SRM UNIVERSITY
(Under section 3 of UGC Act 1956)

B.Tech. (Full Time) – INSTRUMENTATION AND CONTROL ENGINEERING

Curriculum & Syllabus

2013 – 2014

Volume – I
(all courses except open electives)

Faculty of Engineering & Technology
SRM University
SRM Nagar, Kattankulathur – 603 203

STUDENT OUTCOMES

The curriculum and syllabus for B.Tech programs (2013) conform to outcome based teaching learning process. In general, **ELEVEN STUDENT OUTCOMES** (a-k) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

The student outcomes are:

a) An ability to apply knowledge of mathematics, science, and engineering

b) An ability to design and conduct experiments, as well as to analyze and interpret data

c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d) An ability to function on multidisciplinary teams

e) An ability to identify, formulate, and solve engineering problems

f) An understanding of professional and ethical responsibility

g) An ability to communicate effectively

h) the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context

i) A recognition of the need for, and an ability to engage in life-long learning

j) A knowledge of contemporary issues

k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B.Tech. Instrumentation and Control Engineering
Curriculum – 2013
(Applicable for students admitted from the academic year 2013-14 onwards)

SEMESTER I						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1001	G	SOFT SKILLS I	1	0	1	1
MA1001	B	CALCULUS AND SOLID GEOMETRY	3	2	0	4
PY1001	B	PHYSICS	3	0	0	3
PY1002	B	PHYSICS LABORATORY	0	0	2	1
CY1001	B	CHEMISTRY	3	0	0	3
CY1002	B	CHEMISTRY LABORATORY	0	0	2	1
LE1001	G	ENGLISH	1	2	0	2
CE1001	E	BASIC CIVIL ENGINEERING	2	0	0	2
Courses from Table I						
Student shall register for minimum 20 credits in I semester and minimum 20 credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester. Keeping this in mind student shall register for the courses in I and II semesters.						

Legend:
L - Number of lecture hours per week
T - Number of tutorial hours per week
P - Number of practical hours per week
C - Number of credits for the course

Category of courses:
G - General
B - Basic Sciences
E - Engineering Sciences and Technical Arts
P - Professional Subjects

SEMESTER II						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1002	G	SOFT SKILLS II	1	0	1	1
MA1002	B	ADVANCED CALCULUS AND COMPLEX ANALYSIS	3	2	0	4
PY1003	B	MATERIALS SCIENCE	2	0	2	3
CY1003	B	PRINCIPLES OF ENVIRONMENTAL SCIENCE	2	0	0	2
LE1002	G	VALUE EDUCATION	1	0	0	1
IC1001	P	ELECTRIC CIRCUIT ANALYSIS	3	0	0	3
IC1002	P	ELECTRIC CIRCUITS AND DEVICES LAB	0	0	2	1
Courses from Table I						
Student shall register for minimum 20 credits in I semester and minimum 20 credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester. Keeping this in mind student shall register for the courses in I and II semesters.						

TABLE I

COURSES WHICH CAN BE REGISTERED FOR EITHER IN I OR II SEMESTER

SEMESTER I / II						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
CS1001	G	PROGRAMMING USING MATLAB	0	1	2	2
BT1001	B	BIOLOGY FOR ENGINEERS	2	0	0	2
ME1001	E	BASIC MECHANICAL ENGINEERING	2	0	0	2
EE1001	E	BASIC ELECTRICAL ENGINEERING	2	0	0	2
EC1001	E	BASIC ELECTRONICS ENGINEERING	2	0	0	2
ME1005	E	ENGINEERING GRAPHICS	0	1	4	3
EC1002	E	ELECTRONICS ENGINEERING PRACTICES	0	0	2	1
EE1002	E	ELECTRICAL ENGINEERING PRACTICES	0	0	2	1
NC1001 NS1001 SP1001 YG1001	G	*NCC/NSS/NSO/YOGA	0	0	1	1

*NCC - National Cadet Corps
NSS - National Service Scheme
NSO - National Sports Organization (India)

SEMESTER III						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
LE1003/ LE1004/ LE1005/ LE1006/ LE1007	G	GERMAN LANGUAGE PHASE I/ FRENCH LANGUAGE PHASE I/ JAPANESE LANGUAGE PHASE I/ KOREAN LANGUAGE PHASE I / CHINESE LANGUAGE PHASE I	2	0	0	2
PD1003	G	APTITUDE I	1	0	1	1
MA1003	B	TRANSFORMS AND BOUNDARY VALUE PROBLEMS	4	0	0	4
IC1003	P	THEORY AND PERFORMANCE OF ELECTRICAL MACHINES	3	0	0	3
IC1004	P	MEASUREMENTS AND INSTRUMENTATION	3	0	0	3
IC1005	P	ELECTRONIC DEVICES AND CIRCUITS	3	0	0	3
IC1006	P	DIGITAL LOGIC AND DESIGN	3	0	0	3
IC1007	P	OPERATIONAL AMPLIFIER AND LINEAR INTEGRATED CIRCUITS	3	0	0	3
IC1008	P	ANALOG AND DIGITAL INTEGRATED CIRCUITS LAB	0	0	3	2
IC1009	P	ELECTRICAL AND ELECTRONICS LAB	0	0	3	2
		TOTAL	**22**	**0**	**7**	**26**
		Total Contact Hours	**29**			

SEMESTER IV						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
LE1008/ LE1009/ LE1010/ LE1011/ LE1012	G	GERMAN LANGUAGE PHASE II / FRENCH LANGUAGE PHASE II/ JAPANESE LANGUAGE PHASE II KOREAN LANGUAGE PHASE II / CHINESE LANGUAGE PHASE II	2	0	0	2
PD1004	G	APTITUDE II	1	0	1	1
MA1004	B	NUMERICAL METHODS	4	0	0	4
IC1010	P	TRANSDUCER ENGINEERING	3	0	0	3
IC1011	P	APPLIED DIGITAL SIGNAL PROCESSING	3	0	0	3
IC1012	P	CONTROL SYSTEMS	4	0	0	4
IC1013	P	COMMUNICATION ENGINEERING	3	0	0	3
IC1014	P	TRANSDUCER ENGINEERING LAB	0	0	2	1
IC1015	P	CONTROL SYSTEMS LAB	0	0	2	1
	P	Dep. Elective -I	3	0	0	3
		TOTAL	**23**	**0**	**5**	**25**
		Total Contact Hours	**28**			

SEMESTER V						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1005	G	APTITUDE-III	1	0	1	1
MA1005	B	PROBABILITY AND STATISTICS	4	0	0	4
IC1016	P	INDUSTRIAL INSTRUMENTATION-I	3	0	0	3
IC1017	P	MODERN CONTROL SYSTEMS	3	2	0	4
IC1018	P	MICROCONTROLLER AND ITS APPLICATIONS	3	0	0	3
IC1019	P	MICROCONTROLLER LAB	0	0	3	2
IC1020	P	INDUSTRIAL INSTRUMENTATION LAB	0	0	3	2
IC1047	P	INDUSTRIAL TRAINING I (Training to be undergone after IV semester)	0	0	1	1
	P	Dep. Elective -II	3	0	0	3
		Open Elective I	3	0	0	3
		TOTAL	**20**	**2**	**8**	**26**
		Total Contact Hours	**30**			

SEMESTER VI						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1006	G	APTITUDE-IV	1	0	1	1
IC1021	P	PROCESS CONTROL	3	2	0	4
IC1022	P	INDUSTRIAL INSTRUMENTATION-II	3	0	0	3
IC1023	P	INTRODUCTION TO MEMS	3	0	0	3
IC1024	P	MEMS LAB	0	0	3	2
IC1025	P	PROCESS CONTROL LAB	0	0	3	2
IC1049	P	MINOR PROJECT	0	0	2	1
	P	Dep. Elective III	3	0	0	3
		Open Elective II	3	0	0	3
		Open Elective III	3	0	0	3
		TOTAL	**19**	**2**	**9**	**25**
		Total contact hours	**30**			

SEMESTER VII						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
IC1026	P	COMPUTER CONTROL OF PROCESSES	3	2	0	4
IC1027	P	PLC AND DCS	3	0	0	3
IC1028	P	DESIGN PROJECT LAB	0	0	3	2
IC1029	P	AUTOMATION LAB	0	0	3	2
IC1048	P	INDUSTRIAL TRAINING II (Training to be undergone after VI semester)	0	0	1	1
	P	Dep. Elective IV	3	0	0	3
	P	Dep. Elective V	3	0	0	3
		TOTAL	**12**	**2**	**7**	**18**
		Total contact hours	**21**			

SEMESTER VIII						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
IC1050	P	MAJOR PROJECT / PRACTICE SCHOOL	0	0	24	12
		Total	**0**	**0**	**24**	**12**
		Total contact hours	**24**			

DEPARTMENT ELECTIVES

Course Code	Category	Course Name	L	T	P	C
IC1101	P	BIOMEDICAL INSTRUMENTATION	3	0	0	3
IC1102	P	DATA STRUCTURE	3	0	0	3
IC1103	P	DIGITAL SYSTEM DESIGN	3	0	0	3
IC1104	P	POWER ELECTRONICS	3	0	0	3
IC1105	P	APPLIED SOFT COMPUTING	3	0	0	3
IC1106	P	INDUSTRIAL DRIVES AND CONTROL	3	0	0	3
IC1107	P	ADVANCED CONTROL THEORY	3	0	0	3
IC1108	P	WIRELESS SENSOR NETWORKS	3	0	0	3
IC1109	P	ANALYTICAL INSTRUMENTATION	3	0	0	3
IC1110	P	OPTIMAL CONTROL	3	0	0	3
IC1111	P	ADAPTIVE CONTROL.	3	0	0	3
IC1112	P	SYSTEM IDENTIFICATION	3	0	0	3
IC1113	P	NONLINEAR CONTROL	3	0	0	3
IC1114	P	MULTISENSOR DATA FUSION	3	0	0	3
IC1115	P	INSTRUMENTATION AND CONTROL IN PETROCHEMICAL, IRON AND STEEL INDUSTRIES	3	0	0	3
IC1116	P	ROBOTICS AND AUTOMATION.	3	0	0	3
IC1117	P	INSTRUMENTATION IN AEROSPACE AND NAVIGATION.	3	0	0	3
IC1118	P	VLSI AND EMBEDDED SYSTEMS.	3	0	0	3
IC1119	P	DIGITAL IMAGE PROCESSING.	3	0	0	3
IC1120	P	VIRTUAL INSTRUMENTATION USING Lab VIEW	3	0	0	3
IC1121	P	FIBRE OPTICS AND LASER INSTRUMENTS	3	0	0	3
IC1122	P	REAL TIME EMBEDDED SYSTEMS	3	0	0	3
IC1123	P	INSTRUMENTATION AND CONTROL IN POWER PLANT INDUSTRIES	3	0	0	3

Summary of Credits										
Category	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**	**%**
G (Excluding open and departmental electives)	4	4	3	3	1	1			16	8.89
B (Excluding open and departmental electives)	12	11	4	4	4				35	19.44
E (Excluding open and departmental electives)	7	6							13	7.22
P (Excluding open and departmental electives)		4	19	15	15	15	12	12	92	51.11
Open Elective					3	6			9	5
Dep. Elective				3	3	3	6		15	8.33
Total	**23**	**25**	**26**	**25**	**26**	**25**	**18**	**12**	**180**	**100**

SEMESTER – I

PD1001	**SOFT SKILLS-I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE	
To enhance holistic development of students and improve their employability skills.	
INSTRUCTIONAL OBJECTIVES	
1.	To develop inter personal skills and be an effective goal oriented team player.
2.	To develop professionals with idealistic, practical and moral values.
3.	To develop communication and problem solving skills.
4.	To re-engineer attitude and understand its influence on behavior.

