helfrick & William D. Cooper, Modern Electronic Instrumentation & Measurement Techniques, Prentice Hall of India, 2002.
3. A.K. Sawhney, Electrical & Electronic Measurements and Instrumentation, Dhanpath Rai & Co (P) Ltd, 2004.

Reference Books:

1. Patranabis, Principles of Electronic Instrumentation - PHI, 2007
2. B.M.Oliver and J.M.Cage, Electronic Measurements & Instrumentation, McGraw Hill International Edition, 1975.
3. Joseph. J. Carr, Elements of Electronic Instrumentation & Measurements, III edition, Pearson Education, 2003.

Department : Electronics and Instrumentation Engineering	**Programme:** B.Tech. (EI)
Semester : Five	**Category :** TA

Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI112	Microprocessor and its applications	3	1	-	4	40	60	100

Prerequisite	-

Objectives	• To study 8085 and 8086 programming and its applications • To study interfacing devices like 8255, 8253, 8259 and 8251
Outcome	On completion of course the students can • Write simple assembly language programs in 8085 and 8086 • Interface any i/o device to 8085 • Design a microprocessor based system for any application

UNIT – I	**Introduction to 8085**	**Hours: 12**

INTEGRATED CIRCUITS : Generic-8-bit microprocessor and its architecture-8085 functional block diagram-Architecture-functions of different sections-Memory mapping-Memory interfacing-Instruction format-addressing modes-instruction set of 8085 CPU-instruction cycle-timing diagram-different machine cycles-fetch and execute operations-estimation of execution time.

UNIT – II	**PROGRAMMING 8085**	**Hours: 12**

Data transfer instructions-arithmetic operations-logic and branch operations-writing assembly language programmes-looping, count indexing-16 bit arithmetic instructions-arithmetic operations related to memory-logical operations, rotate compare, counter and time delays-debugging techniques. Stack- subroutine- call and return instructions-parameter passing techniques-nested subroutine. Parallel input-output and interfacing applications-peripheral and memory mapped I/O. 8085 interrupts-Restart as software instructions

UNIT – III	**Interfacing Devices**	**Hours: 12**

8255 programmable peripheral interface-8253 programmable interval timer-8259 programmable interrupt controller-direct memory access(DMA) and 8257 DMA controller-8155 multipurpose programmable devices-8279 programmable keyboard display interface-serial I/O and data communication-8251 USART-Interfacing data converters ADC and DAC.

UNIT – IV	**Introduction to 8086**	**Hours: 12**

Architecture of 8086 Microprocessor- Special functions of General purpose registers- 8086 flag register and function of 8086 flags- Addressing modes of 8086-Instruction set of 8086-, Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation-Pin diagram of 8086-Minimum mode and maximum mode of operation- Timing diagram- Memory interfacing to 8086 (Static RAM & EPROM).

UNIT – V	**Applications of Microprocessors**	**Hours: 12**

Typical application of microprocessors: Seven segment display interface, LCD interface, stepper motor control, temperature control, frequency measurement., phase angle and power factor measurement, Measurement of strain, deflection and water level measurement, Microprocessor based traffic control .

Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 6th Edition, Penram International Publishing, New Delhi, 2013. (Unit I, II, and III)
2. A.K. Ray and K.M.Burchandi, and A.K.Ray, Advanced Microprocessor and Peripherals, McGraw Hill International Edition, 3rd Edition, 2012 (Unit-IV)
3. B.Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications, 2001 (Unit V)

Reference Books:

1. N.Senthil Kumar, M.Saravanan and S. Jeevananthan, —Microprocessor and Microcontrollers, OXFORD UNIVERSITY PRESS, November, 2010
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition, Pearson Education, 2002.

Department: Electronics and instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Five		**Category :** LB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI113	VLSI Design Laboratory	-	-	3	2	60	40	100
Prerequisite								

Objectives	• To perform customized digital IC Design using FPGA/CPLD. • To develop digital systems using VHDL and VERILOG and to validate the same through functional simulation and hardware verification.
Outcome	• The students get exposure to the system design aspects of FPGA. • Will be able Design ICs for customized requirements. • Will learn firmware development for FPGA/CPLD using VHDL and VERILOG.
List of Experiments	1. Implementation of Basic Logic Gates, Half and Full Adders in FPGA and logic synthesis. 2. Implementation of Combinational logic circuits-Encoders, Decoders , Multiplexers , Demultiplexers , Comparators in FPGA 3. Implementation of Sequential logic Circuits - Flips Flops, Registers, Counters in FPGA. 4. Implementation of ALU in Structural, Behavioral and Dataflow modes. Validation of Logic outputs. 5. Peripheral Interfacing using FPGA - Switches, LEDs, Segment Displays. 6. Design of Motor Controller using FPGA/CPLD. 7. Design of LCD Display controllers using FPGA/CPLD. 8. Design of Data Acquisition controllers using FPGA/CPLD. 9. Design of Programmable Signal generators using FPGA/CPLD. 10. Design of UART communication controller using FPGA/CPLD. 11. Implementation of CRT controller using FPGA/CPLD 12. Design and Implementation of SD card communication controller using FPGA. 13. Realization of Keypad controller using FPGA. 14. Implementation of PID controllers in FPGA.

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Five				**Category :** LB				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI114	Instrumentation System Design Laboratory	-	-	3	2	60	40	100
Prerequisite	-							

Objectives	• To learn the basics of designing and testing electronic instruments like digital voltmeters, function generators and Power supplies • To learn the design, testing and calibration of instruments used in process control industries	
Outcome	• The students will be able to design, test and calibrate the industrial instruments	
	1. (Any 10 Experiments) 2. Design, Testing and calibration of 3½ Digit Digital Voltmeter using ICL 7107. 3. Design, Testing and calibration of Monolithic function Generator using XR 2206 and LM566 4. Design, Testing and calibration of Regulator Power supplies. 5. Design, Testing and calibration of Batch counter using TTL ICs. 6. Design ,Testing and calibration of DAC and ADC (both passive and digital) 7. Design, Testing and calibration of Electronic P, PI, PID & ON/OFF controllers. 8. Design, Testing and calibration of Cold Junction compensation of a Thermocouple. 9. Design, Testing and calibration of Programmable Timers. 10. Design, Testing and calibration of pH meter using single glass electrode. 11. Design, Testing and calibration of Digital Thermometer. 12. Design, Testing and calibration of F to V and V to F converters. 13. Design and testing of advanced measurement circuits.	**Hours: 09**

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Five				**Category :** LB				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI115	Microprocessor and Applications Laboratory	-	-	3	2	60	40	100
Prerequisite	-							

Objectives	• To write 8085 and 8086 assembly language programs • To interface 8085 / 8086 for measurement and control applications
Outcome	• Get exposure to 8085 and 8086 assembly language programs. • Will be able to interface I/O devices to microprocessor • Will learn the design of microprocessor based systems
	1 Programming 8085 and 8086 microprocessors 2. Interfacing programmable interrupt controller. 3. Interfacing of keyboard and display devices 4. Interfacing of D/A and A/D converters. 5. Interface of programmable timer 6. Stepper motor control using microprocessor. 7. Traffic light Controller and Elevator Interface. 8. Frequency measurement 9. Study of 8251 and 8237 10. Temperature controller

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Six				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI116	Process Control	4	-	-	4	40	60	100
Prerequisite	-							

Objectives	• To study the basic characteristics of first order and higher order processes and get adequate knowledge about the characteristics of various controller modes. • To study controller tuning and various complex control schemes • To study about the construction, characteristics and application of control valves. • To study the importance of state-space representation and stability analysis of discrete data system. • To develop different types of algorithm for digital controllers.
Outcome	The students • Can understand characteristics of various processes • Know the functions of process Control elements • Can design a controller for a selected process. • Can analyze any discrete-time system and design a digital control.

UNIT – I	**Introduction**	**Hours: 12**

Need for process control – Mathematical model of level, pressure and thermal processes– higher order process – interacting and non-interacting systems – continuous and batch processes– self-regulation – servo and regulatory operations.

UNIT – II	**Controllers and FCE**	**Hours: 12**

Basic control actions – characteristics of ON/OFF, proportional, single-speed floating, integral and derivative control modes – P+I, P+D and P+I+D control modes –Auto manual transfer– Final control elements- VFD - TPC - Control valves: Characteristics – inherent and installed – cavitation and flashing.

UNIT – III	**Controller Tuning and Multiloop Control**	**Hours: 12**

Determination of optimum settings for process models using time response and frequency response – Tuning – Process reaction curve method – Ziegler Nichols method - Evaluation criteria – IAE, ISE, ITAE and ¼ decay ratio – Damped oscillation method. Feed-forward control – ratio control- cascade control – inferential control – split-range control – introduction to multivariable control: Distillation column and boiler systems.

UNIT – IV	**Analysis of Discrete Data Systems**	**Hours: 12**

State-space representation of discrete data systems –Selection of sampling period – Review of z-transform – Basic building blocks of computer control system – Pulse transfer function – Modified z-transform - Stability of discrete data system – Jury's stability test.

UNIT – V	**Design of Digital Controller**	**Hours: 12**

Digital PID controller– Position and velocity form – Deadbeat's algorithm – Dahlin's algorithm –Kalman's algorithm - Pole placement controller – Predictive controller.

Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. G. Stephanopoulis, Chemical Process Control, PHI learning, New Delhi, 2008.
2. D.P.Eckman, Automatic Process Control, Wiley Eastern Ltd., New Delhi, 2008

Reference Books:

1. A. Pollard, Process Control, Heinemann educational books, London, 1971.
2. P. Harriott, Process Control, Tata McGraw-Hill Publishing Co., New Delhi, 1991.
3. P.B. Deshpande, and R.H.Ash, Computer Process Control, ISA Publication, USA, 1995.
4. C.M.Houpis, G.B.Lamount, Digital Control Systems Theory, Hardware and Software,
5. Singh, Computer Aided Process Control, Prentice Hall of India, 2004.

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Six		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI117	Industrial Instrumentation	4	0	-	4	40	60	100
Prerequisite	-							

Objectives	To equip the students with the knowledge of industrial measurements like • Pressure, level, temperature, flow measurements • Acceleration , density , viscosity measurements • EMC, safety measures and specification details of instruments.
Outcome	The Students will be able to • identify various instruments based on their working and will be able to test and calibrate them. • understand the automation requirements of any industries like chemical industries, construction industry etc.,. • interpret process flow diagrams, will be able to prepare documents required in projects.

UNIT – I	**Pressure Measurement**	**Hours: 12**

Units of pressure – Types of pressure-Non-electric type pressure measurement – manometers – different types – elastic type pressure gauges – Motion and force balance designs. Bourdon tube - bellows – diaphragms –Electrical methods – elastic elements with LVDT and strain gauges – capacitive type pressure gauge – piezo resistive pressure sensor – resonator pressure sensor – measurement of vacuum – McLeod gauge – Knudsen gauge – thermal conductivity gauges – Ionization gauge cold cathode and hot cathode types – Electrical pressure transmitter – testing and calibration of pressure gauges – dead weight tester.

UNIT – II	**Level & Flow Measurement**	**Hours: 12**

Level: Sight glass - float gauges - level switches –level measurement using displacer and torque tube – bubbler system. differential pressure method – hydra step systems – electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors.

Flow: Variable head and variable area type flow meters: Orifice plate, Venturi tube, Flow nozzle, Pitot tube-Rotameter-Positive displacement meter - electromagnetic flow meter- ultrasonic flow meter– vortex shedding flow meter – turbine flow meter – mass flow meter -angular momentum mass flow meter – coriolis mass flow meters – thermal mass flow meter –ultrasonic flow meter- solid flow measurement -calibration of flow meters – dynamic weighing method- selection factors for flow meters.

UNIT – III	**Temperature Measurement**	**Hours: 12**

Temperature standards - Temperature scale – different types of filled in system thermometer – sources of errors in filled in systems and their compensation – Bimetallic thermometers – Resistance thermometer– 3 lead and 4 lead RTDs –Thermocouples – law of thermocouple –cold junction compensation –response of thermocouple – Linearization of thermocouple and Thermistors –– High Temperature Measurement – total radiation and selective radiation pyrometers– optical pyrometer – two colour radiation pyrometer.

UNIT – IV	**Measurement of Acceleration, Density, Viscosity**	**Hours: 12**

Accelerometers – LVDT, piezo-electric, strain gauge and variable reluctance type accelerometers – seismic instrument as an accelerometer and vibrometer – calibration of vibration pick ups – units of density, specific gravity and viscosity used in industries – Baume scale API scale – pressure head type densitometer – float type densitometer – ultrasonic densitometer -Bridge type gas densitometer. Viscosity terms – say bolt viscometer – rotameter type viscometer - Falling ball viscometer – industrial consistency meters .

UNIT – V	**Industrial Safety and Specifications**	**Hours: 12**

EMC: Introduction, Interference coupling mechanism, basics of circuit layout and grounding, concepts of Interfaces, filtering and shielding. Safety: Introduction, electrical hazards, hazardous areas and classification, Non hazardous areas, enclosures – NEMA types, fuses and circuit breakers, protection methods: purging, explosion proofing and Intrinsic safety. Specification of instruments, process flow sheet, Instrument index sheet, Instrument specification sheet, panel drawing and specifications

Total contact Hours: 60	**Total Tutorials:**	**Total Practical Classes:**	**Total Hours: 60**

Text Books:

Text Books:

1. Ernest O.Doebelin, “Measurement systems Application and Design”, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.
2. R.K.Jain, “Mechanical and Industrial Measurements”, Khanna Publishers, New Delhi, 1999.
3. Bela.G.Liptak,” Process Measurement and Analysis”, Instrument Engineers handbook, fourth Edition, 2003.