UNIT I - SELF ANALYSIS **(4 hours)**

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem

UNIT II - ATTITUDE **(4 hours)**

Factors influencing Attitude, Challenges and lessons from Attitude.

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

UNIT III - MOTIVATION **(6 hours)**

Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

UNIT IV - GOAL SETTING **(6 hours)**

Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

Time Management

Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work.

UNIT V - CREATIVITY **(10 hours)**

Out of box thinking, Lateral Thinking

Presentation

ASSESSMENT

1. A practical and activity oriented course which has continuous assessment for 75 marks based on class room interaction, activities etc.
2. Presentation – 25 marks

TEXT BOOK

1. INSIGHT, 2012, Career Development Centre, SRM Publications.

REFERENCES

1. Covey Sean, *Seven Habits of Highly Effective Teens*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, *How to win Friends and Influence People*, New York: Simon & Schuster, 1998.
3. Thomas A Harris, *I am ok, You are ok* , New York-Harper and Row, 1972
4. Daniel Coleman, *Emotional Intelligence*, Bantam Book, 2006

PD1001 - SOFT SKILLS-I												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					x		x	x		x		
2.	Mapping of instructional objectives with student outcome				1		2	3		4		
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		x										
4.	Approval	23rd Meeting of Academic Council, May 2013										

MA1001	**CALCULUS AND SOLID GEOMETRY**	**L**	**T**	**P**	**C**
	Total Contact Hours-75	**3**	**2**	**0**	**4**
	(Common to all Branches of Engineering except Bio group)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To apply advanced matrix knowledge to Engineering problems.
2.	To equip themselves familiar with the functions of several variables.

3.	To familiarize with the applications of differential equations.
4.	To improve their ability in solving geometrical applications of differential calculus problems
5.	To expose to the concept of three dimensional analytical geometry.

UNIT I - MATRICES (15 hours)

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley – Hamilton theorem orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT II - FUNCTIONS OF SEVERAL VARIABLES (15 hours)

Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangian Multiplier method – Jacobians – Euler's theorem for homogeneous function.

UNIT III - ORDINARY DIFFERENTIAL EQUATIONS (15hours)

Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form – Variation of parameter – Simultaneous first order with constant co-efficient.

UNIT IV - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS (15 hours)

Curvature – Cartesian and polar coordinates – Circle of curvature – Involutes and Evolutes – Envelopes – Properties of envelopes.

UNIT V - THREE DIMENSIONAL ANALYTICAL GEOMETRY (15 hours)

Equation of a sphere – Plane section of a sphere – Tangent Plane – Orthogonal Sphere - Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

TEXT BOOKS

1. Kreyszig.E, "*Advanced Engineering Mathematics*", John Wiley & Sons. Singapore, 10th edition, 2012.
2. K.Ganesan, Sundarammal Kesavan, K.S.Ganapathy Subramanian & V.Srinivasan, "*Engineering Mathematics*",Gamma publications, Revised Edition, 2013.

REFERENCES

1. Grewal B.S, "*Higher Engineering Mathematics*", Khanna Publications, 42nd Edition,2012.
2. Veerajan. T, "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
3. Kandasamy P etal. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "*Advanced Mathematics for Engineering students*", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman M.K., "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.

MA1001 CALCULUS AND SOLID GEOMETRY												
Course Designed by		Department of Mathematics										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
		--		x			--				--	
4.	Approval	23rd Meeting of Academic Council, May 2013										

PY1001	PHYSICS	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to provide an understanding of physical concepts and underlying various engineering and technological applications. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application.

INSTRUCTIONAL OBJECTIVES

1.	To understand the general scientific concepts required for technology

2.	To apply the Physics concepts in solving engineering problems
3.	To educate scientifically the new developments in engineering and technology
4.	To emphasize the significance of Green technology through Physics principles

UNIT I - MECHANICAL PROPERTIES OF SOLIDS AND ACOUSTICS (9 hours)

Mechanical properties of solids: Stress-strain relationship – Hooke's law – Torsional Pendulum – Young's modulus by cantilever – Uniform and non-uniform bending –– Stress-strain diagram for various engineering materials – Ductile and brittle materials – Mechanical properties of Engineering materials (Tensile strength, Hardness, Fatigue, Impact strength, Creep) – Fracture – Types of fracture (Elementary ideas).

Acoustics: Intensity – Loudness – Absorption coefficient and its determination – Reverberation – Reverberation time – Factors affecting acoustics of buildings and their remedies – Sources and impacts of noise – Sound level meter – Strategies on controlling noise pollution – Ultrasonic waves and properties – Methods of Ultrasonic production (Magnetostriction and Piezoelectric) – Applications of Ultrasonics in Engineering and medicine.

UNIT II - ELECTROMAGNETIC WAVES, CIRCUITS AND APPLICATIONS (9 hours)

Del operator – grad, div, curl and their physical significances - displacement current –Maxwell's equations (derivation) – Wave equation for electromagnetic waves – Propagation in free space – Poynting theorem – Characteristic of Transverse electric and magnetic waves – Skin depth – Rectangular and circular waveguides – High powered vacuum-based cavity magnetrons – Applications including radars, microwave oven and lighting systems.

UNIT III - LASERS AND FIBER OPTICS (9 hours)

Lasers: Characteristics of Lasers – Einstein's coefficients and their relations – Lasing action – Working principle and components of CO_2 Laser, Nd-YAG Laser, Semiconductor diode Laser, Excimer Laser and Free electron Laser – Applications in Remote sensing, holography and optical switching – Mechanism of Laser cooling and trapping.

Fiber Optics: Principle of Optical fiber – Acceptance angle and acceptance cone – Numerical aperture – V-number – Types of optical fibers (Material, Refractive index and mode) – Photonic crystal fibers – Fiber optic communication – Fiber optic sensors.

UNIT IV - QUANTUM MECHANICS AND CRYSTAL PHYSICS (9 hours)

Quantum mechanics: Inadequacies of Classical Mechanics – Duality nature of electromagnetic radiation – De Broglie hypothesis for matter waves – Heisenberg's uncertainty principle –Schrödinger's wave equation – Particle confinement in 1D box (Infinite Square well potential). **Crystal Physics:** Crystal directions – Planes and Miller indices – Symmetry elements – Quasi crystals – Diamond and HCP crystal structure – Packing factor – Reciprocal lattice – Diffraction of X-rays by crystal planes – Laue method and powder method – Imperfections in crystals.

UNIT V - GREEN ENERGY PHYSICS (9 hours)

Introduction to Green energy – **Solar energy:** Energy conversion by photovoltaic principle – Solar cells – **Wind energy:** Basic components and principle of wind energy conversion systems – **Ocean energy:** Wave energy – Wave energy conversion devices – Tidal energy – single and double basin tidal power plants – Ocean Thermal Electric Conversion (OTEC) – **Geothermal energy:** Geothermal sources (hydrothermal, geo-pressurized hot dry rocks, magma) – **Biomass:** Biomass and bio-fuels – bio-energies from wastages – **Fuel cells**: H_2O_2 – **Futuristic Energy:** Hydrogen – Methane Hydrates – Carbon capture and storage (CCS).

* One problem sheet consisting of 10 to 15 problems is to be prepared for each unit and discussed in the class.
* Few problems based on design considerations related to appropriate branches of engineering can be incorporated in each problem sheet.

TEXT BOOKS

1. Thiruvadigal, J. D., Ponnusamy S, Sudha D. and Krishnamohan M., "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013
2. Dattu R. Joshi, "*Engineering Physics*", Tata McGraw- Hill,New Delih,2010.

REFERENCES

1. Wole Soboyejo, "*Mechanical Properties of Engineered Materials*", Marcel Dekker Inc., 2003.
2. Frank Fahy, "*Foundations of Engineering Acoustics*", Elsevier Academic Press, 2005.
3. Alberto Sona, "*Lasers and their applications*", Gordon and Breach Science Publishers Ltd., 1976.
4. David J. Griffiths, "*Introduction to electrodynamics*", 3rd ed., Prentice Hall, 1999.

5. Leonard. I. Schiff, "*Quantum Mechanics"*, Third Edition, Tata McGraw Hill, 2010.
6. Charles Kittel, "*Introduction to Solid State Physics*", Wiley India Pvt. Ltd, 7th ed., 2007.
7. Godfrey Boyle, "*Renewable Energy: Power sustainable future*", 2nd edition, Oxford University Press, UK, 2004.

PY1001 PHYSICS												
Course Designed by		**Department of Physics and Nanotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x		x		x						x
2.	Mapping of instructional objectives with student outcome	1		4		2						3
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
		--		x			--				--	
4.	Approval	23rd Meeting of Academic Council, May 2013										

PY1002	PHYSICS LABORATORY	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop scientific temper in experimental techniques and to reinforce the physics concepts among the engineering students

INSTRUCTIONAL OBJECTIVES

1.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables
2.	Develop the skills in arranging and handling different measuring instruments
3.	Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

LIST OF EXPERIMENTS

1. Determination of Young's modulus of a given material – Uniform / Non-uniform bending methods.
2. Determination of Rigidity modulus of a given material – Torsion pendulum
3. Determination of dispersive power of a prism – Spectrometer
4. Determination of laser parameters – divergence and wavelength for a given laser source –laser grating/ Particle size determination using laser
5. Study of attenuation and propagation characteristics of optical fiber cable
6. Calibration of voltmeter / ammeter using potentiometer
7. Construction and study of IC regulation properties of a given power supply
8. Study of electrical characteristics of a solar cell
9. Mini Project – Concept based Demonstration

TEXT BOOKS

1. Thiruvadigal J. D, Ponnusamy S, Sudha D and Krishnamohan M, "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013
2. Shukla R.K. and Anchal Srivastava, "*Practical Physics*", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

REFERENCES

1. G.L.Souires, "*Practical Physics:*", 4th Edition, Cambridge University, UK, 2001.
2. D. Chattopadhyay, P. C. Rakshit and B. Saha, "*An Advanced Course in Practical Physics*", 2nd ed., Books & Allied Ltd., Calcutta, 1990.

PY1002 PHYSICS LABORATORY												
Course Designed by		**Department of Physics and Nanotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1	3			2						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		--		x		--				--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

CY1001	CHEMISTRY	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to acquire knowledge in the principles of chemistry for engineering applications

INSTRUCTIONAL OBJECTIVES

1.	The quality of water and its treatment methods for domestic and industrial applications.
2.	The classification of polymers, different types of polymerizations, preparation, properties and applications of important polymers and FRPs.
3.	The phase rule and its application to one and two component systems.
4.	The principle, types and mechanism of corrosion and protective coatings.
5.	The classification and selection of lubricants and their applications.
6.	The basic principles, instrumentation and applications of analytical techniques

UNIT I - WATER TREATMENT (9 hours)

Water quality parameters: Physical, Chemical & Biological significance - Hardness of water - estimation of hardness (EDTA method) - Dissolved oxygen – determination (Winkler's method), Alkalinity - determination - disadvantages of using hard water in boilers: Scale, sludge formation - disadvantages - prevention - treatment: Internal conditioning - phosphate, carbon and carbonate conditioning methods - External: Zeolite, ion exchange methods - desalination - reverse osmosis and electrodialysis - domestic water treatment.

UNIT II - POLYMERS AND REINFORCED PLASTICS (9 hours)

Classification of polymers - types of polymerization reactions - mechanism of addition polymerization: free radical, ionic and Ziegler - Natta - effect of structure on the properties of polymers - strength, plastic deformation, elasticity and crystallinity -Preparation and properties of important resins: Polyethylene, PVC, PMMA, Polyester, Teflon, Bakelite and Epoxy resins - compounding of plastics - moulding methods - injection, extrusion, compression and calendaring - reinforced plastics - FRP – Carbon and Glass- applications.

UNIT III - PHASE EQUILIBRIA, LUBRICANTS AND ADHESIVES (9 hours)

Phase rule: Statement - explanation of the terms involved - one component system (water system only). Condensed phase rule - thermal analysis - two component systems: simple eutectic, Pb-Ag; compound formation, Zn-Mg.

Lubricants: Classification –solid, semi solid, liquid, emulsion- properties – selection of lubricants for different purposes, Adhesives: classification-natural, synthetic, inorganic- Adhesive action - applications.

UNIT IV - CORROSION AND ITS CONTROL (9 hours)

Corrosion: Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion - pitting corrosion - stress corrosion – Measurement of corrosion (wt. loss method only) - factors influencing corrosion. Corrosion control: Cathodic protection - sacrificial anodic method - corrosion inhibitors. Protective coatings: surface preparation for metallic coatings - electro plating (copper plating) and electroless plating (Nickel plating) - chemical conversion coatings - anodizing, phosphating & chromate coating.

UNIT V - INSTRUMENTAL METHODS OF ANALYSIS (9 hours)

Basic principles, instrumentation and applications of potentiometry, UV - visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy and flame photometry .

TEXT BOOKS

1. Kamaraj.P & Arthanareeswari. M, "*Applied Chemistry", 9th Edition*, Sudhandhira Publications, 2012.
2. S.S.Dara, A Text book of Engineering Chemistry, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003

REFERENCES

1. Jain.P.C and Monika Jain, "*Engineering Chemistry*", Danpat Rai publishing company (P) Ltd, New Delhi, 2010.
2. Helen P Kavitha, "*Engineering Chemistry – I", Scitech* Publications, 2nd edition, 2008.

CY1001 CHEMISTRY												
Course designed by		**Department of Chemistry**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x		x						x
2.	Mapping of instructional objective with student outcome	1-6	1,5	3		2						4
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		--		x		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

CY1002	CHEMISTRY LABORATORY	L	T	P	C
	Total Contact Hours - 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

To apply the concepts of chemistry and develop analytical skills for applications in engineering.

INSTRUCTIONAL OBJECTIVES

1. To enable the students to understand the basic concepts involved in the analyses.

LIST OF EXPERIMENTS

1. Preparation of standard solutions
2. Estimation of total, permanent and temporary hardness by EDTA method
3. Conduct metric titration - determination of strength of an acid
4. Estimation of iron by potentiometer.
5. Determination of molecular weight of polymer by viscosity average method
6. Determination of dissolved oxygen in a water sample by Winkler's method
7. Determination of Na / K in water sample by Flame photometry (Demonstration)
8. Estimation of Copper in ore
9. Estimation of nickel in steel
10. Determination of total alkalinity and acidity of a water sample
11. Determination of rate of corrosion by weight loss method.

REFERENCES

1. Kamaraj & Arthanareeswari, Sudhandhira Publications "*Practical Chemistry*" (work book), 2011.
2. Helen P. Kavitha "*Chemistry Laboratory Manual*", Scitech Publications, 2008.

CY1002 CHEMISTRY LABORATORY												
Course designed by		**Department of Chemistry**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x									x
2.	Mapping of instructional objective with student outcome	1	1									1
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)				Professional Subjects (P)		
		--		x		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1001	**ENGLISH**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**1**	**2**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To help students achieve proficiency in English and develop their professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.

INSTRUCTIONAL OBJECTIVES

1.	To enable students improve their lexical, grammatical and communicative competence.
2.	To enhance their communicative skills in real life situations.
3	To assist students understand the role of thinking in all forms of communication.
4.	To equip students with oral and appropriate written communication skills.
5.	To assist students with employability and job search skills.

UNIT I - INVENTIONS **(9 hours)**

1. Grammar and Vocabulary – Tense and Concord:
2. Listening and Speaking – Common errors in Pronunciation (Individual sounds); Process description (Describing the working of a machine, and the manufacturing process)
3. Writing – Interpretation of data (Flow chart, Bar chart)
4. Reading -- (Reading Comprehension -- Answering questions)

UNIT II - ECOLOGY **(9 hours)**

1. Grammar and Vocabulary – Error Analysis – Synonyms and Antonyms, Parallelisms
2. Listening and Speaking - Conducting Meetings
3. Writing – Notice, Agenda, Minutes , letters to the editor via email : Email etiquette
4. D Reading Comprehension – Summarizing and Note-making

UNIT III - SPACE **(9 hours)**

1. Grammar and Vocabulary – tense and concord; word formation
2. Listening and Speaking – Distinction between native and Indian English (Speeches by TED and Kalam) – accent, use of vocabulary and rendering;
3. Writing – Definitions and Essay writing
4. Reading Comprehension – Predicting the content

UNIT IV - CAREERS **(9 hours)**

1. Grammar and Vocabulary –Homonyms and Homophones
2. Listening and Speaking – – Group Discussion
3. Writing .Applying for job, cover letter and resume
4. Reading, etymology (roots ; idioms and phrases), Appreciation of creative writing.

UNIT V - RESEARCH **(9 hours)**

1. Grammar and Vocabulary – Using technical terms, Analogies
2. Listening and Speaking -- Presentation techniques (Speech by the learner)
3. Writing – Project Proposal
4. Reading Comprehension -- Referencing Skills for Academic Report Writing (Research Methodology – Various methods of collecting data) Writing a report based on MLA Handbook

TEXTBOOK

1. Department of English and Foreign Languages. "*English for Engineers*", SRM University Publications, 2013.

REFERENCES

1. Dhanavel S.P, "*English and Communication Skills for Students of Science and Engineering*", Orient Blackswan Ltd., 2009.
2. Meenakshi Raman and Sangeetha Sharma. "*Technical Communication-Principles and Practice*", Oxford University Press, 2009.
3. Day R A, Scientific English: "*A Guide for Scientists and Other Professionals*", 2nd ed. Hyderabad: Universities Press, 2000.

LE1001 ENGLISH												
Course designed by		**Department of English and Foreign Languages**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					x		x	x		x		
2.	Mapping of instructional objectives with student outcome				1-5		1-5	1-5		1-5		
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

CE1001	BASIC CIVIL ENGINEERING	L	T	P	C
	Total contact hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To get exposed to the glimpses of Civil Engineering topics that is essential for an Engineer.

INSTRUCTIONAL OBJECTIVES

1.	To know about different materials and their properties
2.	To know about engineering aspects related to buildings
3.	To know about importance of surveying and the transportation systems
4.	To get exposed to the rudiments of engineering related to dams, water supply, and sewage disposal

UNIT I - BUILDING MATERILAS (6 hours)

Introduction – Civil Engineering – Materials: Bricks – composition – classifications – properties –uses. Stone – classification of rocks – quarrying – dressing – properties –uses. Timber - properties –uses –ply wood. Cement – grades –types – properties –uses. Steel – types – mild steel – medium steel – hard steel – properties – uses – market forms. Concrete – grade designation – properties – uses.

UNIT II - MATERIAL PROPERTIES (6 hours)

Stress – strain – types – Hook's law – three moduli of elasticity – poisons ratio – relationship – factor of safety. Centroid - center of gravity – problems in symmetrical sections only (I, T and channel sections). Moment of inertia, parallel, perpendicular axis theorems and radius of gyration (definitions only).

UNIT III - BUILDING COMPONENTS (6 hours)

Building – selection of site – classification – components. Foundations –functions – classifications – bearing capacity. Flooring – requirements – selection – types – cement concrete marble – terrazzo floorings. Roof – types and requirements.

UNIT IV - SURVEYING AND TRANSPORTATION (6 hours)

Surveying – objectives – classification – principles of survey. Transportation – classification – cross section and components of road – classification of roads. Railway – cross section and components of permanent way –functions. Water way – docks and harbor – classifications – components. Bridge – components of bridge.

UNIT V - WATER SUPPLY AND SEWAGE DISPOSAL (6 hours)

Dams – purpose – selection of site – types –gravity dam (cross section only). Water supply – objective – quantity of water – sources – standards of drinking water – distribution system. Sewage – classification – technical terms – septic tank – components and functions.

REFERENCES

1. Raju K.V.B., Ravichandran P.T., "*Basics of Civil Engineering"*, Ayyappa Publications, Chennai, 2012.
2. Ramesh Babu, "*Civil Engineering"* , VRB Publishers, Chennai, 2000.
3. Rangwala,S.C., "*Engineering Materials"*, Charotar Publishing House, Anand, 2012.
4. National Building Code of India, Part V, "*Building Material"s*, 2005

5. Surendra Singh, "*Building Materials"*, Vikas Publishing Company, New Delhi, 1996.

<table>
<tr><th colspan="13">CE1001 - BASIC CIVIL ENGINEERING</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Civil Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>K</td></tr>
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<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1 - 4</td><td></td><td></td><td></td><td>1-4</td><td></td><td></td><td></td><td></td><td></td><td>2-4</td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
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<tr><td>4.</td><td>Approval</td><td colspan="11">23rd meeting of academic council , May 2013</td></tr>
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SEMESTER – II

PD1002	**SOFT SKILLS-II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE	
To enhance holistic development of students and improve their employability skills.	
INSTRUCTIONAL OBJECTIVES	
1.	To develop inter personal skills and be an effective goal oriented team player.
2.	To develop professionals with idealistic, practical and moral values.
3.	To develop communication and problem solving skills.
4.	To re-engineer attitude and understand its influence on behavior.

UNIT I - INTERPERSONAL SKILLS (6 hours)

Understanding the relationship between Leadership Networking & Team work, Realizing Ones Skills in Leadership, Networking & Team Work, and Assessing Interpersonal Skills Situation description of Interpersonal Skill.

Team Work

Necessity of Team Work Personally, Socially and Educationally

UNIT II - LEADERSHIP (4 hours)

Skills for a good Leader, Assessment of Leadership Skills

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

UNIT III - STRESS MANAGEMENT (6 hours)

Causes of Stress and its impact, how to manage & distress, Understanding the circle of control, Stress Busters.

Emotional Intelligence

What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales. Managing Emotions.

UNIT IV - CONFLICT RESOLUTION (4 hours)

Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

UNIT V - DECISION MAKING **(10 hours)**

Importance and necessity of Decision Making, process of Decision Making, Practical way of Decision Making, Weighing Positives & Negatives.