Reference Books:

1. D.Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
2. K.Krishnaswamy,” Industrial Instrumentation-II”, New Age publishers, 2005.

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Six		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI118	Digital Signal Processing	3	1	-	4	40	60	100

Prerequisite	-
Objectives	• To find the output of a discrete-time system for the given discrete-time inputs • To study about frequency analysis of discrete-time signals through DFT and FFT • To study about the design of IIR and FIR filters • To study the finite word length effects in digital filters
Outcome	• Analyze the response of a discrete-time system for different inputs • Find the frequency components present in a signal • Plot the frequency response of a discrete-time system • Design IIR and FIR digital filters for the given application

UNIT – I	**Discrete-Time Signals and Linear Systems**	**Hours: 12**

Classification of signals: continuous and discrete, energy and power -representation of discrete-time signals, elementary discrete-time signals, classification of discrete-time signals, Classification of systems, Representation of a system with difference equation, impulse response and step response, FIR and IIR systems, Convolution sum and correlation, sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect, reconstruction of analog signal from its samples..

UNIT – II	**DTFT and Z-Transform**	**Hours: 12**

Discrete-time Fourier series, Frequency range, Discrete-time Fourier transform-properties, Frequency response, ideal filters, Z-transform and its properties- inverse z-transforms- system function- stability criterion- Solving difference equations using Z-transform.

Realization of IIR systems- direct form-I, direct form –II, cascade form and parallel forms. Realization of FIR systems-direct form, linear phase realization, cascade and parallel forms.

UNIT – III	**DFT and FFT**	**Hours: 12**

Discrete Fourier Transform, Relationship of the DFT to other transforms, Properties of DFT, circular convolution, filtering long duration sequences, parameter selection to calculate DFT. Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure- FFT applications.

UNIT – IV	**Design of Digital Filters**	**Hours: 12**

FIR filter design: Linear phase characteristics- Windowing technique of designing FIR filter– Need and choice of windows, frequency sampling method.

IIR filter design: Analog filter design - Butterworth and Chebyshev filters, digital design using impulse invariant and bilinear transformation – War ping effect, prewarping.

UNIT – V	**Finite Word Length Effects in Digital Filters**	**Hours: 12**

Number representation, quantization, rounding truncation. Input quantization error, Product quantization error, Coefficient quantization error, Overflow limit cycle oscillations, Zero input limit cycle oscillation, Scaling. Finite word length effects in computation of DFT using direct evaluation and FFT algorithms.

Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. J.G Proakis and D.G.Manolakis, Digital Signal Processing Principles, Algorithms and Applications, Pearson Education/ PHI, New Delhi, 2011.
2. P. Ramesh Babu, Digital Signal Processing, Sixth edition, Scitech publications, 2014.

Reference Books:

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, Discrete – Time Signal Processing, Pearson Education, New Delhi, 2003.
2. Johny R. Johnson : Introduction to Digital Signal Processing, Prentice Hall, 2004.

Department: Electronics and instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Six		**Category :** LB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI119	Process Control Laboratory	-	-	3	2	60	40	100

Prerequisite	
Objectives	• To understand the process plant and Piping and Instrumentation diagrams. • To get adequate knowledge about practical issues of various controller modes and methods of tuning of PID controller. • To get adequate knowledge about practical issues of closed loop control of processes.
Outcome	• The students will be able to design and implement different closed loop control schemes for different processes
List of Experiments	1. Study of Process Control Training System and Piping and Instrumentation diagram of a plant. 2. Study of Inherent and Installed Characteristics of Control Valves. 3. Tuning and Closed loop control of Level Process. 4. Tuning and Closed loop control of Flow Process. 5. Tuning and Closed loop control of Temperature Process. 6. Tuning and Closed loop control of Pressure Process. 7. Design and implementation of ON/OFF Controller for the Temperature Process. 8. Tuning PID Controller for soft processes. (Mathematically described processes). 9. Tuning and closed loop control of Electronic Processes. 10. PID Implementation Issues and configuring Industrial PID Controller. 11. Simulation study on PID Enhancements (Cascade and Feed-forward Control Schemes)

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Electronics and instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Six				**Category :** LB				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI120	Embedded System Design Laboratory	-	-	3	2	60	40	100

Prerequisite	-
Objectives	• To Design microcontroller based Embedded systems. • To develop firmware for the systems and to validate the same through functional simulation and hardware verification.
Outcome	• The students get exposure to the system design aspects of Microcontrollers. • Will be able Design applications for customized requirements. • Will learn firmware development for microcontrollers.
List of Experiments	(Any 10 Experiments) 1. Parallel Port Interfacing Using MCS51. 2. Implementation of Timer and Counter programming using MCS51. 3. Programming Interrupts using MCS51. 4. Design of Real Time Clock using MCS 51 using segment Displays. 5. Design of PC interface Hardware with MCS51 using UART communication. 6. Interfacing 16x2 LCD Display using MCS51 7. Design of Single Channel Data Acquisition System Using MCS51. 8. Design of PC based DC motor control (Speed & Direction) system. 9. Implementation of GPIO and Timer using ARM LPC2148. 10. Implementation of Interrupts in LPC2148. 11. Implementation of UART features of ARM LPC2148. 12. Implementation of Data Acquisition and Signal Generation using LPC2148. 13. Interfacing SD card and Graphical LCD using LPC2148. 14. Implementation of SPI and I2C communication using LPC2148. 15. Implementation of USB communication using LPC2148.

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Electronics and instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester : Six				**Category :** LB				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI121	Virtual Instrumentation Laboratory	-	-	3	2	60	40	100

Prerequisite	
Objectives	• Learn the basics of virtual instrumentation including use of IEEE GPIB, RS232 interfaces, and data acquisition boards. • Interfacing of a computer to various instruments for data acquisition and instrument control using a state-of-the-art software platform such as National Instrument's LABVIEW
Outcome	• Develop ability for programming in LabVIEW using various data structures, program structures, plotting the graphs and charts for system monitoring, processing and controlling • Understand the basics of interfacing and programming using related hardware • monitor or process system through individual /team project
List of Experiments	1. Basic LabView Programming - Part1 2. Basic LabView Programming - Part2 3. Implementing Serial Communication using LabVIEW 4. Design of Virtual Digital Voltmeter using LabVIEW 5. Design of Virtual Function Generator using LabVIEW 6. Hardware & Firmware design for Programmable Digital Voltmeter 7. Hardware & Firmware design for Programmable Function Generator 8. GPIB based instrument control using Labview. 9. Distributed Instrument control using Ethernet 10. DAQ Post processing and Report Generation 11. Design of Mass Spring Dashpot System using CD tools and Simulation module 12. Design of GUI using MATLAB 13. Design of Serial communication using GUI in MATLAB 14. Implementation of ECG signal processing algorithms using LabVIEW 15. Implementation of Image processing using LabVIEW 16. Realization of PID controllers using LabVIEW

Total contact Hours: -	**Total Tutorials: -**	**Total Practical Classes: 45**	**Total Hours: 45**

Department: Humanities and Social Sciences			**Programme:** B. Tech. (EI)						
Semester : Six			**Category :** PR						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**			
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**	

HS102	General Proficiency	-	-	3	1	100	-	100

Prerequisite	-
Objectives	• To enhance the students' communication and language skills and make them industry-ready. • To encourage brain storming discussions and team work. • To train students to master soft skills through various activities.
Outcomes	On successful completion of the module students will be able to: • Communicate in English effectively and confidently. • Imbibe the requisite soft skills. • Improve critical thinking and analytical skills.

Art of communication: Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language (Proxemics, kinesics, haptic, chronemics and paralanguage) – Effective Listening – Feedback – presentation skills.

Introduction to soft skills: Self-Confidence – Leadership Qualities – Emotional Quotient – Time Management – Stress Management – Interpersonal Skills.

Comprehension and Analysis: British and American English – GRE based comprehension – analytical writing – analyzing contemporary issues – current English usage.

Adapting to corporate life: Group discussions – meetings – Public Speaking – Debate – Intercultural communication – etiquettes –interviews-email writing.

Aptitude: Vocabulary building - Verbal and Numerical aptitude.

Total contact Hours:	**Total Tutorials:**	**Total Practical Classes: 45**	**Total Hours: 45**

Reference Books:

1. Nicholls, Anne. Mastering Public Speaking. Jaico Publishing House,2003.
2. Agrawal, R.S. Quantitative Aptitude,S.Chand and Co., 2004.
3. Sherfield M Robert. Developing Soft Skills Pearson Education, 2005.
4. Hair O' Dan, Friedrich W. Gustav and Lynda Dee Dixon. Strategic Communication in Business and the Professions, Pearson Education, 2008.
5. Chaney Lilian and Jeanette Martin. Intercultural Business Communication, Pearson Education, Fourth Edition, 2008.
6. Dignen, B. Fifty ways to improve your presentation skills in English. Orient Blackswan, 2014.

Websites:

1. www.cambridgeenglish.org

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Seven		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

EI122	PLC and DCS	4	0	-	4	40	60	100

Prerequisite	-
Objectives	• To provide idea about various Data Networks. • To get an exposure to SCADA. • To learn about different PLC languages. • To study about Industrial DCS. • To have an exposure to HART and Fieldbus
Outcome	The students • Know the fundamentals of data networks • Can do PLC programming • Know the fundamentals of DCS, HART and Field bus

UNIT – I	**PLC Architecture and Interface Modules**	**Hours: 12**

PLC Architecture -comparative study of industrial PLC's- Interface modules-ac and dc input and output modules-analog and discrete input and output modules, BCD and TTL input and output modules - communication modules - PID-Thermocouple-stepper motor, Encoder/Counter, servo and language modules.

UNIT – II	**PLC Programming**	**Hours: 12**

Ladder logic - Boolean language - sequential function instruction set-program counter, data manipulation, chart-Arithmetic, shift registers and sequencers – Structured Text Programming.

UNIT – III	**Data Network Fundamentals**	**Hours: 12**

Network hierarchy and switching-ISO/OSI Reference model-Data link control protocol: HDLC-SDLC-Multiple access protocols-Token ring Token bus and CSMA/CD, Polling, reservation, FDMA, TDMA, CDMA, Addressing concepts: class full, classless addressing and network address translation. TCP/IP-Bridges-routers-gateways-standard Ethernet and ARCNET configuration

UNIT – IV	**Distributed Control System**	**Hours: 12**

Evolution – Different architecture – Local control unit functions – Operator Interface – LLOI and HLOI - redundancy concepts – Displays – Communication networks and communications standards in DCS – Engineering Interface – Factors to be considered in selecting a DCS.

UNIT – V	**Hart and Fieldbus**	**Hours: 12**

Introduction HART communication protocol – communication modes - HART networks – HART commands – HART application – Fieldbus: Introduction – fieldbus architecture, Basic requirements of field bus standard – fieldbus topology – Interoperability and Interchangeability. Smart Transmitters – MAP protocol.

Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. Frank. D.Petrezuella , Programmable logic controllers, McGrewhill, Third edition.
2. Lucas. M.P., Distributed control systems ,Van Nostrand and Reinholdcompany, NY,1986.
3. Hughes. T. , Programmable controllers, ISA Press, 2000
4. M. Chidambaram , Computer control of process, Narosa publishing house.

Reference Books:

1. McMillan, G. K . , Process Industrial Instrument and controls handbook, McGraw Hill, Newyork, 1999.
2. Berge . J., Field buses for process control: Engineering, operation and maintenance, ISA Press, 2004.

Department: Electronics and Instrumentation Engineering					**Programme:** B.Tech. (EI)			
Semester : Seven					**Category :** TA			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

EI123	Analytical Instrumentation	4	-	-	4	40	60	100

Prerequisite	-
Objectives	• To 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.
Outcome	• 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	**Spectroscopy**	**Hours: 12**

Electromagnetic radiation - Electromagnetic spectrum - Spectral methods of analysis. Absorption spectroscopy – Emission Spectroscopy – Beer Lamberts Law.
UV – Visible spectrophotometers – Single beam and double beam instruments – Sources and detectors.
IR spectrophotometers –Sources and detectors – Sample handling techniques – FTIR spectrometers – Raman Spectrometers

UNIT – II	**Flame, NMR & Microwave Spectroscopy**	**Hours: 12**

Flame emission spectrometry – Atomic absorption spectrometry - NMR, ESR / EPR spectroscopy – basic principles – instrumentation techniques and applications.

UNIT – III	**Mass Spectrometers & Radiation Measurement**	**Hours: 12**

Ion sources – Types: Magnetic Deflection – Time of Flight – Quadrupole Mass Spectrometers - single focusing and double focusing mass spectrometers – principles and application
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 – IV	**Chromotography**	**Hours: 12**

Gas chromatography – Methods of analysis in gas chromatography - Column details
Detectors: Thermal conductivity detectors- Flame ionization detectors - Flame photometric detectors - Electron capture detectors - Effect of temperature.
Liquid chromatography – Pre column - Separation column - Detectors - HPLC.

UNIT – V	**Environmental Pollution Monitoring Instruments**	**Hours: 12**

Introduction to air and water pollution – Review of primary and secondary pollutants - Conductivity and water purity meters – Carbon Monoxide, Sulphur dioxide, Hydrogen Sulphide & NO monitors – oxygen analyzers.

Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. R.S.Khandpur, Handbook of Analytical Instruments, Tata McGraw Hill Publishing, 9th Reprint, 2011
2. Bela.G.LIptak, Analytical Instrumentation, CRC Press, 1994.

Reference Books:

1. Pooja Bhagwan, A Handbook of Chemical Analysis, International Scientific Publishing Academy, 2009.
2. Gallen Wood Ewing,, Analytical Instrumentation Hand book, Second Edition,, CRC Press 1997.

Department: Mechanical Engineering				**Programme:** B.Tech. (EI)				
Semester : Seven				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

ME135	Maintenance and Safety Engineering	4	-	-	4	40	60	100

Prerequisite -

Objectives

- To study the issues of maintenance, reliability and safety of technical systems
- To study Fault finding and diagnostics in engineering industry
- To get Knowledge of lubricants and lubrication systems and know maintenance requirements of plant and equipment
- To study Hazard identification and risk assessment in operation and maintenance of industrial plant
- To Familiarize with prevailing regulations for safe environment and health

Outcomes

The Students

- Know Effective maintenance strategy and continuously improve maintenance systems.
- Can Plan maintenance programs and Evaluate plants' reliability programs.
- Can Effectively computerized maintenance management systems.
- Know Condition monitoring techniques to develop effective maintenance policies.
- Understand Importance of safety and codes

UNIT - I **Hours: 12**

Objectives of maintenance - types of maintenance – Breakdown, preventive and predictive maintenance - Repair cycle - Repair Complexity, Lubrication system – Lubricants - inspection. Maintenance of Mechanical transmission systems - align machinery – static and dynamic balancing - process plants – air conditioning – water purification – environmental control.

UNIT - II **Hours: 12**

Predictive Maintenance - vibration analysis data and noise as maintenance tool – wear debris analysis - Condition monitoring concepts applied to industries – diagnose faults – overhaul – testing and measurement using approved procedures - Total Productive Maintenance (TPM) - Economics of Maintenance- Computer aided maintenance – modern practice – modern manufacturing aspects.

UNIT - III **Hours: 12**

Reliability: Definition, concept of reliability based design, failure rate, MTTF, MTBF, failure pattern, system reliability: Series, Parallel and Mixed configurations - Availability and Maintainability concepts- applications – electro, proportional and servo hydraulic components – shutdown machinery – isolation – dismantle – inspect – NDT - assembly – fans – pumps – valves – bearings – static – dynamic seals.

UNIT - IV **Hours: 12**

Safety and productivity - causes of accidents in industries – accident reporting and investigation - measuring safety performance - Safety organizations and functions - Factories act and rules - Manufacture, Storage and Import of Hazardous Chemical rules - Explosive act - Gas cylinder rules – Electricity act

UNIT - V **Hours: 12**

Safety Codes and Standards – Air Quality – indoor - outdoor – safe drinking water - General Safety considerations in Material Handling equipments - Machine Shop machineries-pressure vessels and pressurized pipelines – IBR - welding equipments – operation and inspection of extinguishers – prevention and spread of fire – emergency exit facilities - NFPA Standards – ISO 14000.

Total Contact Hours : 60	**Total Tutorials : -**	**Total Practical Classes : -**	**Total Hours : 60**

Text Books:

1. P.Gopalakrishnan and A. K. Banerji - Maintenance and Spare Parts Management, PHI Learning Pvt. Ltd., New Delhi, 2013.
2. Patrick D. T. O'Connor – Practical Reliability Engineering, Wiley, 2008.
3. B. S. Dhillon – Engineering Safety – Fundamental Techniques and Applications, World Scientific, 2003.

Reference Books:

1. R.C.Mishra and K.Pathak, Maintenance Engineering and Management, PHI Learning Pvt. Ltd., New Delhi, 2012.
2. H.P.Garg, Industrial Maintenance, S.Chand & Co Ltd., New Delhi, 1990.
3. Birolini, Reliability Engineering, Springer, 2014.
4. Rolland P.Blake - Industrial Safety, Prentice Hall of India Pvt. Ltd., New Delhi, 1973.

Websites:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents
2. http://ocw.mit.edu/courses/mechanical engineering
3. http://en.wikipedia.org

Department: Electronics and instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Seven		**Category :** LB						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

EI124	Industrial Measurement and Control Laboratory	-	-	3	2	60	40	100

Prerequisite	-
Objectives	• To understand practical issues of applications of PLC hardware and programming a PLC. • To get adequate knowledge about practical issues of implementations of PLC and DCS. • To get adequate knowledge about practical issues of calibration of Process instruments • To get adequate knowledge about practical issues of various digital controllers. • To get adequate knowledge about practical issues of closed loop control of processes using Digital Controllers
Outcome	• Calibrate different instruments used in industries • Design and implement computer based control schemes for different processes
	(Any 10 Experiments) 1. Calibration of Pressure gauge using Dead weight Tester. 2. Calibration of manometers and Control valves 3. Calibration of Control valves, I to P and P to I converters 4. Calibration of Pressure Switch, RTD and Thermocouple. 5. PC based Cascade control of level process 6. PC based control of interacting level process 7. Design and simulation of digital controller using Dahlin's algorithm 8. Design and simulation of digital controller using Dead beat algorithm 9. Parameter estimation of process from input output data 10. Control of a real time process using ADC/DAC interface between Simulink and Process hardware. 11. Design and simulation of digital controller using Kalman's algorithm 12. PC based PID Control of 4^{th} order electronic process using C program 13. Study of basic programming of PLC 14. Analog operation in PLC 15. Arithmetic operation, Timer, Counter operation using PLC 16. Annunciator design using PLC 17. PLC based control of Level Process , Temperature Process. 18. Design of PID Controller and Auto tuning of PID Controller (a) Analysis of Multi-input Multi-output System(Four-tank System) (b) Design of Multi-Loop PID Controller and Multivariable PID Controller. 19. Design of Gain scheduling controller 20. Design of Self-Tuning Controller 21. Design of Deterministic/stochastic State Observer b) Design of State Feedback Controller.

Total contact Hours: - **Total Tutorials: -** **Total Practical Classes: 45** **Total Hours: 45**

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Seven		**Category :** PR						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

EI125	Project work Phase-I	-	-	3	2	100	-	100
The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental , design or combination of these in the area of Electronics and Instrumentation Engineering. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. The evaluation is based on continuous internal assessment.								

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Seven		**Category :** PR						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

EI126	Professional Ethics and Practice	3	-	-	1	100	-	100

The course should cover the following topics by way of Seminars, Expert Lectures and Assignments:

1. Engineering Ethics – Moral issues, Ethical theories and their uses
2. Engineering as Experimentation – Code of Ethics
3. Engineer's responsibility for safety
4. Responsibilities and rights
5. Global issues of engineering ethics

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Eight		**Category :** PR						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

EI127	Comprehension Test and Viva-Voce	-	-	3	1	60	40	100

The student will be tested for his understanding of basic principles of the core Electronics and Instrumentation Engineering subjects through objective type tests and Viva-Voce examination.

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester : Eight		**Category :** PR						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**

EI128	Project Work Phase-II		-	9	6	-	-	100
Project work phase II will be an extension of the project work started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee. The external university examination will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner.								

SYLLABUS (Elective Subjects)

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP01	Visual Programming for Instrumentation Engineers		4	0	-	4	40	60	100
Prerequisite	-								
Objectives	• To introduce visual programming applicable to instrumentation and for instrument control software development using .net • To develop window based applications in multi language environment								
Outcome	The student can • Understand fundamentals of .net, vb.c# and vb.net • Understand advanced concepts in c# and vb in .net • Able to choose a platform and language for developing instrumentation software • Create sample applications for instrument control.								
UNIT – I	**Net Frame Work and C# Basics**	**Hours: 12**							
.Net Frame work : Introduction – Components of .NET architecture –Principal Design features-web services **C# basics**: Introduction –Data Types-Access Modifiers- Variables and Constants –Statements –OO concepts-arrays –strings-System collections-delegate and events –indexer-properties-versioning									
UNIT – II	**C# Using Libraries**	**Hours: 12**							
Name space System-Input and output- Multithreading-Windows Forms –data handling and Exception handling									
UNIT – III	**Advanced Features Using C#**	**Hours: 12**							
Web services –Window services-Messaging, Reflection and COM- Localization and Globalization- - XML- Unsafe Model- Graphical Device Interface									
UNIT – IV	**Introduction to VB.Net**	**Hours: 12**							
Concepts and Simple Applications- variables, constants and Functions – processing decisions- Loop Structure and List File and Database Application: File access-Dialog Boxes –exception handling , Menus in Vb.net- Connecting to databases.									
UNIT – V	**Advanced Programming Constructs**	**Hours: 12**							
Sub Procedures –Functions –Modules-Arrays-Structure –Collection .Net Architecture and Advanced Tools: OOP with VB.net – Creating Distributed Web applications –Graphics, Printing ,Reporting Case Study: Case studies in developing applications for Instrumentation									
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**						
Text Books:									
1. ISRD Group, Application of .net Technology, Tata Mcgraw Hill Education Private Limited, 2011									
Reference Books:									
1. Balagurusamy E, Programming with C#., Tata Mcgraw Hill 2008 2. Chappell D , Understanding .NET , Pearson Edition 2007									

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech. (EI)				
Semester :				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP02	Embedded System Design	3	1	-	4	40	60	100
Prerequisite	Microprocessor and Applications							
Objectives	• To introduce system design concepts to students using microcontrollers. • To introduce 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.							
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 ARM Processor hardware features and internal peripherals. Programming knowledge of ARM Processors. • Software design techniques to be followed for embedded system designing. • Using real time operating systems for embedded systems.							
UNIT – I	**Review Of Embedded Systems**				**Hours: 12**			
Introduction to Embedded Systems – Components of an Embedded System – Processor Specifications – Role of Microcontrollers in Embedded System design – Features of Microcontrollers – 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- Intel Hex File Format.								
UNIT – II	**MCS51 Microcontroller**				**Hours: 12**			
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, RS-232 implementation, Interrupts Programming, External Memory interfacing.								
UNIT – III	**LPC2148 Microcontroller**				**Hours: 12**			
ARM 7 Architecture – LPC2148 microcontroller introduction – Internal memory map - Peripheral details – Implementation of GPIO, Timer/Counter, UART, Interrupt architecture – ADC and DAC. SPI, I2C and USB features of LPC2148. Firmware development using Embedded C – introduction to data types – conditional statements – loops – simple programs using embedded 'C'								
UNIT – IV	**System Design Using MCU**				**Hours: 12**			
Design of Simple I/O systems using Switches, LEDs, Buzzers - Current source and sink concepts - Interfacing Character and Graphical LCD Displays – RTC interfacing - Interfacing External ADC and DAC - DC Motor Speed Control System – Speed Measurement – Design of Digital Frequency meter - Stepper Motor Interfacing – Relays – Keypads - Interfacing SD cards and touch screens–PC based Control systems								
UNIT – V	**Real Time Operating Systems**				**Hours: 12**			
Concept of Scheduling – Round Robin and Preemptive scheduling – Implementing a simple scheduler in 'C' - Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Message queues- Events-Memory Management, Interrupt Routines in an RTOS environment, Implementing SD card – Graphical LCD system using RTOS.								
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**			**Total Hours: 60**			
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. 3. Trevor Martin, The Insider's Guide to the Philips ARM7-Based Microcontrollers, Hitex Pubications(UK),2005. 4. Michael J Pont, Patterns for Time-Triggered Embedded Systems, Addison-Wesley Professional,2001.								
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.
4. Heath, Steve, Embedded Systems Design", Newnes ,1997.
5. John B Peat man , Design with Microcontroller, Pearson education Asia, 1998.