Presentation

ASSESSMENT

1. A practical and activity oriented course which has a continuous assessment for 75 marks based on class room interaction, activities etc.,
2. Presentation - 25 marks

TEXT BOOK

1. INSIGHT, 2009. Career Development Centre, SRM Publications.

REFERENCE

1. Covey Sean, *Seven Habit of Highly Effective Teens*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, *How to win Friends and Influence People*, New York: Simon & Schuster, 1998.
3. Thomas A Harris, *I am ok, You are ok* , New York-Harper and Row, 1972
4. Daniel Coleman, *Emotional Intelligence*, Bantam Book, 2006

PD1002 - SOFT SKILLS-II												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					X		X	X		X		
2.	Mapping of instructional objectives with student outcome				1		2	3		4		
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		X										
4.	Approval	23rd Meeting of Academic Council, May 2013										

MA1002	**ADVANCED CALCULUS AND COMPLEX ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours -75	**3**	**2**	**0**	**4**
	(Common to all Branches of Engineering except Bio group)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To have knowledge in multiple calculus
2.	To improve their ability in Vector calculus
3.	To equip themselves familiar with Laplace transform
4.	To expose to the concept of Analytical function
5.	To familiarize with Complex integration

UNIT I - MULTIPLE INTEGRALS (15 hours)

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as a double integral – Triple integration in Cartesian coordinates – Conversion from Cartesian to polar – Volume as a Triple Integral.

UNIT II - VECTOR CALCULUS (15 hours)

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities (without proof) – Directional derivatives – Line, surface and volume integrals – Green's, Gauss divergence and Stoke's theorems (without proof) – Verification and applications to cubes and parallelopipeds only.

UNIT III - LAPLACE TRANSFORMS (15 hours)

Transforms of simple functions – Basic operational properties – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – periodic functions – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

UNIT IV- ANALYTIC FUNCTIONS (15 hours)

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: 1/z, az, az+b and bilinear transformation.

UNIT V - COMPLEX INTEGRATION **(15 hours)**

Line integral – Cauchy's integral theorem (without proof) – Cauchy's integral formulae and its applications – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem – Contour integration – Unit circle and semi circular contour.

TEXT BOOKS

1. Kreyszig.E, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons. Singapore, 2012.
2. K.Ganesan, Sundarammal Kesavan, K.S.Ganapathy Subramanian & V.Srinivasan, "*Engineering Mathematics*", Gamma publications, Revised Edition, 2013.

REFERENCES

1. Grewal B.S, "*Higher Engg Maths*", Khanna Publications, 42nd Edition, 2012.
2. Veerajan, T., "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co., New Delhi, 5th edition, 2006.
3. Kandasamy P etal. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "*Advanced Mathematics*" for Engineering students, Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman M.K., "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.

MA1002 ADVANCED CALCULUS AND COMPLEX ANALYSIS												
Course designed by		Department of Mathematics										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		--		x		--				--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

PY1003	MATERIALS SCIENCE	L	T	P	C
	Total Contact Hours - 60	2	0	2	3
	Prerequisite				
	Nil				

PURPOSE

The course introduces several advanced concepts and topics in the rapidly evolving field of material science. Students are expected to develop comprehension of the subject and to gain scientific understanding regarding the choice and manipulation of materials for desired engineering applications.

INSTRUCTIONAL OBJECTIVES

1.	To acquire basic understanding of advanced materials, their functions and properties for technological applications
2.	To emphasize the significance of materials selection in the design process
3.	To understand the principal classes of bio-materials and their functionalities in modern medical science
4.	To get familiarize with the new concepts of Nano Science and Technology
5.	To educate the students in the basics of instrumentation, measurement, data acquisition, interpretation and analysis

UNIT I - ELECTRONIC AND PHOTONIC MATERIALS (6 hours)

Electronic Materials: Fermi energy and Fermi–Dirac distribution function – Variation of Fermi level with temperature in intrinsic and extrinsic semiconductors – Hall effect – Dilute Magnetic Semiconductors (DMS) and their applications

Superconducting Materials: Normal and High temperature superconductivity – Applications.

Photonic Materials: LED – LCD – Photo conducting materials – Photo detectors – Photonic crystals and applications – Elementary ideas of Non-linear optical materials and their applications.

UNIT II - MAGNETIC AND DIELECTRIC MATERIALS (6 hours)

Magnetic Materials: Classification of magnetic materials based on spin – Hard and soft magnetic materials – Ferrites, garnets and magnetoplumbites – Magnetic bubbles and their applications – Magnetic thin films – Spintronics and devices (Giant magneto resistance, Tunnel magneto resistance and Colossal magneto resistance).

Dielectric Materials: Polarization mechanisms in dielectrics – Frequency and temperature dependence of polarization mechanism – Dielectric loss – Dielectric

waveguide and dielectric resonator antenna – Piezoelectric, pyroelectric and ferroelectric materials and their applications.

UNIT III - MODERN ENGINEERING AND BIOMATERIALS (6 hours)

Modern Engineering Materials: Smart materials – Shape memory alloys – Chromic materials (Thermo, Photo and Electro) – Rheological fluids – Metallic glasses – Advanced ceramics – Composites.

Bio-materials: Classification of bio-materials (based on tissue response) – Comparison of properties of some common biomaterials – Metallic implant materials (stainless steel, cobalt-based and titanium-based alloys) – Polymeric implant materials (Polyamides, polypropylene, Acrylic resins and Hydrogels) – Tissue replacement implants – Soft and hard tissue replacements – Skin implants – Tissue engineering – Biomaterials for organ replacement (Bone substitutes) – Biosensor.

UNIT IV - INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY (6 hours)

Basic concepts of Nanoscience and Nanotechnology – Quantum wire – Quantum well – Quantum dot – fullerenes – Graphene – Carbon nanotubes – Material processing by chemical vapor deposition and physical vapor deposition – Principle of SEM, TEM, AFM, Scanning near-field optical microscopy (SNOM) – Scanning ion-conducting microscopy (SCIM) – Potential uses of nanomaterials in electronics, robotics, computers, sensors, sports equipment, mobile electronic devices, vehicles and transportation – Medical applications of nanomaterials.

UNIT V - MATERIALS CHARACTERIZATION (6 hours)

X-ray diffraction, Neutron diffraction and Electron diffraction– X-ray fluorescence spectroscopy – Fourier transform Infrared spectroscopy (FTIR) – Ultraviolet and visible spectroscopy (UV-Vis) – Thermogravimetric Analysis (TGA) – Differential Thermal Analysis (DTA) – Differential Scanning Calorimetry (DSC).

PRACTICAL EXPERIMENTS (30 hours)

1. Determination of resistivity and band gap for a semiconductor material – Four probe method / Post-office box
2. Determination of Hall coefficient for a semiconducting material
3. To study V-I characteristics of a light dependent resistor (LDR)
4. Determination of energy loss in a magnetic material – B-H curve
5. Determination of paramagnetic susceptibility – Quincke's method
6. Determination of dielectric constant for a given material
7. Calculation of lattice cell parameters – X-ray diffraction

8. Measurement of glucose concentration – Electrochemical sensor
9. Visit to Advanced Material Characterization Laboratory (Optional)

TEXT BOOKS

1. Thiruvadigal, J. D., Ponnusamy,S..Sudha.D. and Krishnamohan M., "*Materials Sciences"*, Vibrant Publication, Chennai, 2013
2. Rajendran.V, "*Materials Science*",Tata McGraw- Hill,New Delhi,2011

REFERENCES

1. Rolf E. Hummel, "*Electronic Properties of Materials"*, 4th ed., Springer, New York, 2011.
2. Dennis W. Prather, "*Photonic Crystals: Theory, Applications, and Fabrication"*, John Wiley & Sons, Hoboken, 2009.
3. James R. Janesick, "*Scientific Charge-Coupled Devices",* Published by SPIE - The International Society for Optical Engineering, Bellingham, Washington, 2001.
4. David M. Pozar, "*Microwave Engineering*", 3rd ed., John Wiley & Sons, 2005.
5. F. Silver and C. Dillion, "*Biocompatibility: Interactions of Biological and Implantable Materials*", VCH Publishers, New York, 1989.
6. Severial Dumitriu, "*Polymeric Biomaterials*" Marcel Dekker Inc, CRC Press, Canada 2001.
7. G. Cao, "*Nanostructures and Nanomaterials: Synthesis, Properties and Applications*", Imperial College Press, 2004.
8. T.Pradeep, "*A Text Book of Nanoscience and Nanotechnology*", Tata McGraw Hill, New Delhi, 2012.
9. Sam Zhang, "*Materials Characterization Techniques*", CRC Press, 2008.

PY1003 MATERIALS SCIENCE												
Course designed by		**Department of Physics and Nanotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x		x	x						x
2.	Mapping of instructional objectives with student outcome	1	5		4	2						3
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		--		x		--				--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

CY1003	PRINCIPLES OF ENVIRONMENTAL SCIENCE	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

The course provides a comprehensive knowledge in environmental science, environmental issues and the management.

INSTRUCTIONAL OBJECTIVES

To enable the students

1.	To gain knowledge on the importance of environmental education and ecosystem.
2.	To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution.
3.	To understand the treatment of wastewater and solid waste management.
4.	To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.
5.	To be aware of the national and international concern for environment for protecting the environment

UNIT I- ENVIRONMENTAL EDUCATION AND ECOSYSTEMS (6 hours)

Environmental education: Definition and objective. Structure and function of an ecosystem – ecological succession –primary and secondary succession - ecological pyramids – pyramid of number, pyramid of energy and pyramid of biomass.

UNIT II- ENVIRONMENTAL POLLUTION (6 hours)

Environmental segments – structure and composition of atmosphere - Pollution – Air, water, soil , thermal and radiation – Effects – acid rain, ozone layer depletion and green house effect – control measures – determination of BOD, COD, TDS and trace metals.

UNIT III- WASTE MANAGEMENT (6 hours)

Waste water treatment (general) – primary, secondary and tertiary stages.
Solid waste management: sources and effects of municipal waste, bio medical waste - process of waste management.

UNIT IV - BIODIVERSITY AND ITS CONSERVATION (6 hours)

Introduction: definition - genetic, species and ecosystem diversity – bio diversity hot spots - values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife – endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

UNIT V - ENVIRONMENTAL PROTECTION (6 hours)

National concern for environment: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act – functions of central and state pollution control boards - international effort – key initiatives of Rio declaration, Vienna convention, Kyoto protocol and Johannesburg summit.

TEXT BOOKS

1. Kamaraj.P & Arthanareeswari.M, "*Environmental Science – Challenges and Changes"*, 4th Edition, Sudhandhira Publications, 2010.
2. Sharma.B.K. and Kaur, "*Environmental Chemistry",* Goel Publishing House, Meerut, 1994.

REFERENCES

1. De.A.K., "*Environmental Chemistry"*, New Age International, New Delhi, 1996.
2. Helen P Kavitha, "*Principles of Environmental Science*", Sci tech Publications, 2nd Edition, 2008.

CY1003 – PRINCIPLES OF ENVIRONMENTAL SCIENCE												
Course designed by		**Department of Chemistry**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
				x		x	x		x	x	x	
2.	Mapping of instructional objective with student outcome			5		2	4		1,3	3	2, 5	
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)			
				x		--			--			
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1002	VALUE EDUCATION	L	T	P	C
	Total Contact Hours- 15	1	0	0	1
	Prerequisite				
	Nil				

PURPOSE

To provide guiding principles and tools for the development of the whole person recognizing that the individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions.