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP03	Web Based Instrumentation	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To learn Internet and web concepts • To learn various application of Internet • To learn the language constructs of the programming language • To understand the basic concepts of the internet based control and measurement							
Outcome	• Select the suitable Internet technology to implement Internet based control and measurement. • To write programs in Java to make it useful to develop internet based instrumentation and control • To deploy internet application in Internet							
UNIT – I	**Basic Internet Concepts**					**Hours: 12**		
Packet Switching - Internet: A Network of Networks-ISPs: Broadband and Wireless Access - Software to Create a Virtual Network -TCP: Software for Reliable Communication - Clients + Servers = Distributed Computing - Names for Computers- NAT: Sharing an Internet Connection								
UNIT – II	**Internet Application**					**Hours: 12**		
Electronic Mail- Bulleting Board Service (Newsgroups)-Browsing the World Wide Web- World Wide Web Documents (HTML)-Advanced Web Technologies (Forms, Frames, Plugins, Java, JavaScript, Flash)-Group and Personal Web Pages (Wikis and Blogs)-Automated Web Search (Search Engines)-Text, Audio, and Video Communication (IM, VolP)-Faxes, File Transfer, and File Sharing (FTP)-Remote Login and Remote Desktops (TELNET)-Facilities for Secure Communication-Secure Access from a Distance (VPNs)-Internet Economics and Electronic Commerce-The Global Digital Library								
UNIT – III	**Basics of Java Language:**					**Hours: 12**		
Java Evolution-Overview of Java Language-Constants, Variables and Data Types- Operators and Expressions - Classes, Objects and Methods- Arrays and Strings Concepts and Simple Applications- variables, constants and Functions – processing decisions- Loop Structure and List File and Database Application: File access-Dialog Boxes –exception handling , Menus in Vb.net- Connecting to databases								
UNIT – IV	**Application of Internet Measurement and Control**:					**Hours: 12**		
Measurements through Internet: Web based data acquisition – Monitoring of plant parameters through Internet – Calibration of measuring instruments through Internet. **Internet based Control:** Virtual laboratory – Web based Control – Tuning of controllers through Internet. **Case Study:** Internet based Measurement and Control case studies using Java, JVM and security – Over view of class library: I/O, AWT and NET – JDBC, Object serialisation – remote method invocation – Java script – Java vs C++.								
UNIT – V	**Miscellaneous Topics**					**Hours: 12**		
Intranets – Internet commerce – Internet and VRML – Active X. Case study : Internet based measurement , Telemonitoring and Tele control in Biomedical , instrumentation Applications								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. Douglas E. Comer, The Internet Book, 4th Edition, 2009 Princtice Hall (Unit 1 and Unit II)
2. Balagurusamy, Object Oriented Programming Using C++ and JAVA , Tata Mcgraw Hill Education Private Limited,2012 (Unit III and Unit IV)
3. Alessandri Ferrero and Vincenzo Piuri, A simulation Tool for Virtual Laboratory Experiments in WWW environment, IEEE Transactions on IM, Vol. 48, 1999.
4. Kang B. Lee and Richard D. Schneeman, Internet-based Distributed Measurement and Control Application, IEEE magazine IM, June 1999

Reference Books:

1. Deitel and Deitel, Java: How to Program, 9th Edition Printice Hall 2012
2. TANENBAUM, Computer Networks, 2012 5th Edition, DORLING KINDERSLEY (RS) publication

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP04	Instrumentation Buses and Data Networks	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To educate on the basic concepts of data networks • To introduce the basics of inter networking and serial communications • To provide details on HART and Field buses • To educate on MODBUS, PROFIBUS and other communication protocol • To introduce industrial Ethernet and wireless communication							
Outcome	• Ability to understand and analyze Instrumentation systems and their applications to various industries							
UNIT – I					**Hours: 12**			
Basic concepts on Buses , Interrupts , Interfacing PC systems – Interfacing Standards – comparison of different buses – PCI Bus – PCI operation , Bus arbitration – PCI pins – configuring address space – I/O addressing – ISA Bus – ISA operation – ISA pins –address space configuration.								
UNIT – II					**Hours: 12**			
Motherboard Design – Introduction – TX mother board. IDE and Mass storage – Tracks and sectors – Floppy discs – drive specification – hard disc and CD ROM specifications – IDE interface – communication - SCSI- types, interface, operation, pointers- Message system description – SCSI commands.								
UNIT – III					**Hours: 12**			
PCMCIA – Introduction, PCMCIA signals and registers. Introduction to USB and FIREWIRE ports – AGP – PCI and AGP, Bus transactions, Pin Description, AGP master configuration, Bus commands – Addressing modes and Bus commands – Register Description. Fiber channel – Introduction, channel Standards, cables hubs, adapters and connectors. RS -232 – Electrical characteristics – communication between two nodes-programming RS-232. Introduction to RS-422, RS-423,and RS-485.Line Drivers – RS232/485 converter.								
UNIT – IV					**Hours: 12**			
Parallel Port-Introduction, PC connections, data handshaking, I/O addressing, Interrupt driven parallel port. Enhanced Parallel port- Introduction compatibility mode, Nibble mode, Byte mode-EPP, ECP.MODBUS- MODBUS protocol, Function codes, diagnostics. FIELDBUS-Types, Foundation FIELDBUS.WORLDFIP-Introduction, physical layer, data link layer. CAN BUS-introduction, Bus basics, Message transfer, Fault confinement, Bit timing, CAN open.								
UNIT – V					**Hours: 12**			
IEEE 488,VME and VXI- Instruction, IEEE 488 bus, VME bus , VXI bus. TCP/IP – Introduction, Gateways and hosts, IP protocol, Internet diagram, TCP/IP internets, Domain naming system. Networks – Introduction- topologies, OSI model, Routers, Bridges and repeaters – Network cable types.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			
Text Books:								
1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, Practical Industrial Data 2. Networks Design, Installation and Troubleshooting' Newnes Publication, Elsevier First Edition, 2004 3. Computer Buses – William Buchanan – CRC press								
Reference Books:								
1. IBM PC and CLONES – B.Govindarajulu – Tata McGraw – Hill Publishing Company. 2. A. Behrouz Forouzan ,Data Communications & Networking ,3rd Edition, Tata Mc Graw Hill, 2006.								

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP05	Applied Soft Computing		4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To expose the students to the concepts of feed forward neural networks. • To provide adequate knowledge about feedback neural networks • To provide adequate knowledge about fuzzy and neuro-fuzzy systems • To provide comprehensive knowledge of fuzzy logic control to real time systems. • To provide adequate knowledge of genetic algorithms and its application to economic dispatch and unit commitment problems.							
Outcome	• The students will be able to understand the applications of neural network and fuzzy logic in the area of control systems							
UNIT – I	**Artificial Neural Network**					**Hours: 12**		
Review of fundamentals – Biological neuron, Artificial neuron, activation function, single layer perceptron-limitation – multilayer perceptron- Back propagation algorithm –recurrent network- adaptive resonance theory based network – radial base function network- online learning algorithms, BP through time- RTRL algorithm reinforce learning								
UNIT – II	**Neural Networks for Modeling And Control**					**Hours: 12**		
Modeling of non-linear systems using ANN- generation of training data – optimal architecture – model validation – control of non- linear systems using ANN – direct and indirect neuro control schemes – adaptive neuro controller – familiarization with neural network toolbox								
UNIT – III	**Fuzzy Set Theory**					**Hours: 12**		
Fuzzy set theory- fuzzy sets- operation on fuzzy sets- Scalar cardinality, fuzzy cardinality, union and intersection-complement (Yeger and sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation- fuzzy membership functions								
UNIT – IV	**Fuzzy Logic For Modeling And Control**					**Hours: 12**		
Modeling of non linear systems using fuzzy models – TSK model – fuzzy logic controller- fuzzification – knowledge base- decision making logic – defuzzification – adaptive fuzzy systems – Familiarization with fuzzy logic toolbox								
UNIT – V	**Hybrid Control Schemes**					**Hours: 12**		
Fuzzification and rule base using ANN – Neuro fuzzy systems ANFIS – Fuzzy neuron – Introduction to GA – Optimization of membership function and rule base using Genetic algorithm – Introduction to support vector machine – particle swarm optimization – case study – familiarization with ANFIS toolbox								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**				**Total Hours: 60**		

Text Books:

1. Laurene V.Fausett, Fundamentals of Neural Networks, Architecture, Algorithms, and Applications, Pearson Education, 2008.
2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, Wiley, Third Edition, 2010.
3. David E.Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education, 2009.

Reference Books:

1. George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications,PHI, First Edition, 1995.
2. W.T.Miller, R.S.Sutton and P.J.Webrose, Neural Networks for Control, MIT Press, 1996.
3. C.Cortes and V.Vapnik, Support-Vector Networks, Machine Learning, 1995.

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester :		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP06	Power Plant Instrumentation	4	0	-	4	40	60	100

Prerequisite	-
Objectives	• To provide an overview of power generation with a particular stress on thermal power generation and also to familiarize the drawing of P&I diagrams of different power plant control loops and various measurements involved in power plants. • To impart knowledge about the different types of controls and control loops in thermal power plants to improve the efficiency. • To familiarize the student with the methods of monitoring different parameters like speed, vibration of turbines and their control along with flue gas analysis and trimming of gases to reduce emissions in order to sensitize students to the environmental impact of these systems.
Outcome	• The students could understand the role of P&I diagrams and control loops of the different power plant and control loops. • The students will be able to design the instrumentation required for the power plant. • To analyze the various instruments used in power plant control systems and safety system and interlock requirement in plant. • To explain the environmental impact of electricity generation and show how adequate control processes may reduce or eliminate these impacts.

UNIT – I	**Introduction**	**Hours: 12**

Piping and instrumentation diagram of a thermal power plant, basic process on a boiler, - measurement of non electrical parameters –flow of feed water, fuel, air and steam with correction factor for temperature, steam pressure and steam temperature , drum level measurement –water level gauge for boiler drums, closed circuit television instrument, gas analysis meters, smoke instruments, dust monitor-analysis of impurities in feed water and steam, flue gas oxygen analyser, dissolved oxygen analyzer, pH meter , fuel analyser, radiation detectors and pollution monitoring instruments.

UNIT – II	**Boiler Control-I**	**Hours: 12**

Boiler control objectives-combustion of fuels (gaseous liquid, and solid), excess air, combustion chemistry and products of combustion, requirement for excess combustion, air-circulation of efficiency of boiler: input/output method-stream temperature control systems super heaters and de-super heaters.

UNIT – III	**Boiler Control-II**	**Hours: 12**

Feed water supply and boiler water circulation system-drum level control systems-boiler draft systems-measurement and control of furnace draft-measurement and control of combustion-draft and air flow control related functions, control techniques and safety interlocks in boiler operation.

UNIT – IV	**Flue Gas Analysis Trimming of Combustion Control Systems**	**Hours: 12**

Flue gas analysis and its importance, combustion control for liquid and gaseous fuel boilers coal or solid fuel strokes-combustion control for stoker-fired boilers- pulverised coal-fired boilers and trimming of combustion control systems. Turbine monitoring and control: speed, vibration, shell temperature monitoring, lubricant oil temperature control and cooling system.

UNIT – V	**Nuclear Power Plant Instrumentation**	**Hours: 12**

Piping and instrumentation diagram of different types of nuclear power plants-radiation detection instruments-process sensors for nuclear power plants-spectrum analyzers-nuclear reactor control systems and allied instrumentation.

Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 45**

Text Books:

1. B.G.Liptak, Instrumentation in process industries, Vol. I and II, Chilton books co, 1973.
2. Sam G. Dukelow. The control of boilers, Instrument Society of America press, 1991.

Reference Books:

1. A.Sherryet. Al. (Editors), Modern power station practice, Vol.6 (Instrumentation controls and testing), Pergamon Press, 1971
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna publishers, New Delhi, 1995.
3. Elonka. S.M and Kohal. A.L., Standard Boiler Operations, Mc Graw Hill, New Delhi, 1994.

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP07	Digital Image Processing	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To Learn the basics of Digital image processing and transforms • To study image processing techniques such as image enhancement, image restoration, image compression and image segmentation							
Outcome	• Students will know the fundamentals of digital image processing and its applications.							
UNIT – I	**Digital Image Fundamentals and Transforms**					**Hours: 12**		
Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.								
UNIT – II	**Image Enhancement Techniques**					**Hours: 12**		
Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters : Smoothing – Sharpening filters – Homomorphic filtering.								
UNIT – III	**Image Restoration**					**Hours: 12**		
Model of Image Degradation/restoration process – Noise models – Inverse filtering -Least mean square filtering – Constrained least mean square filtering – Blind image restoration – Pseudo inverse – Singular value decomposition.								
UNIT – IV	**Image Compression**					**Hours: 12**		
Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization.								
UNIT – V	**Image Segmentation and Representation**					**Hours: 12**		
Edge detection – Thresholding - Region Based segmentation – Boundary representation: chair codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors –Simple descriptors- Texture.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**				**Total Hours: 60**		
Text Books:								
1. Rafael C Gonzalez, Richard E Woods, 2nd Edition, Digital Image Processing - Pearson Education 2003.								
Reference Books:								
1. William K Pratt, Digital Image Processing John Willey (2001) 2. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999). 3. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing. 4. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India, 2000								

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Semester :			**Category :** TA					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP08	Computer Networks	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	The objective of the course is to study about the various network models, protocols and standards that provide guidelines to manufacturers, vendors ,government agencies and other service providers to ensure the kind of inter-connectivity necessary in today's marketplace and in international communications.							
Outcome	At the end of the course a knowledge of the seven layer ISO/OSI model, types of connections, like transmission media available such as coax and fiber optic cables, line coding, modems, RS-232 interfaces at the physical layer is acquired. Also an exposure to the various error correction and detection techniques, flow and error control protocols and the various LAN topologies , the different switching , routing and addressing methods are also obtained.							
UNIT – I	**Data Communications**				**Hours: 12**			
Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies –Protocols and Standards – ISO / OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences								
UNIT – II	**Data Link Layer**				**Hours: 12**			
Error – detection and correction – Parity – LRC – CRC – Hamming code – low Control and Error control - stop and wait – go back-N ARQ – selective repeat ARQ- sliding window – HDLC - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11 – FDDI - SONET – Bridges.								
UNIT – III	**Network Layer**				**Hours: 12**			
Internetworks – Packet Switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers								
UNIT – IV	**Transport Layer**				**Hours: 12**			
Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services.								
UNIT – V	**Application Layer**				**Hours: 12**			
Domain Name Space (DNS) – SMTP – FTP – HTTP - WWW – Security – Cryptography.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

Reference Books:

1. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education, 2003.
2. Larry L.Peterson and Peter S. Davie, Computer Networks, Harcourt Asia Pvt. Ltd., Second Edition.
3. Andrew S. Tanenbaum, Computer Networks, PHI, Fourth Edition, 2003.
4. William Stallings, Data and Computer Communication, Sixth Edition, Pearson Education, 2000.

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)						
Semester :			**Category :** TA						
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**		
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP09	Design of Process Control System Components		3	1	-	4	40	60	100
Prerequisite	-								
Objectives	• To understand the health and safety implications of working with process control systems • To know the operation of typical instrumentation systems • To Identify the various methods of signal transmission								
Outcome	• Be able to interpret and formulate design specifications for instrumentation systems that meet accuracy and sampling speed requirements. • Be able to design, construct, and verify an instrumentation system to meet desired specifications • Be familiar with safety issues concerning design of instrumentation, including the effects of electric current through tissue and defibrillation.								
UNIT – I		**Hours: 12**							
Orifice meter - design of orifice for given flow condition - design of rotameter - design of RTD measuring circuit - design of cold junction compensation circuit for thermocouple using RTD - Transmitters – zero and span adjustment in D/P transmitters and temperature transmitters.									
UNIT – II		**Hours: 12**							
Bourdon gauges - factors affecting sensitivity - design aspect of Bourdon tube -design of Air purge system for level measurement. Electronic P+I+D controllers - design - adjustment of set point, bias and controller settings.									
UNIT – III		**Hours: 12**							
Control valves - characteristics of control valves - types of valve bodies - valve characteristics - materials for body and trim - sizing of control valves - cavitations, flashing in control valves- selection of body materials and characteristics of control valves for typical applications.									
UNIT – IV		**Hours: 12**							
Types of pumps - pump performance - Different types of pump systems- characteristics of pump system-pressure , friction and flow - pump operation - maintenance - instruments used in pumping practice - pump noise and vibration - selection of pumps.									
UNIT – V		**Hours: 12**							
Interlocks and alarms: Interlock design principles, fail-safe design - alarms and their types.Design of logic circuits for alarm and annunciator circuits, interlocks design.									
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**	**Total Hours: 60**						
Text Books:									
1. N.A.Anderson, Instrumentation for Process Measurement and Control, Chilton Company, 1980. 2. D.M.Considine, Process Instruments and Controls Handbook,McGraw-Hill., 1985.									
Reference Books:									
1. R.H.Warring, Pumping Manual, Gulf Publishing Co., 1984. 2. J.P.Bentley, Principles of Measurment Systems, Longman Inc., 1983. 3. C.D. Johnson, Process Control Instrumentation Technology, Prentice Hall of India, 1998.									

Department: Electronics and Instrumentation Engineering					**Programme:** B.Tech. (EI)			
Semester :					**Category :** TA			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP10	Fibre Optics and Laser Instrumentation	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To study in detail about the application of optical fibres in industries • To study about the fundamentals of laser and its applications in industry and medical							
Outcome	• The students will have insight on theory and applications of fibre optics and laser industry and medical field							
UNIT – I	**Optical Fibres and Their Properties**				**Hours: 12**			
Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics - Absorption losses - Scattering losses - Dispersion - Connectors & Splices - Optical Sources - Optical detectors.								
UNIT – II	**Industrial Applications of Optical Fibres**				**Hours: 12**			
Fibre Optic Sensors - Fibre Optic Instrumentation System – Electro optic, Acousto-optic and Travelling Wave Modulators - Interferometric Method of Measurement of Length – Moire fringes – Measurement of Pressure, Temperature, Current, Voltage, Liquid level and Strain.								
UNIT – III	**Laser Fundamentals**				**Hours: 12**			
Fundamental Characteristics of Lasers – Three level and Four level Lasers - Properties of Lasers - Laser Modes - Resonator Configuration – Q-Switching and Mode locking – Cavity dumping - Types of Lasers – Gas lasers, Solid lasers, Liquid lasers, Semiconductor lasers.								
UNIT – IV	**Industrial Applications of Lasers**				**Hours: 12**			
Laser for measurement of Distance, Length, Velocity, Acceleration, Current, Voltage and Atmospheric Effect - Material Processing - Laser heating, Welding, Melting and Trimming of Material - Removal and Vaporization.								
UNIT – V	**Hologram and Medical Applications**				**Hours: 12**			
Holography - Basic Principle - Methods - Holographic interferometry and applications, Holography for non-destructive testing - Medical Applications of Lasers, Lasers and Tissue interaction - Laser Instrumentations for surgery, Removal of Tumours of Vocal cords, Brain surgery, Plastic surgery.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. G.Keiser, Optical Fibre Communication, McGrawHill, 1995.
2. Ajoyghatak K.Thyagarajan, Optical Electronics, Cambrige University Press, 2009.

Reference Books:

1. J.M.Senior, OFC – Principles and Practice,PH1,1985.
2. J.Wilson and J.F.Bhawkes, Introduction to Optical Electronics, PH1, 2001.
3. Dr.Manjeet Singh, Lasers – Theory, Principles and Applications, VEI, Vayn Education India, 2011.
4. Mr.Gupta, Fibre Optics Communication, PH1, 2004.

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EI P11	Instrumentation Control in Petrochemical Industries		4	0	-	4	40	60	100
Prerequisite	-								
Objectives	• To introduce the methods of crude oil extraction, processing and refining. • To educate on Unit operations in petroleum refinery and petrochemical industry • To introduce Production routes of important petrochemicals • To provide knowledge on Control of selected petrochemicals production processes. • To educate on the safety in instrumentation systems								
Outcome	• The student will be able understand and explain different Measurements and analyze instrumentation systems in refineries and petrochemical industries. • Necessity of Safety in instrumentation systems • Apply the advanced control techniques in refineries								
UNIT – I	**Oil Extraction and Processing**	**Hours: 12**							
Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system – Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil – control loops in oil gas separator - scrubber – coalesce.									
UNIT – II	**Petroleum Refining**	**Hours: 12**							
Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking -catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum.									
UNIT – III	**Chemicals from Petroleum**	**Hours: 12**							
Chemicals from methane, acetylene, ethylene and propylene - production routes of important petrochemicals such as polyethylene, polypropylene, ethylene dioxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC.									
UNIT – IV	**Control Loops in Petrochemical Industry**	**Hours: 12**							
Control of binary and fractional distillation columns - Control of catalytic and thermal crackers – control of catalytic reformer - control of alkylation process - Control of polyethylene production – Control of VCM and PVC production									
UNIT – V	**Safety in Instrumentation Systems**	**Hours: 12**							
Area and material classification as per National Electric Code (NEC) - Classification as per International Electro technical Commission (IEC) -Techniques used to reduce explosion hazards - Pressurization techniques - Type X, Type Y and Type Z - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit.									
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 45**						

Text Books:

1. Balchen J.G and Mumme K.I., Process Control Structures and Applications, Von Nostrand Reinhold Company, New York, 1988.
2. Ram Prasad, Petroleum Refining Technology, Khanna Publishers, New Delhi, 2000.

Reference Books:

1. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company, 2005.
2. Waddams A.L., Chemicals from Petroleum, Butter and Janner Ltd., 1968.
3. www.scribd.com/doc/2336259/ABB-Oil-Gas-production-Hand-Book.
4. Considine M. and Ross S.D., Handbook of Applied Instrumentation, McGraw Hill,1964.

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP12	System Identification and Adaptive Control		4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To introduce Non parametric methods • To impart knowledge on parameter estimation methods • To impart knowledge on Recursive identification methods • To impart knowledge on Adaptive control schemes • To introduce stability, Robustness and Applications of adaptive control method							
Outcome	• Ability to apply advanced control theory to practical engineering problems							
UNIT – I	**Non Parametric Methods**					**Hours: 12**		
Non parametric methods: Transient analysis–frequency analysis–Correlation analysis–Spectral analysis								
UNIT – II	**Parameter Estimation Methods**					**Hours: 12**		
Least square estimation – best linear unbiased estimation under linear constraints – updating the parameter estimates for linear regression models–prediction error methods: description of prediction methods – optimal prediction – relation between prediction error methods and other identification methods – theoretical analysis - Instrumental variable methods: Description of instrumental variable methods – Input signal design for identification.								
UNIT – III	**Recursive Identification Methods**					**Hours: 12**		
The recursive least square method – the recursive instrumental variable methods- the recursive prediction error methods – Maximum likelihood. Identification of systems operating in closed loop: Identification considerations – direct identification – indirect identification								
UNIT – IV	**Adaptive Control Schemes**					**Hours: 12**		
Introduction – Types of adaptive control–Gain scheduling controller–Model reference adaptive control schemes–Self tuning controller–MRAC and STC: Approaches–The Gradient approach – Lyapunov functions – Passivity theory – pole placement method – Minimum variance control – Predictive control								
UNIT – V	**Issues Inadaptive Control and Applications**					**Hours: 12**		
Stability – Convergence – Robustness –Applications of adaptive control.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**				**Total Hours: 60**		

Text Books:

1. Soder storm T and Peter Stoica, System Identification, Prentice Hall International, 1989.
2. Astrom,K.J. and Wittenmark,B., Adaptive Control, Pearson Education, 2nd Edition, 2001.
3. Sastry,S. and Bodson, M., Adaptive Control– Stability, Convergence and Robustness, Prentice Hall inc., New Jersey, 1989.

Reference Books:

1. Ljung L, System Identification: Theory for the user, Prentice Hall, Engle wood Cliffs,1987.
2. Bela.G.Liptak., Process Control and Optimization, Instrument Engineers' Handbook., volume 2, CRC press and ISA, 2005.
3. William S.Levine, Control Systems Advanced Methods, The Control Handbook, CRC Press 2011

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Semester :		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP13	Virtual Instrumentation	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To study background information required for studying virtual instrumentation. • To study the basic building blocks of virtual instrumentation. • To study the various techniques of interfacing of external instruments of PC. • To study the various graphical programming environment in virtual instrumentation. • To study a few applications in virtual instrumentation.							
Outcome	• The student will be able to develop virtual instruments for industrial applications							
UNIT – I	**Review of Digital Instrumentation**				**Hours: 12**			
Representation of analog signals in the digital domain – Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.								
UNIT – II	**Fundamentals of Virtual Instrumentation**				**Hours: 12**			
Concept of virtual instrumentation – PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency - Multiplexing of analog inputs – Single-ended and differential inputs – Different strategies for sampling of multi-channel analog inputs. Concept of universal DAQ card - Use of timer-counter and analog outputs on the universal DAQ card.								
UNIT – III	**Cluster of Instruments in VI System**				**Hours: 12**			
Interfacing of external instruments to a PC – RS 232, RS 422, RS 485 and USB standards - IEEE 488 standard – ISO-OSI model for serial bus – Introduction to bus protocols of MOD bus and CAN bus.								
UNIT – IV	**Graphical Programming Environment in VI**				**Hours: 12**			
Concepts of graphical programming – LabVIEW software – Concept of VIs and sub VI - Display types – Digital – Analog – Chart – Oscilloscopic types – Loops – Case and sequence structures - Types of data – Arrays – Formulae nodes –Local and global variables – String and file I/O.								
UNIT – V	**Analysis Tools and Simple Applications in VI**				**Hours: 12**			
Fourier transform - Power spectrum - Correlation – Windowing and filtering tools – Simple temperature indicator – ON/OFF controller – P-I-D controller - CRO emulation - Simulation of a simple second order system – Generation of HTML page.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. S. Gupta and J.P Gupta, PC Interfacing for Data Acquisition and Process Control, Instrument society of America, 1994.
2. Peter W. Gofton, Understanding Serial Communications, Sybex International.
3. Robert H. Bishop, Learning with LabVIEW, Prentice Hall, 2003.

Reference Books:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newness, 2000.
2. Gary W. Johnson, Richard Jennings, LabVIEW Graphical Programming, McGrawHill Professional Publishing, 2001.

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Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP14	Advanced Control Theory		3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• To provide knowledge on design in state variable form • To provide knowledge in phase plane analysis. • To give basic knowledge in describing function analysis. To study the design of optimal controller.							
Outcome	• Ability to apply advanced control theory to practical engineering problems.							
UNIT – I	**State Variable Design**					**Hours: 12**		
Introduction to state Model- effect of state Feedback- Necessary and Sufficient Condition for Arbitrary Pole-placement- pole placement Design- design of state Observers- separation principle								
UNIT – II	**Phase Plane Analysis**					**Hours: 12**		
Features of linear and non-linear systems - Common physical non-linearities – Methods of linearization Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method								
UNIT – III	**Describing Function Analysis**					**Hours: 12**		
Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – limit cycles – Stability of oscillations.								
UNIT – IV	**Stability**					**Hours: 12**		
Stability concepts - Equilibrium points - BIBO and asymptotic stability,Lyapunov Theory, Definitions (Stability and Functions). Direct method of Lyapunov,Application to non-linear problems. Stability analysis by describing function method –jump resonance. Frequency domain stability criteria, Popov's method and its extensions								
UNIT – V	**Optimal Control**					**Hours: 12**		
Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti's equation – Application examples.								
Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**				**Total Hours: 60**		

Text Books:

1. K. P. Mohandas, Modern Control Engineering, Sanguine Technical Publishers, 2006.
2. G. J. Thaler, Automatic Control Systems, Jaico Publishing House 1993.
3. M.Gopal, Modern Control System Theory, New Age International Publishers, 2002.

Reference Books:

1. William S Levine, Control System Fundamentals, The Control Handbook, CRC Press, Tayler and Francies Group, 2011.
2. Ashish Tewari, Modern Control Design with Matlab and Simulink, John Wiley, New Delhi, 2002.
3. K. Ogata, Modern Control Engineering, 4th Edition, PHI, New Delhi, 2002.
4. T. Glad and L. Ljung, Control Theory –Multivariable and Non-Linear Methods, Taylor & Francis, 2002.
5. D.S.Naidu, Optimal Control Systems, First Indian Reprint, CRC Press, 2009.