INSTRUCTIONAL OBJECTIVES

1.	To help individuals think about and reflect on different values.
2.	To deepen understanding, motivation and responsibility with regard to making personal and social choices and the practical implications of expressing them in relation to themselves, others, the community and the world at large
3.	To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening

UNIT I - INTRODUCTION (3 hours)

Definition, Relevance, Types of values, changing concepts of values

UNIT II - INDIVIDUAL AND GROUP BEHAVIOUR (3 hours)

Personal values – Self – Strengths (self-confidence, self-assessment, self-reliance, self-discipline, determination, self-restraint, contentment, humility, sympathy and compassion, gratitude, forgiveness) Weaknesses (Influences -- Peer pressure, familial and societal expectations, media)

UNIT III- SOCIETIES IN PROGRESS (3 hours)

Definition of society; Units of society; Communities – ancient and modern – Agents of change – Sense of survival, security, desire for comfort and ease sense of belonging, social consciousness and responsibility

UNIT IV - ENGINEERING ETHICS (3 hours)

Definition - Societies for engineers – Code of Ethics – Ethical Issues involved in cross border research -- Ethical and Unethical practices – case studies – situational decision making

UNIT V - SPIRITUAL VALUES **(3 hours)**

What is religion? -- Role of religion – Misinterpretation of religion – moral policing – Consequences -- Religion as spiritual quest – Aesthetics and religion

TEXT BOOK

1. Department of English and Foreign Languages SRM University, "*Rhythm of Life",* SRM Publications, 2013.

REFERENCE

1. Values **(**Collection of Essays). Published by : Sri Ramakrishna Math, Chennai-4. 1996.

LE1002 VALUE EDUCATION												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	J	k
							x			x		
2.	Mapping of instructional objectives with student outcome						1-3			1-3		
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

IC1001	**ELECTRIC CIRCUIT ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop a strong basics in the Electric Circuits. The subject gives the students an in-depth knowledge about network theorems and analysis of complex circuits.

INSTRUCTIONAL OBJECTIVES

1.	Understand about analysis of complex circuits using super mesh and super node method.
2.	Understand about analysis of complex circuits using network theorems.

3.	Get an insight into solution of RLC parallel circuits, analysis of coupled circuits.
4.	Understand the concept of complex frequency & free and forced responses of RL, RC & RLC circuits.
5.	Understand the different parameters of two port networks.

UNIT I - BASICS OF CIRCUIT ANALYSIS (9 hours)

Ideal sources - Dependent and Independent sources - Formation of matrix equations and analysis of complex circuits using Super mesh analysis_ Super node analysis- application to DC and AC circuits.

UNIT II - NETWORK THEOREMS (9 hours)

Thevenin's Theorem, Norton's Theorem, Superposition theorem, Maximum power transfer theorem, compensation Theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem - Statement, illustration & application to DC and AC circuits.

UNIT III - RESONANCE IN AC CIRCUITS& COUPLED CIRCUIT ANALYSIS (9 hours)

Resonance –Series &parallel- Self Inductance- Mutual Inductance - Coefficient of coupling -dot rule- effective inductance of coupled coils in series & in parallel.

UNIT IV - TRANSIENT ANALYSIS (9 hours)

Concept of complex frequency - Network functions- Poles and Zeros _Representation of network elements in time domain & frequency domain - Free & forced responses of RL, RC, and RLC circuits with DC and sinusoidal excitation.

UNIT V - TWO PORT NETWORKS (9 hours

Definitions of driving point and transfer immittance function of two port networks - of network functions- Two port Parameters: z, y, h, inverse-h, ABCD parameters and transmission parameters- Relationship between the different parameters.

TEXT BOOKS

1. Hayt & Kemmerley, "*Engineering circuit Analysis"*, Tata McGraw Hill.2010
2. Sudhakar, A. And Shyam Mohan.S.P, "*Circuits and Networks Analysis and Synthesis"*, Tata McGraw Hill Publishing Co. Ltd. New Delhi 2011
3. S.P.Ghosh & A.K.Chakraborty , "Network Analysis and Synthesis", Tata McGraw Hill.2010

REFERENCS

1. C.L.Wadhwa, "Network Analysis and Synthesis", New age International publishers 2006.
2. Charles k. Alexander, Mathew N.O.Sadiku, "*Fundamentals of Electric circuits"*, Tata McGraw Hill.2010

IC1001 ELECTRIC CIRCUIT ANALYSIS												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1to 5	1to 5			1to 5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								x				
4.	Broad Area	Instrumentation		Control		Electrical		Electronics				
						x						
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1002	ELECTRIC CIRCUITS AND DEVICES LAB	L	T	P	C
	Total Contact Hours 30	**0**	**0**	**2**	**1**
	Prerequisite				
	NIL				

PURPOSE	
To enable the students to verify electric circuit theorem practically and verify electronic devices characteristics practically.	
INSTRUCTIONAL OBJECTIVES	
1.	To verify electric circuit theorem practically
2.	To verify resonance circuit practically .
3.	To verify stead and transient response of AC circuits.
4.	To verify electronic devices characteristics practically.

LIST OF EXPERIMENTS

1. Verification of Thevenin's and Norton' Theorem
2. Verification of Superposition and Reciprocity Theorem
3. Verification of Maximum power transfer and compensation theorem
4. Verification of Tellegen's and Millman's theorem
5. Series and Parallel Resonance Circuits
6. Transients in RLC Circuits
7. Series and Parallel AC Circuits and Phasor Diagram
8. Characteristics of semiconductor Zener and Diode
9. Characteristics of Transistor under Common Emitter configuration
10. Characteristics of Transistor under Common Base Configuration
11. Characteristics of UJT
12. Characteristics of FET
13. Characteristics of SCR
14. Characteristics of DIAC
15. Characteristics of TRIAC
16. Characteristics of PHOTO DIODE

REFERENCE

1. Circuits and devices Lab manual

<table>
<tr><th colspan="14">IC1002 ELECTRIC CIRCUITS AND DEVICES LAB</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="12">Department of Instrumentation & Control Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
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<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1to 4</td><td>1to 4</td><td></td><td></td><td>1to 4</td><td></td><td></td><td></td><td></td><td></td><td>1to 4</td></tr>
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<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Instrumentation</td><td colspan="2">Control</td><td colspan="4">Electrical</td><td colspan="2">Electronics</td></tr>
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<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

CS1001	PROGRAMMING USING MATLAB	L	T	P	C
	Total Contact Hours - 45	0	1	2	2
	Prerequisite				
	Nil				

PURPOSE

This Lab Course will enable the students to understand the fundamentals and programming knowledge in MATLAB.

INSTRUCTIONAL OBJECTIVES

1.	To learn the MATLAB environment and its programming fundamentals
2.	Ability to write Programs using commands and functions
3.	Able to handle polynomials, and use 2D Graphic commands

LIST OF EXPERIMENTS

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
4. Input-Output functions, Reading and Storing Data.
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart.

TEXT BOOK

1. R.K.Bansal, A.K.Goel, M.K.Sharma, "*MATLAB and its Applications in Engineering*", Pearson Education, 2012.

REFERENCES

1. Amos Gilat, *"MATLAB-An Introduction with Applications"*, Wiley India, 2009.
2. Stephen.J.Chapman, *"Programming in MATLAB for Engineers"*, Cengage Learning, 2011.

CS1001 PROGRAMMING USING MATLAB												
Course designed by		**Department of Computer Science and Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x									x
2.	Mapping of instructional objective with student outcome	2,3	1-3									1

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
		x	--	--	--
4.	Approval	23rd Meeting of Academic Council, May 2013			

BT1001	**BIOLOGY FOR ENGINEERS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize the students with the basic organization of organisms and subsequent building to a living being
2.	To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.
3.	To provide knowledge about biological problems that require engineering expertise to solve them

UNIT I - BASIC CELL BIOLOGY (6 hours)

Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism-Homoeostasis- Cell growth, reproduction, and differentiation.

UNIT II - BIOCHEMISTRY AND MOLECULAR ASPECTS OF LIFE (5 hours)

Biological Diversity --Chemistry of life: chemical bonds--Biochemistry and Human biology--Protein synthesis—Stem cells and Tissue engineering.

UNIT III - ENZYMES AND INDUSTRIAL APPLICATIONS (5 hours)

Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases—Photosynthesis

UNIT IV - MECHANOCHEMISTRY (7 hours)

Molecular Machines/Motors—Cytoskeleton—Bioremediation—Biosensors

UNIT V - NERVOUS SYSTEM, IMMUNE SYSTEM, AND CELL SIGNALING (7 hours)

Nervous system--Immune system- General principles of cell signaling

TEXT BOOK

1. S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, "*Biology for Engineers*," Tata McGraw-Hill, New Delhi, 2012.

REFERENCES

1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "*Biochemistry*," W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, "*Molecular Biology*," MCGraw-Hill, 5th Edition, 2012.
3. Jon Cooper, "*Biosensors A Practical Approach*" Bellwether Books**,** 2004.
4. Martin Alexander, "*Biodegradation and Bioremediation,"* Academic Press, 1994.
5. Kenneth Murphy, "*Janeway's Immunobiology*," Garland Science; 8th edition, 2011.
6. Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, "Principles of Neural Science, McGraw-Hill, 5th Edition, 2012.

BT1001 BIOLOGY FOR ENGINEERS												
	Course designed by	**Department of Biotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x			x						x	
2.	Mapping of instructional objectives with student outcome	1			2						3	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
			x		
4.	Approval	23rd Meeting of Academic Council, May 2013			

ME1001	**BASIC MECHANICAL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the basics of Mechanical Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize with the basic machine elements
2.	To familiarize with the Sources of Energy and Power Generation
3.	To familiarize with the various manufacturing processes

UNIT I - MACHINE ELEMENTS– I (5 hours)

Springs: Helical and leaf springs – Springs in series and parallel. **Cams:** Types of cams and followers – Cam profile.

UNIT II - MACHINE ELEMENTS– II (5 hours)

Power Transmission: Gears (terminology, spur, helical and bevel gears, gear trains). Belt drives (types). Chain drives. Simple Problems.

UNIT III - ENERGY (10 hours)

Sources: Renewable and non-renewable (various types, characteristics, advantages/disadvantages). **Power Generation:** External and internal combustion engines – Hydro, thermal and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). Simple Problems.

UNIT IV - MANUFACTURING PROCESSES - I (5 hours)

Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages). **Welding:** Types – Equipments – Tools and accessories – Techniques employed -applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

UNIT V - MANUFACTURING PROCESSES– II (5 hours)

Lathe Practice: Types - Description of main components – Cutting tools – Work holding devices – Basic operations. Simple Problems. **Drilling Practice:** Introduction – Types – Description – Tools. Simple Problems.

TEXT BOOKS

1. Kumar T, Leenus Jesu Martin and Murali G, *"Basic Mechanical Engineering"*, Suma Publications, Chennai, 2007.
2. Prabhu T. J, Jai Ganesh V and Jebaraj S, *"Basic Mechanical Engineering"*, Scitech Publications, Chennai, 2000.