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Semester :		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIE15	Advanced Digital Signal Processing	3	1	-	4	40	60	100
Prerequisite	Digital Signal Processing							
Objective	• To learn methods of power spectral estimation using nonparametric and parametric methods • Provide the students the fundamentals of estimation • Impart an understanding of adaptive filters • Introduce Multirate signal Processing							
Outcome	• Students will have an understanding in analysis of signals and systems using advanced techniques in digital signal processing							
UNIT – I	**Frequency Domain Analysis of Signals and System and Digital Filters**				**Hours: 12**			
Introduction, Discrete time Fourier Transform – Frequency response of LTI systems, Discrete Fourier Transform, Fast Fourier Transform Algorithms – Decimation in time and Decimation in Frequency algorithm, Digital Filters – Introduction to FIR filter, IIR filter.								
UNIT – II	**Random Signal Processing and Spectrum Estimation**				**Hours: 12**			
Discrete Random Processes, Expectations, Variance, Parseval's Theorem, Wiener Khintchine Relation - Power Spectral Density - Periodogram – Sample Autocorrelation - Sum Decomposition Theorem, Spectral Factorization Theorem Non-Parametric Methods-Correlation Method - Co-Variance Estimator - Consistent Estimators-Periodogram Estimator-Barlett Spectrum Estimation-Welch Estimation-Model based Approach - AR, MA, ARMA signal Modeling-Parameter Estimation using Yule-Walker Method								
UNIT – III	**Linear Estimation and Prediction**				**Hours: 12**			
Maximum likelihood criterion-efficiency of estimator-Least mean squared error criterion - Wiener filter-Discrete Wiener Hoff equations-Recursive estimators-Kalman filter-Linear prediction, prediction error-whitening filter, inverse filter-Levinson recursion, Lattice realization, and Levinson recursion algorithm for solving Toeplitz system of equations								
UNIT – IV	**Adaptive Filters**				**Hours: 12**			
FIR adaptive filters-Newton's steepest descent method - adaptive filter based on steepest descent method-Widrow Hoff LMS adaptive algorithm- Adaptive channel equalization-Adaptive echo chancellor-Adaptive noise cancellation-RLS adaptive filters-Exponentially weighted RLS-sliding window RLS-Simplified IIR LMS adaptive filter.								
UNIT – V	**Multirate Digital Signal Processing**				**Hours: 12**			
Mathematical description of change of sampling rate - Interpolation and Decimation - continuous time model - Direct digital domain approach - Decimation by an integer factor - Interpolation by an integer factor - Single and multistage realization - poly phase realization - Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.								
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books

1. Monson H.Hayes, " Statistical Digital Signal Processing and Modeling ", John Wiley and Sons, Inc., New York, 1996.
2. John G.Proakis, Dimitris G.Manolakis, " Digital Signal Processing ", Prentice Hall of India, 1995.

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Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP16	Biomedical Instrumentation		4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To learn the physiology of the human body and the Instrumentation related to Biomedical Systems • To introduce the concepts of physiology and the Electrical Components of a Biomedical System. • To discuss the measurement of physiological parameters. • To understand the concepts of Imaging System and Telemetry and the various Therapeutic Equipment's used in Medicine							
Outcome	• Students will have an understanding of physiology of the human body and different biomedical equipments used in medical field							
UNIT – I	**Phsyiology**					**Hours: 12**		
Cell Structure, Basic Cell functions, Sources of Biomedical signals, Physiology of Cardiovascular, Nervous system & Respiratory system. Special senses: Auditory & Vision System, Engineering Analogy of Physiological system, Difficulties faced in measuring a living system.								
UNIT – II	**Basic Components Of Biomedical System**					**Hours: 12**		
Bio potential electrodes, Electrode-electrolyte interface, Half-cell Potential, Electrodes-Micro needle and surface electrodes. Various biomedical transducers. Bio-signal Amplifiers - Differential amplifiers, Chopper amplifiers, Notch Filters - Electrical Safety of Medical Equipment and Patients.								
UNIT – III	**Measurement of Physiological Parameters**					**Hours: 12**		
ECG– ECG Lead systems and recording methods - EEG- EMG – Measurement of blood pressure-Cardiac output - Heart sounds - Respiratory rate - Lung Volumes and Capacities – Pneumotachography, Flow rate of CO_2, O_2 in exhaust air - pH of blood, GSR measurements- Plethysmography								
UNIT – IV	**Imaging System and Telemetry**					**Hours: 12**		
Ultrasound scanner – X-Ray Imaging - CAT / CT scan –MRI Imaging – PET scan. Basic elements of a Biotelemetry system - Single / Multi channel Telemetry Systems – Implanted transmitters – Telemedicine								
UNIT – V	**Assisting and Therapeutic Equipments**					**Hours: 12**		
Electrotherapy – Diathermy – Pacemakers - Defibrillators – Heart Lung Machine - Audiometry - Hearing aid – Dialysis machine-Ventilators-Endoscopes.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**				**Total Hours: 60**		
Text Book:								
1. R. Anandanatarajan, Biomedical Instrumentation and Measurements, PHI Learning, 2011.								
Reference Books:								
1. Leslie Cromwell, Fred. J. Weibull, Biomedical Instrumentation and Measurements, 2nd Edition, PHI, 2003. 2. John Webster, Medical Instrumentation: Application and Design, 3rd Edition, Wiley Publishing, 2009.								

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Semester :				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP17	VLSI Design	3	1	-	4	40	60	100
Prerequisite	Digital Logic Design							
Objectives	• To introduce Digital VLSI design concepts and to introduce IC designing using Field Programmable Gate Arrays. • To impart skill set in VHDL Hardware Description Language and understand real time modeling of ICs with test benches.							
Outcome	• Foundational skill set in CMOS technology and logic implementation using CMOS. • Basics of VHDL hardware description language and VHDL levels of abstraction. • Working knowledge of VHDL programming using concurrent architecture • Designing complex digital systems using component instantiation. • Working knowledge of test bench development.							
UNIT – I	**Review of IC Technologies**				**Hours: 12**			
Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies- Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design-Gate realization using CMOS-Introduction to Chip Design Process- Evolution of Computer Aided Digital Design - Hardware Description Languages- Introduction to Reconfigurable Hardware -FPGA and CPLD basics- Applications of VLSI.								
UNIT – II	**Introduction to VHDL**				**Hours: 12**			
VHDL basics - VHDL levels of abstraction – Structural , Behavioral and dataflow modes of implementation- The VHDL design flow - VHDL design entities - Entity declarations - Architectures –Concurrent signal assignments - Signal assignments with delays – Signal and variable assignments -Sequential statements - VHDL process statements - sensitivity lists – Conditional statements – loops - selective signal assignments.								
UNIT – III	**System Implementation Using VHDL**				**Hours: 12**			
Component declarations - Component instantiation - Named port mapping – Positional port mapping –Packages - Package declaration - Package body. Test Bench Development in VHDL- Simple Test Benches. Modeling hardware in VHDL - VHDL models for multiplexers, Encoders, Decoders, Parity Generators – combinational circuit implementation - VHDL Synthesis.								
UNIT – IV	**Introduction to Verilog**				**Hours: 12**			
VERILOG HDL Design Flow-Module Description -Lexical Conventions - Description of Data types - Net - Register-Scalar Data Description - Vector Data Description -Parameters description - Array Description - Gate level Modeling -Dataflow modeling - Behavioral Modeling -Switch level Modeling								
UNIT – V	**System Implementation Using Verilog**				**Hours: 12**			
Structured Procedural Statements-Always Statements-Initial Statements. Conditional statements Loops - Block Statements - Parallel block - Sequential block. VERILOG HDL implementation for combinational and Sequential digital circuits – Test Bench Implementation – Synthesis using VERILOG.								
Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. J. Bhasker ,VHDL Primer, Prentice Hall, 2006.
2. J. Bhasker,Verilog HDL Synthesis-A Practical Primer, Star Galaxy Publications,1998.

Reference Books:

1. Chip Design for Submicron VLSI: CMOS Layout & Simulation, - John P.Uyemura, Thomson Learning.
2. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley,2003.
3. Digital Integrated Circuits - John M. Rabaey, PHI, EEE, 1997.
4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech. (EI)					
Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP18	Robotics and Automation		3	1	-	4	40	60	100
Prerequisite	-								
Objectives	• To introduce the design of multi degree-of-freedom robots and mobile platforms. • To review of the latest technology available to design robotic systems. • To design robots using professional engineering tools. • To learn programming of microcontrollers to control a robotic system. • To have Hands-on experience to design a robotic system.								
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 • Develop an engineering report and demonstrate the robot's performance.								
UNIT – I	**Introduction**						**Hours: 12**		
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	**End Effectors**						**Hours: 12**		
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 – III	**Robot Control**						**Hours: 12**		
Control of robot manipulators- state equations-constant solutions-linear feedback systems-single axis PID control-PD gravity control- computed torque control- variable structure control- Impedance control .									
UNIT – IV	**Robot Motion Analysis**						**Hours: 12**		
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**						**Hours: 12**		
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.									
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**				**Total Hours: 60**			

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

Department: Electronics and Instrumentation Engineering					**Programme:** B.Tech. (EI)			
Semester :					**Category :** TA			
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP19	Industrial Electronics	3	1	-	4	40	60	100
Prerequisite	-							
Objectives	• This course will provide the community qualified graduates prepared to repair, install and maintain electrical and electronic equipment used in the manufacturing and service industries.							
Outcome	• Employ safety procedures presently being used in local manufacturing environments. • Communicate effectively using the appropriate written or oral techniques. • Modify or repair currently used manufacturing systems to operate in accordance with industry requirements and standards. • Perform maintenance and troubleshooting functions							
UNIT – I	**Regulated Supplies and SCRS**				**Hours: 12**			
Switched Mode Voltage Regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators, Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators, Current boosting. Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors, Classes A, B, C, D, E and F, Ratings of SCR.								
UNIT – II	**Applications of SCR-I**				**Hours: 12**			
Static circuit breaker, Protection of SCR, Inverters, Classification, Single Phase inverters, Converters , single phase Half wave and Full wave. Chopper circuits, Principle, methods and Configurations, Diac and Triac – Triggering modes, Firing Circuits, Commutation								
UNIT – III	**Applications of SCRS-II**				**Hours: 12**			
Voltage compensator – solid state DC voltage regulation – DC shunt motor – armature control and field control of motor speed – electronic control of DC motor – speed regulator action – full wave motor speed regulation by one SCR								
UNIT – IV	**Industrial Timers**				**Hours: 12**			
Industrial timers -Classification, types, Electronic Timers, Classification, RC and Digital timers, Time base Generators. Electric Welding , Classification, types and methods of Resistance and ARC wielding								
UNIT – V	**Industrial Heating Applications**				**Hours: 12**			
High Frequency heating, principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating, principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics, Generation and Applications.								
Total contact Hours: 45	**Total Tutorials: 15**	**Total Practical Classes: -**			**Total Hours: 60**			
Text Books:								
1. G.K. Mithal and Maneesha Gupta, Industrial and Power Electronics, Khanna Publishers, 19th Ed., 2003.								
Reference Books:								
1. M. Ramamurthy, Thyristors and applications, East-West Press, 1977. 2. S.K. Bhattacharya and S.chatterjee, Industrial electronics and control, Tata Me Graw Hill, 1995 3. Frank D. Petruzella, Industrial Electronics, McGraw Hill International Editions, 1996								

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech. (EI)						
Semester :		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIP20	Digital Control Systems	3	1	-	4	40	60	100
Prerequisite	Control Systems							
Objectives	• To understand digital feedback control systems. • To develop a knowledge of constructing discrete-time mathematical model system. • To develop a knowledge of analyzing the system behaviour using discrete-time model and evaluating the system performance. • To develop knowledge to use controller design techniques to make the system behaviour satisfies specified design objectives.							
Outcome	• Students will have the basic knowledge of digital feedback control systems • Students will have the knowledge analyzing the system behaviour using discrete-time model and evaluating the system • Students will have knowledge of digital control design • Students will have the ability to evaluate and test the system performance using digital simulations							
UNIT – I	**Introduction to Digital Control**				**Hours: 12**			
Introduction-Discrete time system representation -Mathematical modeling of sampling process Data reconstruction -Modeling discrete-time systems by pulse transfer function, Revisiting Z-transform, Mapping of s-plane to z-plane, Pulse transfer function, Pulse transfer function of closed loop system Sampled signal flow graph Stability analysis of discrete time systems, Jury stability test, Stability analysis using bi-linear transformation.								
UNIT – II	**Response of discrete time systems**				**Hours: 12**			
Time response of discrete systems, Transient and steady state responses, Time response parameters of a prototype second order system, Deadbeat response design, Design of digital control systems with deadbeat response , Practical issues with deadbeat response design, Sampled data control systems with deadbeat response.								
UNIT – III	**Digital Control System Design**				**Hours: 12**			
Design of sampled data control systems, Root locus method, Controller design using root locus, Root locus based controller design using MATLAB, Nyquist stability criteria, Bode plot, Lead compensator design using Bode plot, Lag compensator design using Bode plot, Lag-lead compensator design in frequency domain.								
UNIT – IV	**Discrete State Space Model**				**Hours: 12**			
Introduction to state variable model Various canonical forms Characteristic equation, state transition matrix Solution to discrete state equation, Controllability, observability and stability of discrete state space models Controllability and observability, Stability : Lyapunov stability theorem								
UNIT – V	**State Feedback Design**				**Hours: 12**			
State feedback design, Pole placement by state feedback, Set point tracking controller, Full order observer, Reduced order observer, Output feedback design, Theory Examples, Introduction to optimal control, Basics of optimal control , Performance indices, Linear Quadratic Regulator (LQR) design								
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. B. C. Kuo, Digital Control Systems, Oxford University Press, 2/e, Indian Edition, 2007.
2. M. Gopal, Digital Control and State Variable Methods, Tata McGraw Hill, 2/e, 2003.