REFERENCES

1. Hajra Choudhary S.K. and HajraChoudhary, A. K., "*Elements of Workshop Technology", Vols. I & II*, Indian Book Distributing Company Calcutta, 2007.
2. Nag, P.K., "*Power Plant Engineering"*, Tata McGraw-Hill, New Delhi, 2008.
3. Rattan, S.S., "*Theory of Machines"*, Tata McGraw-Hill, New Delhi, 2010.

ME1001 BASIC MECHANICAL ENGINEERING												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				x						
2.	Mapping of instructional objectives with student outcome	1- 3				1- 3						
3.	Category	General (G)		Basic sciences(B)		Engineering sciences and technical art (E)				Professional subjects (P)		
		--		--		x				--		
4.	Approval	23rd meeting of the Academic Council , May 2013										

EE1001	**BASIC ELECTRICAL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

This course provides comprehensive idea about circuit analysis, working principles of machines and common measuring instruments.

INSTRUCTIONAL OBJECTIVES	
1.	Understand the basic concepts of magnetic circuits, AC & DC circuits.
2.	Explain the working principle, construction, applications of DC & AC machines and measuring instruments.
3.	Gain knowledge about the fundamentals of wiring and earthing

UNIT I - FUNDAMENTALS OF DC CIRCUITS (6 hours)

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor , Kirchhoff's laws, Mesh analysis, Nodal analysis, Ideal sources –equivalent resistor, current division, voltage division

UNIT II - MAGNETIC CIRCUITS (6 hours)

Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, induced emfs and inductances

UNIT III - AC CIRCUITS (6 hours)

Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator. Analysis of R-L, R-C, R-L-C circuits. Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT IV - ELECTRICAL MACHINES & MEASURING INSTRUMENTS (6 hours)

Working principle, construction and applications of DC machines and AC machines (1 - phase transformers, single phase induction motors: split phase, capacitor start and capacitor start & run motors). Basic principles and classification of instruments -Moving coil and moving iron instruments.

UNIT V - ELECTRICAL SAFETY, WIRING &INTRODUCTION TO POWER SYSTEM (6 hours)

Safety measures in electrical system- types of wiring- wiring accessories-staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing- Simple layout of generation, transmission & distribution of power.

TEXT BOOK

1. Dash S.S., Subramani C., Vijayakumar K.,"BasicElectrical Engineering", First edition, Vijay Nicole Imprints Pvt.Ltd,2013

REFERENCES

1. Smarajt Ghosh, "*Fundamentals of Electrical & Electronics Engineering*", Second edition, PHI Learning, 2007.
2. K.Metha V, Rohit Metha, "*Basic Electrical Engineering*", Fifth edition, S.Chand & Co, 2012.
3. Kothari D. P and Nagrath IJ, "*Basic Electrical Engineering*", Second edition, Tata McGraw - Hill, 2009
4. Bhattacharya S. K., "*Basic Electrical and Electronics Engineering"*, First edition, Pearson Education, 2011

EE1001 - BASIC ELECTRICAL ENGINEERING												
Course designed by		**Department of Electrical and Electronics Engineering**										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
		--		--		x				--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

EC1001	**BASIC ELECTRONICS ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

This course provides comprehensive idea about working principle, operation and characteristics of electronic devices, transducers, Digital Electronics and Communication Systems.

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able to gain knowledge about the

1.	Fundamentals of electronic components, devices, transducers
2.	Principles of digital electronics
3.	Principles of various communication systems

UNIT I - ELECTRONIC COMPONENTS (4 hours)

Passive components – resistors, capacitors & inductors (properties, common types, I-V relationship and uses).

UNIT II - SEMICONDUCTOR DEVICES (7 hours)

Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, optocouplers)

UNIT III - TRANSDUCERS (5 hours)

Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

UNIT IV - DIGITAL ELECTRONICS (7 hours)

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

UNIT V - COMMUNICATION SYSTEMS (7 hours)

Block diagram of a basic communication system – frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, pulse analog and pulse digital modulation – AM / FM transmitters & receivers (block diagram description only)

TEXT BOOKS

1. Thyagarajan T,. SendurChelvi K.P, Rangaswamy T.R., *"Engineering Basics: Electrical, Electronics and Computer Engineering"*, New Age International, Third Edition, 2007.
2. Somanathan Nair B, Deepa S.R., "*Basic Electronics",* I.K. International Pvt. Ltd., 2009.

REFERENCES

1. Thomas L. Floyd, *"Electronic Devices",* Pearson Education, 9th Edition, 2011.
2. Rajput R.K., *"Basic Electrical and Electronics Engineering"*, Laxmi Publications, First Edition, 2007.

EC1001 BASIC ELECTRONICS ENGINEERING												
Course designed by		Department of Electronics and Communication Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x										
2.	Mapping of instructional objectives with student outcome	1,2,3										
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)				Professional Subjects (P)	
		--		--			x				--	
4.	Approval	23rd Meeting of Academic Council, May 2013										

ME1005	ENGINEERING GRAPHICS	L	T	P	C
	Total Contact Hours - 75	0	1	4	3
	Prerequisite				
	Nil				

First Angle Projection is to be followed - Practice with Computer Aided Drafting tools

PURPOSE	
1.	To draw and interpret various projections of 1D, 2D and 3D objects.
2.	To prepare and interpret the drawings of buildings.
INSTRUCTIONAL OBJECTIVES	
1.	To familiarize with the construction of geometrical figures
2.	To familiarize with the projection of 1D, 2D and 3D elements
3.	To familiarize with the sectioning of solids and development of surfaces
4.	To familiarize with the Preparation and interpretation of building drawing

UNIT I - FUNDAMENTALS OF ENGINEERING GRAPHICS (2 hours)

Lettering – Two dimensional geometrical constructions – Conics – Representation of three-dimensional objects – Principles of projections – Standard codes – Projection of points.

UNIT II - PROJECTION OF LINES AND SOLIDS (4 hours)

Projection of straight lines – Projection of planes - Projection of solids – Auxiliary projections.

UNIT III - SECTIONS AND DEVELOPMENTS (3 hours)

Sections of solids and development of surfaces.

UNIT IV - PICTORIAL PROJECTIONS (4 hours)

Conversion of Projections: Orthographic projection – Isometric projection of regular solids and combination of solids.

UNIT V - BUILDING DRAWING (2 hours)

Plan, Elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course) with electrical wiring diagram.

PRACTICAL (60 hours)

TEXT BOOKS

1. Venugopal, K. and Prabhu Raja, V., "*Engineering Graphics"*, Eighth Edition (Revised), New Age International Publishers, Chennai, 2007.
2. Natarajan, K.V., "*A Text Book of Engineering Graphics"*, 21st Edition, Dhanalakshmi Publishers, Chennai, 2012.
3. Jeyapoovan, T., "*Engineering Drawing and Graphics using AutoCAD"*, Vikas Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCES

1. Bethune, J.D., "*Engineering Graphics with AutoCAD 2013*", PHI Learning Private Limited, Delhi, 2013.
2. Bhatt, N.D., "*Elementary Engineering Drawing (First Angle Projection)"*, Charotar Publishing Co., Anand, 1999.
3. Narayanan, K. L. and Kannaiah, P., "*Engineering Graphics"*, Scitech Publications, Chennai, 1999.
4. Shah, M. B. and Rana, B. C., "*Engineering Drawing"*, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2005.

ME1005 ENGINEERING GRAPHICS												
Course designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
			x	x				x				
2.	Mapping of instructional objectives with student outcome		1-4	1-4				1-4				
3.	Category	General (G)		Basic sciences (B)		Engineering sciences and technical art (E)				Professional subjects (P)		
		--		--		x				--		
4.	Approval	23rd meeting of the Academic Council , May 2013										

EC1002	ELECTRONICS ENGINEERING PRACTICES	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To equip the students with the knowledge of PCB design and fabrication processes.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize the electronic components and basic electronic instruments.
2.	To make familiar with PCB design and various processes involved.
3.	To provide in-depth core knowledge in the and fabrication of Printed Circuit Boards.
4.	To provide the knowledge in assembling and testing of the PCB based electronic circuits.

UNIT I - INTRODUCTION TO BASICS OF ELECTRONIC COMPONENTS AND INSTRUMENTS (4 hours)

Study of electronic components- active & passive, Electronic Instruments: CRO, Function generator, Power Supply, Multi-meter, IC tester. Solder practice.

UNIT II - SCHEMATIC CAPTURE (6 hours)

Introduction to ORCAD schematic capture tool, Simulation of simple electronic circuit, Schematic to layout transfer, Layout Printing

UNIT III - PCB DESIGN PROCESS (6 hours)

Conception Level Introduction: Specifying Parts, Packages and Pin Names, Libraries and Checking foot prints of the components, Partlist, Netlist, Making Netlist Files, Placing Parts, Routing Traces, Modifying Traces, Mounting Holes, Adding Text, PCB Layout, DRC, Pattern Transfer

UNIT IV - PCB FABRICATION PROCESS (6 hours)

Etching, cleaning, drying and drilling

UNIT V - ASSEMBLING AND TESTING (8 hours)

Identifying the components and its location on the PCB, soldering of active and passive components, Testing the assembled circuit for correct functionality

TEXT BOOKS

1. Orcad User manual.
2. Raghbir Singh Khandpur, "Printed Circuit Boards: Design, Fabrication, and Assembly", Tata McGraw-Hill Education, 2005.

REFERENCES

1. Department Laboratory Manual.

EC1002 ELECTRONICS ENGINEERING PRACTICE												
Course designed by		**Department of Electronics and Communication Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x								x
2.	Mapping of instructional objectives with student outcome	1	2,3	2,3								1-4
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
		--		--			x			--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

EE1002	**ELECTICAL ENGINEERING PRACTICE**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

To provide exposure to the students with hands on experience on various Electrical Engineering practices.

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able

1.	To learn the residential wiring and various types of wiring.
2.	To measure the various electrical quantities.
3.	To gain knowledge about the fundamentals of various electrical gadgets and their working and trouble shooting of them.
4.	To design a prototype of a transformer.
5.	To know the necessity and types of earthing and measurement of earth resistance.

LIST OF EXPERIMENTS

1. Residential wiring (using Energy meter, fuses, switches, indicator, lamps, etc)
2. Types of wiring (fluorescent lamp wiring, staircase wiring, godown wiring, etc)
3. Measurement of electrical quantities (like voltage, current, power, power factor in RLC circuits)
4. Measurement of energy (using single phase and three phase energy meter)
5. Study of Earthing and Measurement of Earth resistance.
6. Study of trouble shooting of electrical equipments (fan, iron box, mixer-grinder, etc)
7. Study of various electrical gadgets (Induction motor, transformer, CFL, LED, PV cell, etc)
8. Assembly of choke or small transformer.

REFERENCES

1. Subhransu Sekhar Dash & K.Vijayakumar, "*Electrical Engineering Practice Lab Manual".* Vijay Nicole Imprints Private Ltd., First Edition, 2013
2. K. Jeyachandran, S.Natarajan & S.Balasubramanian, " *A Primer on engineering practices laboratory*", Anuradha Publications, 2007

3. T.Jeyapoovan, M.Saravanapandian & S.Pranitha, "*Engineering practices lab manual*",Vikas Publishing House Pvt., Ltd., 2006

EE1002- ELECTICAL ENGINEERING PRACTICE												
Course designed by		**Department of Electrical and Electronics Engineering**										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
		x	x	x								
2.	Mapping of instructional objectives with student outcome	1-5	2,5	4								
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)			Professional Subjects(P)			
		--		--		x			--			
4.	Approval	23rd Meeting of Academic Council, May 2013										

NC1001/ NS1001/ SP1001/ YG1001	**NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO) / YOGA**	**L**	**T**	**P**	**C**
	Total Contact Hours – 15 (minimum, but may vary depending on the course)	**0**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE

To imbibe in the minds of students the concepts and benefits of NCC/NSS/NSO/YOGA and make them practice the same

INSTRUCTIONAL OBJECTIVES

1. To enable the students to gain knowledge about NCC/NSS/NSO/YOGA and put the same into practice

NATIONAL CADET CORPS (NCC)

Any student enrolling as a member of National Cadet Core (NCC) will have to attend sixteen parades out of twenty parades each of four periods over a span of academic year.

Attending eight parades in first semester will qualify a student to earn the credits specified in the curriculum. Grading shall be done based on punctuality, regularity in attending the parades and the extent of active involvement.

NATIONAL SERVICE SCHEME (NSS)

A student enrolling as member of NSS will have to complete 60 hours of training / social service to be eligible to earn the credits specified in the curriculum.

Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

NATIONAL SPORTS ORGANIZATION (NSO)

Each student must select one of the following games/sports events and practice for one hour per week. An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

List of games/sports:

Basket Ball, Football, Volley Ball, Ball Badminton, Cricket, Throw-ball, Track events

Field events or any other game with the approval of faculty member.

YOGA

Benefits of Agnai Meditation -Meditation - Agnai, Asanas, Kiriyas, Bandas, Muthras

Benefits of santhi Meditation - Meditation Santhi Physical Exercises (I & II)

Lecture & Practice - Kayakalpa Yoga Asanas, Kiriyas, Bandas, Muthras

Analysis of Thought - Meditation Santhi Physical Exercises III & IV

Benefits of Thuriyam - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Attitude - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Importance of Arutkappy & Blessings - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Benefits of Blessings - Meditation Santhi Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Assessment

An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

TEXT BOOKS

1. Yogiraj Vethathiri Maharishi, "*Yoga for Modern Age*", Vethathiri Publishers, 1989
2. Vethathiri Maharishi, T., "*Simplified Physical Exercises*", Vethathiri Publishers, 1987.

NC1001/ NS1001/ SP1001/ YG1001		**NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO)/YOGA**										
Course designed by		**NCC/NSS/NSO/YOGA PRACTITIONERS**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
2.	Mapping of instructional objectives with student outcome				X					X		
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
		X										
4.	Approval	23rd Meeting of Academic Council, May 2013										

SEMESTER III

LE1003	**GERMAN LANGUAGE PHASE I**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

Germany offers infinite opportunities for students of engineering for higher studies, research and employment in Germany. B.Tech Students are offered German Language during their second year. Knowledge of the language will be helpful for the students to adjust themselves when they go for higher studies.

INSTRUCTIONAL OBJECTIVES

1.	To introduce the language, phonetics and the special characters in German language
2.	To introduce German culture & traditions to the students.
3.	By the end of Phase – I, the students will be able to introduce themselves and initiate a conversation..
4.	We endeavor to develop the ability among the students to read and understand small texts written in German
5.	To enable the students to elementary conversational skills.

UNIT I (**6 hours)**

Wichtige Sprachhandlungen: Phonetics – Sich begrüßen - Sich und andere vorstellen formell / informell - Zahlen von 1 bis 1 Milliarde - verstehen & sprechen **Grammatik:** regelmäßige Verben im Präsens - "sein" und haben im Präsens - Personalpronomen im Nominativ

UNIT II **(6 hours)**

Wichtige Sprachhandlungen Telefon Nummern verstehen und sprechen Uhrzeiten verstehen und sagen Verneinung "nicht und kein" (formell und informell) **Grammatik** : Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/Nein Frage) Nomen buchstabieren und notieren bestimmter und unbestimmter Artikel und Negativartikel im Nom. & Akkusativ

UNIT III **(6 hours)**

Wichtige Sprachhandlungen Tageszeiten verstehen und über Termine sprechen -Verabredungen verstehen - Aufgaben im Haushalt verstehen **Grammatik** Personalpronomen im Akkusativ und Dativ - W-Fragen "wie, wer, wohin,wo, was

usw.- Genitiv bei Personennamen - Modalverben im Präsens “können, müssen, möchten”

UNIT IV **(6 hours)**

Wichtige Sprachhandlungen Sich austauschen, was man kann, muss – Bezeichnungen Lebensmittel – Mengenangaben verstehen – Preise verstehen und Einkaufzettel schreiben

Grammatik Wortstellung in Sätzen mit Modalverben – Konnektor ”und” – “noch”-kein-------mehr – “wie viel, wie viele, wie alt, wie lange” –Possessivartikel im Nominativ.

UNIT V **(6 hours)**

Wichtige Sprachhandlungen Freizeitanzeigen verstehen – Hobbys und Sportarten Anzeigen für Freizeitpartner schreiben bzw. darauf antworten – Vorlieben und Abneigungen ausdrucken

Grammatik Verben mit Vokalwechsel im Präsens – Modalverben im Präsens “ dürfen, wollen und mögen - “haben und sein” im Präteritum – regelmäßige Verben im Perfekt – Konnektoren “denn, oder, aber

TEXT BOOK

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprach training).

REFERENCES

1. German for Dummies
2. Schulz Griesbach

<table>
<tr><td colspan="13">LE1003 GERMAN LANGUAGE PHASE I</td></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of English and Foreign Languages</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
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<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1-5</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="2">Professional Subjects (P)</td></tr>
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<tr><td>4.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
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LE1004	FRENCH LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To enable the student learners acquire a basic knowledge of the French language and concepts of general French for everyday interactions and technical French at the beginner's level and also to get to know the culture of France.

INSTRUCTIONAL OBJECTIVES

1.	To enable students improve their grammatical competence.
2.	To enhance their listening skills.
3.	To assist students in reading and speaking the language.
4.	To enhance their lexical and technical competence.
5.	To help the students introduce themselves and focus on their communication skills.

UNIT I **(6 hours)**

1. Grammar and Vocabulary: Usage of the French verb "se presenter", a verb of self- introduction and how to greet a person- "saluer"
2. Listening and Speaking – The authentic sounds of the letters of the French alphabet and the accents that play a vital role in the pronunciation of the words.
3. Writing – correct spellings of French scientific and technical vocabulary.
4. Reading -- Reading of the text and comprehension – answering questions.

UNIT II **(6 hours)**

1. Grammar and Vocabulary – Definite articles , "prepositions de lieu" subject pron ouns
2. Listening and Speaking – pronunciation of words like Isabelle, presentez and la liaison – vous etes, vous appelez and role play of introducing each other – group activity
3. Writing – particulars in filling an enrollment / registration form
4. Reading Comprehension – reading a text of a famous scientist and answering questions.

UNIT III **(6 hours)**

1. Grammar and Vocabulary – verb of possession "avoir' and 1st group verbs "er", possessive adjectives and pronouns of insistence- moi, lui..and numbers from 0 to 20
2. Listening and Speaking –nasal sounds of the words like feminine, ceinture , parfum and how to ask simple questions on one's name, age, nationality, address mail id and telephone number.
3. Writing –conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person.
4. Reading Comprehension – reading a text that speaks of one's profile and answering questions

UNIT IV **(6 hours)**

1. Grammar and Vocabulary –negative sentences, numbers from 20 to 69, verb "aimer"and seasons of the year and leisure activities.
2. Listening and Speaking – To express one's likes and dislikes and to talk of one's pastime activities (sports activities), je fais du ping-pong and nasal sounds of words – janvier, champagne
3. Writing- conjugations of the irregular verbs – faire and savoir and their usage. Paragraph writing on one's leisure activity- (passé temps favori).Conj
4. Reading- a text on seasons and leisure activities – answering questions.

UNIT V **(6 hours)**

1. Grammar and Vocabulary – les verbes de direction- to ask one's way and to give directions, verbes- pouvoir and vouloir and 2nd group verbs , a droite, la premiere a gauche and vocabulary relating to accommodation.
2. Listening and Speaking – to read and understand the metro map and hence to give one directions – dialogue between two people.
3. Writing –paragraph writing describing the accommodation using the different prepositions like en face de, derriere- to locate .
4. Reading Comprehension -- a text / a dialogue between two on location and directions- ou est la poste/ la pharmacie, la bibliotheque?.....

TEXT BOOK

1. Tech French

REFERENCES

1. French for Dummies.
2. French made easy-Goyal publishers
3. Panorama

LE1004 FRENCH LANGUAGE PHASE I												
Course designed by		Department of English and Foreign Languages										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-5				
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
		x		--			--			--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

LE 1005	JAPANESE LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours- 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To enable students achieve a basic exposure on Japan, Japanese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the Japanese scripts viz. hiragana and a few basic kanji.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Japan and Japanese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Japan.

UNIT I **(8 hours)**

1. Introduction to Japanese language. Hiragana Chart 1 - vowels and consonants and related vocabulary.
2. Self introduction
3. Grammar – usage of particles wa, no, mo and ka and exercises
4. Numbers (1-100)
5. Kanji – introduction and basic kanjis – naka, ue, shita, kawa and yama
6. Greetings, seasons, days of the week and months of the year

7. Conversation – audio
8. Japan – Land and culture

UNIT II (**8 hours)**

1. Hiragana Chart 1 (contd.) and related vocabulary
2. Grammar – usage of kore, sore, are, kono, sono, ano, arimasu and imasu. Particles – ni (location) and ga. Donata and dare.
3. Numbers (up to 99,999)
4. Kanji – numbers (1-10, 100, 1000, 10,000 and yen)
5. Family relationships and colours.
6. Conversation – audio
7. Festivals of Japan

UNIT III (**5 hours)**

Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary
Lesson 3
Grammar - particles ni (time), kara, made and ne. Koko, soko, asoko and doko.
Time expressions (today, tomorrow, yesterday, day before, day after)
Kanji – person, man, woman, child, tree and book
Directions – north, south, east and west

UNIT IV **(5 hours)**

Grammar - directions,-kochira, sochira, achira and dochira. Associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)
Conversation – audio
Japanese art and culture like ikebana, origami, etc.

UNIT V **(4hours)**

Kanji – hidari, migi, kuchi
Japanese sports and martial arts

TEXT BOOK

1. First lessons in Japanese, ALC Japan

REFERENCES

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation

LE1005 JAPANESE LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
		x		--			--				--	
4.	Approval	23rd Meeting of Academic Council, May 2013										

LE1006	KOREAN LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours-30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Korean culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea.