Reference Books:

1. K. Ogata, Discrete Time Control Systems, Prentice Hall, 2/e, 1995.
2. G. F. Franklin, J. D. Powell and M. L. Workman, Digital Control of Dynamic Systems.
3. Addison Wesley, 1998, Pearson Education, Asia, 3/e, 2000. K. J. Astroms and B.
4. Wittenmark, Computer Controlled Systems - Theory and Design, Prentice Hall, 3/e,1997.

Department: Electronic and Instrumentation Engineering		Programme : B. Tech. EIE						
Semester:		Category: TA						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
EIP21	Signals and Systems	3	1	0	4	40	60	100
Prerequisite								
Objective:	• To understand the fundamentals of signals, systems and their classification • To study Fourier series , Fourier transform, Laplace transforms and their applications in continuous-time signal and system analysis • To learn about sampling theorem and aliasing effects. • To study DTFS, DTFT, Z-transforms and their applications in discrete-time signal and system analysis							
Outcome:	• Understand about signals, systems and their classification • Will able to analyze the signals and systems in frequency domain • Will acquire thorough knowledge on sampling concepts • Analyze CT and DT systems using Laplace transforms and Z-Transforms							
UNIT – I	Introduction to signals and systems					Hours: 12		
Classification of signals – Continuous-time signal and discrete-time signals – periodic and aperiodic signals – even and odd signals – energy and power signals – deterministic and random signal. Basic operations on signals-. Types of signals – exponential, sinusoidal, step, impulse and ramp. System –Classification of systems : Linear, Nonlinear, static, dynamic, time –invariant, time variant, causal and non-causal, stable and unstable systems.								
UNIT – II	Fourier Series and Fourier transform					Hours: 12		
Trigonometric Fourier series and Exponential Fourier series, Dirichlet's conditions, Complex Fourier spectrum -properties of Fourier series, , Deriving Fourier transform from Fourier series, Fourier transform of standard signals, properties of Fourier transforms, frequency response of a system, Sampling theorem. Aliasing effect, Discrete-Fourier series-Properties-DTFT-properties-frequency response –transfer function.								
UNIT – III	Analysis of continuous-time and discrete-time systems					Hours: 12		
Analysis of continuous-time and discrete-time systems-: Linear system, -representation of an arbitrary CT and DT signals- impulse response of CT and DT systems -convolution -properties-convolution integral- convolution sum-causality and stability - Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation								
UNIT – VI	LAPLACE TRANSFORMS					Hours: 12		
Review of Laplace transforms, , Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of Laplace transform-relation between lapalce transform and Fourier transform, Laplace transform of certain signals using waveform synthesis. Inverse Laplace transform, Partial fraction expansion, Solutions of differential equation using Laplace transform, Transfer function-stability-State space representation								
UNIT – V	Z–TRANSFORMS					Hours: 12		
Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, properties of z-transform-Inverse Z-transform, Solution of difference equations using z- transform, system function-stability- State space representation.								
Total contact Hours: 45	Total Tutorials: 15	Total Practical Classes: 00			Total Hours: 60			

Text Books:

1. Allan V.Oppenheim, “Signals and systems”, Prentice Hall of India, 2011.
2. Roger E.Ziemer, “Signals and Systems Continuous and discrete”, McMillan, 2008

Reference Books:

1. P.Ramesh Babu & R.Ananda Natrajan, Signals and Systems, Fourth Edition, Scitech Publications (India) Pvt. Ltd.,2014
2. Signals and Systems- Narayan Iyer and K Satya Prasad , Cenage Learning, 2011

CA – Continuous Assessment, **SE** – Semester Examination, **TM** – Total Marks

Department: Electronic and Instrumentation Engineering		Programme : B. Tech. EIE						
Semester:		Category: TA						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
EIP22	Network Analysis and Synthesis	3	1	0	4	40	60	100
Prerequisite								
Objective:	• To study Fourier analysis of circuits • To learn about network functions and understand stability concepts in time domain and frequency domain • To design different types of passive filters, attenuators and equalizers • To learn elements of network synthesis							
Outcome:	• Will be able to analyze the circuits in frequency domain • Will acquire thorough knowledge on network functions and stability of networks • Will be able to design all types of filters, attenuators • Synthesize the networks for the given network functions							
UNIT – I	Fourier Analysis of Networks					Hours: 12		
Review of transient analysis-Response to step and sinusoidal inputs - Fourier series representation of periodic inputs - Trigonometric and complex forms - Response of circuits to non-sinusoidal periodic inputs. Fourier transform of important functions-Properties of Fourier transform- Transfer function-Circuit Analysis using Fourier transform.								
UNIT – II	Network Functions					Hours: 12		
Concept of Complex Frequency, Transform Impedances, Network function of one port and two port networks, Concept of poles and zeros, Relation between locations of poles. Necessary conditions for driving point functions, Transfer function, and Necessary condition for transfer functions-Convolution Integral-Time response and stability. Frequency response. Interrelation between frequency response and convolution integral.								
UNIT – III	Passive Filters					Hours: 12		
Classification of filters - Analysis of a proto type low pass filter and High pass filters- Analysis of a proto type Band pass and Band stop filters- constant K filters - m-derived filters – BPF and BSF-Lowpass filter with RL and RC sections-High pass filter with RC and RL Sections-Band pass filter with RLC circuits.								
UNIT – VI	Attenuators and Equalizers					Hours: 12		
Attenuators – Types of Attenuators, Symmetrical and asymmetrical Attenuators- section and Pi sections- Equalizers –Inverse Impedance-Two terminal Equalizers- Four terminal Equalizers								
UNIT – V	ELEMENTS OF NETWORK SYNTHESIS					Hours: 12		
Reliability of one port networks - Hurwitz polynomials - Positive Real function - Necessary and sufficient conditions of PR function - Properties of driving point impedance - Synthesis of LC,RL and RC driving point impedance, Foster and Cauer forms.								
Total contact Hours: 45	Total Tutorials: 15	Total Practical Classes: 00			Total Hours:60			
Text Books:								
1. Shyam Mohan S.P., Sudhakar A, "Circuits and Network Analysis &Synthesis", Tata McGraw Hill, 2007. 2. M.E. Valkenburg, Network Analysis, Pearson Education; 3rd edition (2015)								
Reference Books: 1. K.Satya Prasad and S Sivanagaraju, Network Analysis, Cengage Learning, 2011 2. Smarajit Ghosh, "Network Theory, Analysis and Synthesis, PHI, 2011								

CA – Continuous Assessment, **SE** – Semester Examination, **TM** – Total Marks

Department: Electronic and Instrumentation Engineering		Programme : B. Tech. EIE						
Semester:		Category: TA						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
EIP23	Product Design and Development	4	0	0	4	40	60	100
Objective	• To know the fundamentals of product design, product planning • To understand about product development economics and schedule • To learn about submission of project proposal and financial model							
Outcome	• The student will be able to design a product his area of study.							
Unit-I	Product Design Hours: 12							
	Product Design: Introduction. Product Planning. Identifying Customer Needs. Project Selection, Concept Generation. Concept Testing, Concept Selection.							
Unit-II	Product Specification Hours: 12							
	Product Specification, Product Architecture, Industrial Design, Robust Design, Product Development Economics, Design for Manufacturing, Supply Chain Design, Intellectual Property, Design for Environment.							
Unit-III	Product Development Schedule Hours: 12							
	Product Development Schedule: Customer base for customer needs survey, Project Proposal, Mission statement and customer needs, Concepts sketch and target specification, Preliminary concept selection, Drawings, plans and revised schedule, financial model and patent review.							
Unit-IV	Design Reviews Hours: 12							
	Product time-line, Design Reviews, Preliminary Design Review, Critical Design Review, Design Validation.							
Unit- V	Prototyping Hours: 12							
	Submission and Evaluation of Alpha prototype and test report, Beta prototype and customer evaluation, demonstration of working model.							

Text Books:

1. Karl T. Ulrich and Steven D. Eppinger, "Product Design and Development", 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0-07-058513-X
2. Kevin Otto and Kristin Wood, "Product Design", Pearson Education, 2003, ISBN:8129702711.

CA – Continuous Assessment, **SE** – Semester Examination, **TM** – Total Marks

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech.					
Semester :			**Category :** TA					
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIG01	System Design using Advanced Microcontroller	3	1	-	4	40	60	100
Prerequisite	Microprocessor and Applications							
Objectives	• To introduce system design concepts to students using Advanced microcontrollers. • To introduce ARM Architecture and LPC2148 microcontroller • To introduce Real time operating systems and its implications.							
Outcome	• Design considerations for system level implementation. • Knowledge of LPC2148 Microcontroller hardware features and internal peripherals. • Programming knowledge of LPC2148 microcontrollers. • Using real time operating systems for Real time systems.							
UNIT – I	**Introduction to LPC2148 Microcontroller**				**Hours: 12**			
Background of ARM Architecture – LPC2148 microcontroller introduction – Peripheral features - Bus Structure – Memory Map - Memory Accelerator Module – Boot Loader – In application programming – PLL and VLSI Bus Divider – Power Control - Software development using Embedded 'C' – Development Tools.								
UNIT – II	**LPC2148 Microcontroller Operation**				**Hours: 12**			
General Purpose IO – Timer Operation – Prescalar – Timer Capture and Compare modes – PWM Modulator – Real Time Clock – Watch Dog Timer – Interrupt Structure – FIQ Interrupt – Vectored IRQ – Non–Vectored Interrupts – ISR.								
UNIT – III	**LPC2148 Advanced Peripherals**				**Hours: 12**			
UART operation – I2C operation – SPI Interface - Analog to Digital Converter – Digital to Analog Converter – CAN Controller – USB Interface.								
UNIT – IV	**System Design Using LPC2148**				**Hours: 12**			
Design of Simple I/O systems using Switches, LEDs, Buzzers - Current source and sink concepts - Interfacing Character and Graphical LCD Displays – DC Motor Speed Control System – Speed Measurement – Design of Digital Frequency meter - Stepper Motor Interfacing – Relays – Keypads - Interfacing SD cards and touch screens–PC based Control systems								
UNIT – V	**Real Time Operating Systems**				**Hours: 12**			
Concept of Scheduling – Round Robin and Preemptive scheduling – Implementing a simple scheduler in 'C' - Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Message queues- Events-Memory Management, Interrupt Routines in an RTOS environment, Implementing SD card – Graphical LCD system using RTOS.								
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**			**Total Hours: 60**			

Text Books:

1. David E Simon, An embedded software primer, Pearson education Asia, 2001.
2. Trevor Martin, The Insider's Guide to the Philips ARM7-Based Microcontrollers, Hitex Pubications(UK), 2005.
3. Michael J Pont, Patterns for Time-Triggered Embedded Systems, Addison-Wesley Professional,2001.

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.
4. Heath, Steve, Embedded Systems Design , Newnes, 1997.
5. John B Peat man , Design with Microcontroller , Pearson education Asia, 1998.

Department: Electronics and Instrumentation Engineering		**Programme:** B.Tech.						
Semester :		**Category :** TA						
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIG02	Measurement and Instrumentation	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To understand the concepts of measurements and instrumentation • To study about the electrical and electronic instruments • To learn about the signal generators and signal analyzers • To learn about oscilloscopes and data loggers • To understand the concepts of virtual instrumentation							
Outcome	• Conceptual understanding of measurements and instrumentation • Knowledgeable about electrical and electronic measuring devices • Knowledgeable about signal generators and signal analyzers • Understanding of the evolving virtual instrumentation concepts							
UNIT – I	**Introduction to Measurement**					**Hours: 12**		
Elements of Generalized measurement system - Methods of measurement - Classification of instruments – Static & Dynamic characteristics of instruments - Mean, Standard deviation. Probability of errors - Types of error Accuracy, Precision, Sensitivity, Linearity, Resolution, Hysteresis, Threshold, Input impedance, loading effects								
UNIT – II	**Electrical Measuring Instruments**					**Hours: 12**		
Principle of operation and comparison of moving coil, moving iron meters, dynamometer, induction type & thermal type meter, rectifier type – Extension of range of voltmeter and ammeter. Principle of operation of electrodynamometer type wattmeter, induction type KWH meter – Calibration of wattmeter, energy meter. Power factor meter – Frequency meter.								
UNIT – III	**Signal Generators and Analyzers**					**Hours: 12**		
Sine wave generator – Frequency synthesized sine wave generator – Sweep frequency generator, pulse and square wave generator – Function generator – Wave analyzer –Applications – Harmonic distortion analyzer – Spectrum analyzer – Applications – Audio Frequency generator – Noise generator								
UNIT – IV	**Cathode Ray Oscilloscope and Data Logging**					**Hours: 12**		
General purpose oscilloscope – Screens for CRT graticules – Vertical & horizontal deflection systems – Delay line – Multiple trace – Dual beam & dual trace – Probes –Oscilloscope techniques – Special oscilloscopes – Storage oscilloscopes – Sampling oscilloscope. Data loggers.								
UNIT – V	**Virtual Instrumentation**					**Hours: 12**		
Historical perspective, advantages, blocks 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. VI programming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.								
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**				**Total Hours: 60**		

Text Books:

1. E.W.Golding & F.C.Widdis, Electrical Measurements and Measuring Instruments, A.H.Wheeler & Co, 1994.
2. Albert D. Helfrick and William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2002.
3. Jovitha Jerome, Virtual Instrumentation using LabVIEW, PHI Learning Pvt. Ltd., New Delhi, 2010

Reference Books:

1. Patranabis, Principles of Electronic Instrumentation - PHI, 2008
2. Kalsi H.S, Electronic Instrumentation, 2nd edition, TMH, 2004.
3. Joseph.J.Carr, Elements of Electronic Instrumentation & Measurement, III edition, Pearson Education, 2003.
4. A.K.Sawhney, A course of in Electrical and Electronics measurement and instrumentation, Dhanpat Rai & sons, 2010.
5. 5. Gary Johnson and Richard Jennings, LabVIEW Graphical Programming, McGraw Hill Inc., 2006

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech.					
Semester :			**Category :** TA					
Subject Code	**Subject**	Hours / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIG03	Process Instrumentation	4	-	-	4	40	60	100
Prerequisite	-							
Objectives	• To understand the health and safety implications of working with process control Systems • To get detail about the control issues within such industries • To make the student to able to correlate instrumentation and its role in such industry • To understand the role of instrumentation engineer during such process							
Outcome	• The students will know different instruments used in industries and their working principles							

UNIT – I	**Hours: 12**

Process Characteristics

Introduction to control aspects their needs & application in industries, 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, control aspects of a chemical plant, stirred tank heater, flow in tank & their control aspects-– Inverse response.

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.

UNIT – II	**Hours: 12**

Generalized scheme of measurement systems – Basic method of measurements –Errors in measurements – Types of Errors. Transducers – definition – classification – Static characterisitics of instruments – Dynamic characteristic. Transmitter –definition – different types.

UNIT – III	**Hours: 12**

Temperature & Pressure Measurement

Temperature measurements: Introduction – Temperature scale – Conventional methods of temperature sensing. Resistance Thermometer Detector (RTD)- Thermistors – Temperature sensing using thermistor – Semiconductor temperature sensor. Thermocouple –Basics of thermocouple – Thermocouple types – Cold junction compensation

Pressure measurements: Introduction – Units of pressure – Types of pressure measurement – Bourdon tube and bellows – SG based pressure sensors –Capacitance type pressure transducers. Low pressure measurements.

UNIT – IV	**Hours: 12**

Basics of fluid flow – Flow meters – Quantum flow measurements, Differential pressure measurement – Principle of the differential pressure flowmeter, Orifice plate, Venturi meter, Flow nozzle, Dall tube, Pitot tube. Variable area flow meter – Electro Magnetic Flowmeter – Different type of ultrasonic Flowmeter.

UNIT – V	**Hours: 12**

Level Measurements – Level transducer with differential pressure sensing –Capacitance based level sensors – Capacitance sensors for conducting liquids –Capacitance sensors for Non – conducting liquids, other liquid sensors –Displacement type level sensor – Ultrasonic type level sensor – Gamma ray level sensor. pH measurements – Basic ideas of pH value – Measurement of electrode potentials.

Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**	**Total Hours: 60**

Text Books:

1. Tattamangalam R. Padmanaban , Industrial Instrumentation Principles and Design, Springer, 2000.
2. P. Harriott, Process Control, Tata McGraw Hill, 1984.
3. S. Renganathan, Transducer Engineering, Allied Publishers, 1999.

Reference Books:

1. C. Stephanopoulos, Chemical Process Control, Prentice Hall of India, 1990.
2. Donald P. Eckman, Industrial Instrumentation, CBS Publishers, New Delhi, 2002.
3. C.D. Johnson, Process Control Instrumentation Technology, Prentice Hall of India, 1998.

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech.					
Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIG04	PLC and Industrial Automation		**4**		**-**	**4**	**40**	**60**	**100**
Prerequisite	-							
Objectives	• To understand the basics of Automation • To understand the PLC hardware, PLC programming • To understand Supervisory Control & Data Acquisition (SCADA).							
Outcome	• Be able to interpret and formulate design aspect of industrial automation system • Be able to design, construct, and verify an automation system to meet desired specifications, • Be familiar with PLC programming.							
UNIT – I	**Basics of Automation**					**Hours: 12**		
Introduction -Need of automation - Benefits of automation - Programmable Logic Controller (PLC) Overview - Introduction -PLC History - PLC in Industrial Automation - Application areas – Process industries, Buildings, Robotics, Automobiles, Telecom, Electrical distribution, Medical								
UNIT – II	**Programmable Logic Controller (PLC) Basics**					**Hours: 12**		
PLC architecture - Principle of Working -PLC Classification based on Type and size - PLC characteristics – CPU, Racks, Power Supply, Memory, Input & Output Modules, Application Specific Modules, Speed of Execution, Communication, Redundancy.								
UNIT – III	**PLC Hardware**					**Hours: 12**		
PLC Inputs and Outputs Types - Source and Sink Concept - Description and Function of various PLC Modules- I/O Modules and Communication Modules - PLC Hardware Configuration - Addressing of PLC I/O - Diagnostic Features- PLC Wiring - Interfacing with Sensors and Actuators								
UNIT – IV	**PLC Programming**					**Hours: 12**		
PLC Applications-Programming methods- Relay & logic ladder diagrams-Boolean logic-Definition and Use of Bits and Words - Introduction to PLC Programming Languages- Ladder, Instruction List, Structed Text,- Instruction Set in Ladder – NO, NC, Set, Reset, Timers, Counters, Comparison, Arithmetic, Logical, Move, Drum Controller - Programming Examples in Ladder with simple applications - PLC Instructions - Data Transfer Instruction , Arithmetic Instructions , Data Comparison Instructions, Data Manipulation Instructions , Timer Instructions ,Counter Instructions , Program Control Instructions - Different Programming Techniques -Trouble shooting PLC								
UNIT – V	**HMI: Supervisory Control & Data Acquisition (SCADA)**					**Hours: 12**		
Need for HMI - Types and Characteristics of Local HMI operator panels - Introduction to Programming of HMI Panels - Interface between HMI Panels and PLC - Definition of SCADA Functional Block Diagram - Function of SCADA - SCADA data base configuration - Alarm management - Real time & historical trends- Communication between PLC and SCADA SCADA Applications.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes: -**				**Total Hours: 60**		
Text Books:								
1. Huges T, Programmable Logic Controllers, ISA press,1994. 2. D.M.Considine, Process Instruments and Controls Handbook, McGraw-Hill., 1985.								
Reference Books:								
1. Moore, Digital control devices, ISA press, 1986. 2. Tanaenbaum A.S., Computer networks, Prentice Hall, 1998. 3. B.G.Liptak, Instrumentation in process industries, Vol. I and II, Chilton books co,1973.								

Department: Electronics and Instrumentation Engineering			**Programme:** B.Tech.					
Semester :			**Category :** TA					
Subject Code	**Subject**		**Hours / Week**			**Credit**	**Maximum Marks**	
			L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIG05	Micro-Electro Mechanical Systems		4	-	-	4	40	60	100
Prerequisite	-							
Objectives	• To Study about MEMS and parts of MEMS • To Study the design methodology of MEMS for various mechanics. • To Study about actuators in MEMS. • To Study about MEMS based circuits. • To Study about optical and RF based MEMS.							
Outcome	• The students will be able to understand the fundamentals of MEMs and their applications							
UNIT – I	**Introduction To MEMS**					**Hours: 12**		
MEMS and Microsystems, Miniaturization, Typical products, Micro Sensors, Micro actuation, MEMS with micro actuators, Micro-accelerometers and Micro fluidics, MEMS materials, Micro Fabrication.								
UNIT – II	**Mechanics for MEMS Design**					**Hours: 12**		
Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics, material, physical vapor deposition (PVD), chemical mechanical polishing (CMP)								
UNIT – III	**Electro Static Design**					**Hours: 12**		
Electrostatics: basic theory, electro static instability, Surface tension, gap and finger pull up, Electro static actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators, bistable actuators.								
UNIT – IV	**Circuit And System Issues**					**Hours: 12**		
Electronic interfaces, Feed back systems, Noise, Circuit and system issues, Case studies –Capacitive accelerometer, Peizo electric pressure sensor, Thermal sensors, radiation sensors, mechanical sensors, bio-chemical sensors Modeling of MEMS systems, CAD for MEMS.								
UNIT – V	**Introduction To Optical And RF MEMS**					**Hours: 12**		
Optical MEMS, system design basics – Gaussian optics, matrix operations, Resolution, Case studies, MEMS scanners and retinal scanning, display, Digital Micro mirror devices, RF Mems – design basics, case study – Capacitive RF MEMS switch, Performance issues.								
Total contact Hours: 45	**Total Tutorials: -15**	**Total Practical Classes: -**				**Total Hours: 60**		

Text Books:

1. Stephen Santeria, Microsystems Design , Kluwer publishers, 2000.

Reference Books:

1. Nadim Maluf, An introduction to Micro electro mechanical system design, Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, The MEMS Handbook, CRC press Baco Raton, 2000
3. Tai Ran Hsu, MEMS & Micro systems Design and Manufacture, Tata McGraw Hill, New Delhi, 2002.
4. Julian w. Gardner, Vijay k. varadan, Osama O. Awadelkarim, Micro sensors ,MEMS and Smart devices, John Wiley & son LTD,2002
5. James J.Allen, micro electro mechanical system design, CRC Press published in 2005

Department: Electronics and Instrumentation Engineering				**Programme:** B.Tech.				
Semester :				**Category :** TA				
Subject Code	**Subject**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**SE**	**TM**
EIG06	Neural Networks and Fuzzy Logic	4	0	-	4	40	60	100
Prerequisite	-							
Objectives	• To expose the students to the concepts of feed forward neural networks. • To provide adequate knowledge about feedback neural networks • To provide adequate knowledge about fuzzy and neuro-fuzzy systems • To provide comprehensive knowledge of fuzzy logic control to real time systems.							
Outcome	• The students will be able to understand the applications of neural network and fuzzy logic in the area of control systems							
UNIT – I	**Introduction to Neural Networks**				**Hours: 12**			
Evolution of neural networks; Artificial Neural Network: Basic model, Classification, Feed forward and Recurrent topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Fundamentals of connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline.								
UNIT – II					**Hours: 12**			
Topology of Multi-layer perceptron, Back propagation learning algorithm, limitations of Multi-layer perceptron. Radial Basis Function networks: Topology, learning algorithm; Kohenen's self-organising network: Topology, learning algorithm; Bidirectional associative memory Topology, learning algorithm, Applications.								
UNIT – III	**Applications of Neural Networks**				**Hours: 12**			
Recurrent neural networks: Basic concepts, Dynamics, Architecture and training algorithms, Applications; Hopfield network: Topology, learning algorithm, Applications; Industrial and commercial applications of Neural networks: Semiconductor manufacturing processes, Communication, Process monitoring and optimal control, Robotics, Decision fusion and pattern recognition.								
UNIT – IV	**Fuzzy Logic Systems**				**Hours: 12**			
Classical and fuzzy sets: Introduction, Operations and Properties, Fuzzy Relations: Cardinality, Operations and Properties, Equivalence and tolerance relation, Value assignment: cosine amplitude and max-min method; Fuzzification: Membership value assignment- Inference, rank ordering, angular fuzzy sets. Defuzzification methods, Fuzzy measures, Fuzzy integrals, Fuzziness and fuzzy resolution; possibility theory and Fuzzy arithmetic; composition and inference; Considerations of fuzzy decision-making.								
UNIT – V	**FLC and Neuro-FLC**				**Hours: 12**			
Basic structure and operation of Fuzzy logic control systems; Design methodology and stability analysis of fuzzy control systems; Applications of Fuzzy controllers. Applications of fuzzy theory. BNN network based fuzzy controllers – architecture of multivariable FLC – Fuzzy neuron – RBF networks in pattern recognition – architecture and training algorithm of RBF.								
Total contact Hours: 60	**Total Tutorials: -**	**Total Practical Classes:**			**Total Hours: 60**			

Text Books:

1. Laurene Fausett ,Fundamentals of Neural networks ,architecture ,algorithms and applications, PHI, New Jersey ,1994.
2. Timothy.Ross ,Fuzzy logic with Engineering applications, Mc Graw Hill,1997.
3. Zimmer man H.J, Fuzzy set theory and its applications ,second edition ,Allied Publishers,1991.

Reference Books:

1. Elaine Rich , Kevin Knight and Shivashankar B.Nair , Artificial Intelligence. TMH, third edition.
2. Freeman J.A., Skapura D.M., Neural networks , algorithms, applications and programming techniques.Addison Wesley 2005.
3. Laurene Fausett ,Fundamentals of Neural networks ,architecture ,algorithms and applications- PHI, New Jersey ,1994.
4. Jacek.M.Zaruda, Introduction to ANS, Jaico Publishing House,1999.
5. Klir.G.J .,Fogler T.A, Fuzzy sets ,uncertainty and information,PHI,1994.
6. Junhong Nie and Derek Linkens ,Fuzzy neural control, principles, algorithms and applications", PHI, 1998.