UNIT I **(6 hours)**

Lesson 1 < Introduction to Korean Language >, Lesson2 < Consonants and Vowels >, <Basic Conversation, Vocabularies and Listening >

UNIT II **(10 hours)**

Lesson 3 < Usage of "To be" >, Lesson 4 < Informal form of "to be" >, Lesson 5 <Informal interrogative form of "to be" >, Lesson 6 < To be, to have, to stay >, < Basic Conversation, Vocabularies and Listening >

UNIT III (**10 hours)**

Lesson 7 < Interrogative practice and Negation >, < Basic Conversation, Vocabularies and Listening >

UNIT IV **(4 hours)**

Lesson 8 < Korean Culture and Business Etiquette >, < Basic Conversation, Vocabularies and Listening

TEXT BOOK

1. Korean Through English 1 (Basic Korean Grammar and Conversation).

REFERENCES

1. Bharati Korean (Intermediate Korean Grammar).
2. Hand-outs.
3. Various visual mediums such Movie CD, Audio CD.
4. Collection of vocabularies for engineering field.

LE1006 KOREAN LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
		x		--			--			--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

LE1007	**CHINESE LANGUAGE PHASE I**	**L**	**T**	**P**	**C**
	Total contact hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	NIL				

PURPOSE

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES	
1.	To help students learn the Chinese scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about China and Chinese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china.

UNIT I

Introduction of Chinese Language

UNIT II

Phonetics and Notes on pronunciation

a) 21 Initials:

b p m f d t n l g k h j q x z c s zh ch sh r

b) 37 Finals:

a	o	e	i	u	ü
ai	ou	ei	ia	ua	üe
an	ong	en	ian	uai	üan
ang		eng	iang	uan	ün
ao		er	iao	uang	
			ie	uei(ui)	
			in	uen(un)	
			ing	ueng	
			iong	uo	
			iou(iu)		

c) The combination of Initials and Finals - Pinyin

UNIT III

Introduction of Syllables and tones

a) syllable=initial+final+tone

b) There are four tones in Chinese: the high-and-level tone, the rising tone, the falling-and-rising tone, and the falling tone. And the markers of the different tones.

UNIT IV

A. Tones practice

B. the Strokes of Characters

1. Introduction of Chinese Characters
2. The eight basic strokes of characters

UNIT V

1. Learn to read and write the Characters:

八(eight) 不(not) 马(horse) 米(rice) 木(wood).

2. **classes are organized according to several Mini-dialogues.**

TEXT BOOK

A New Chinese Course 1- Beijing Language and Culture University Press.

REFERENCES

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press.
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press.
3. My Chinese Classroom - East China Normal University Press.

LE1007 CHINESE LANGUAGE PHASE I												
Course designed by		Department of English and Foreign Languages										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
		x		--			--				--	
4.	Approval	23rd Meeting of Academic Council, May 2013										

PD1003	APTITUDE-I	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To improve aptitude, problem solving skills and reasoning ability of the student.
2.	To collectively solve problems in teams & group.

UNIT I – NUMBERS **(6 hours)**

Types and Properties of Numbers, LCM, GCD, Fractions and decimals, Surds

UNIT II - ARITHMETIC – I **(6 hours)**

Percentages, Profit & Loss, Simple Interest & Compound Interest, , Clocks & calendars

UNIT III - ALGEBRA – I **(6 hours)**

Logarithms, Problems on ages

UNIT IV - MODERN MATHEMATICS – I **(6 hours)**

Permutations, Combinations, Probability

UNIT V - REASONING **(6 hours)**

Logical Reasoning, Analytical Reasoning

ASSESSMENT

1. Objective type – Paper based / Online – Time based test

REFERENCE

1. Agarwal.R.S – *Quantitative Aptitude for Competitive Examinations,* Chand. S Limited 2011
2. Abhijit Guha*, Quantitative Aptitude for Competitive Examinations,* Tata McGraw Hill, 3rd Edition*,* 2011
3. Edgar Thrope, *Test Of Reasoning for Competitive Examinations,* Tata McGraw Hill, 4th Edition, 2012
4. *Other material related to quantitative aptitude*

PD1003 – APTITUDE-I												
Course designed by		Career Development centre										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X							
2.	Mapping of instructional objectives with student outcome	1			2							
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		X										
4.	Broad Area	-		-		-						
		--		--		--				--		
5.	Approval	23rd Meeting of Academic Council, May 2013										

	TRANSFORMS AND BOUNDARY VALUE PROBLEMS	L	T	P	C
MA1003	Total Contact Hours - 60	**4**	**0**	**0**	**4**
	(Common to CSE, SWE, ECE, EEE, ICE, EIE, TCE & MECT)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To know to formulate and solve partial differential equations
2.	To have thorough knowledge in Fourier series
3.	To be familiar with applications of partial differential equations
4.	To gain good knowledge in the application of Fourier transform
5.	To learn about Z- transforms and its applications

UNIT I - PARTIAL DIFFERENTIAL EQUATIONS (12 Hours)

Formation – Solution of standard types of first order equations – Lagrange's equation – Linear homogeneous partial differential equations of second and higher order with constant coefficients - Classification of second order linear partial

differential equations including the reduction to the above types – Separable Variable Method.

UNIT II - FOURIER SERIES (12 Hours)

Dirichlet's conditions – General Fourier series – Half range Sine and Cosine series – Parseval's identity – Harmonic Analysis.

UNIT III - ONE DIMENSIONAL WAVE & HEAT EQUATION (12 Hours)

Boundary and initial value problems - Transverse vibrations of elastic string with fixed ends – Fourier series solutions – One dimensional heat equation - Steady and transient states – problems – Excluding thermally insulated ends.

UNIT IV - FOURIER TRANSFORMS (12 Hours)

Statement of Fourier integral theorem(proof omitted) – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Integral equations.

UNIT V Z-TRANFORMS AND DIFFERENCE EQUATIONS (12 Hours)

Z-transform – Elementary properties – Inverse Z-transfrom – Convolution theorem – Formation of Difference equations – Solution of difference equations using Z-transform.

TEXT BOOKS

1. Kreyszig.E, "*Advanced Engineering Mathematics"*, 10th edition, John Wiley & Sons. Singapore, 2012.
2. Grewal B.S, *"Higher Engg Maths",* Khanna Publications, 42nd Edition,2012.

REFERENCES

1. Kandasamy P etal. *"Engineering Mathematics",* Vol. II & Vol. III (4th revised edition), S.Chand & Co., New Delhi, 2000.
2. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., *"Advanced Mathematics for Engineering students"*, Volume II & III (2nd edition), S.Viswanathan Printers and Publishers, 1992.
3. Venkataraman M.K., *"Engineering Mathematics"* – Vol.III – A & B (13th edition), National Publishing Co., Chennai, 1998.
4. Sankara Rao, "*Introduction to Partial Differential Equations"*, 2nd Edition, PHI Learning Pvt. Ltd., 2006.
5. Sivaramakrishna Das P. and Vijayakumari.C, *"A text book of Engineering Mathematics-III"*,Viji's Academy,2010

MA1003 TRANSFORMS AND BOUNDARY VALUE PROBLEMS												
Course designed by		Department of Mathematics										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
		--		x			--				--	
4.	Approval	23rd Meeting of Academic Council, May 2013										

IC1003	THEORY AND PERFORMANCE OF ELECTRICAL MACHINES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Basic Electrical Engg.				

PURPOSE

The purpose of this course is to develop strong basics in machines, understand the different types of electrical machines and transformers.

INSTRUCTIONAL OBJECTIVES

1.	To understand dc generator and dc motors.
2.	To understand transformers
3.	To understand synchronous machines.
4.	To understand 3-phase induction machines.
5	To understand 1-phase induction machines & special machines

UNIT I - DC MACHINES **(9 hours)**

Review of constructional details - working principle of DC generator - E.M.F equation - classification & performance equations - No load & load characteristics - working principle of DC motor - Back e.m.f - equations for torque, power & speed - characteristics of shunt, series & compound motors - Need for starters - 3 point starter - Power stages &efficiency - speed control (qualitative treatment only)

UNIT II - TRANSFORMERS (9 hours)

Construction - working principle - e.m.f equation - transformer operation on no load & load - phase diagram -approximate equivalent circuit - voltage regulation & efficiency calculations - predetermination from OC & SC test -direct loading- 3-phase transformer (qualitative treatment only)-Constructional details of 3-phase transformer -connection of banks of 1-phase transformer for different operations such as star-star, delta-delta, star-delta, delta -star.

UNIT III - PHASE SYNCHRONOUS MACHINES (9 hours)

General constructional features - types - synchronous generators - e.m.f. equation - brief idea of armature reaction -voltage regulation calculation by approximate formula - phasor diagram - Synchronous Motor-Operation at constantload, variable excitation - constant excitation, variable load - phasor diagrams - starting methods (qualitative treatmentonly).

UNIT IV - PHASE INDUCTION MACHINES (9 hours)

Types - construction features of 3-phase induction motor - Torque equation - slip torque characteristics- power stages & efficiency- starting & speed control methods (qualitative treatment only).

UNIT V - SINGLE PHASE INDUCTION MOTOR & SPECIAL MACHINES (9 hours)

Principle of operation of single phase induction motor - split phase - capacitor start & run motors - servo motor -stepper motor - linear induction motor - reluctance, Universal motor.

TEXT BOOKS

1. Theraja B. L. & Theraja. A. K., "*A Text Book of Electrical Technology",* Vol.II, S.Chand & Co.Ltd., 2010.
2. D. P. Kothari & I.J.Nagrath., "*Electric Machinery",* Tata McGraw Hill education., 2010.

REFERENCES

1. Rajput R.K., "*A text book of Electrical Machines"*, Lakshmi publications, 2008.
2. Gupta J.B.," *Theory & performance of Electrical Machines"*, SK Kataria & Sons 2010.

WEBSITES

1. ***MIT coursework,*** *http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-685-electric-machines-fall-2005/index.htm*
2. ***NPTEL,*** *http://nptel.iitm.ac.in/courses/IIT-MADRAS/Electrical_Machines_I/*

IC1003 THEORY AND PERFORMANCE OF ELECTRICAL MACHINES												
Course designed by		Department of Instrumentation & Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1,2, 3,4 &5	1,2, 3,4 &5			1,2, 3,4 &5						
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										x		
4.	Broad Area	Instrumentation			Control		Electrical			Electronics		
							x					
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1004	MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to learn in detail about the various instruments available for monitoring/measuring electrical parameters encountered in domestic / industrial applications.

INSTRUCTIONAL OBJECTIVES

1.	Understand and learn the different principles and instruments adopted for measurement of current, voltage, power, energy etc.
2.	Study different methods available for measurement of passive elements like resistance, inductance & capacitance and solving problems
3.	Analyzing signals using cathode ray oscilloscope. Storage of digital signal and analyzers for analyzing digital signal to provide with meaning full information

UNIT I - MEASUREMENT OF CURRENT AND VOLTAGE (9 hours)

Introduction to electrical measurements - classification of analog instruments - Galvanometers - vibration, tangent and d'Arsonval type. Principle of operation, construction, sources of errors and compensations in PMMC, moving iron,

dynamometer and induction type instruments. Extension of ranges and calibration of ammeters & voltmeters- Potentiometers.

UNIT II - MEASUREMENT OF POWER AND ENERGY (9 hours)

Power measurement - Voltmeter ammeter method, electrodynamic wattmeter - Theory, errors and compensation methods, low power factor wattmeter - power measurement in poly-phase systems-Energy measurement - single phase and poly phase induction type energy meter - theory and adjustments - D.C.energy meter - testing of energy meters-Calibration of wattmeter and energy meter.

UNIT III - MEASUREMENT OF RESISTANCE AND IMPEDANCE (11 hours)

Low Resistance : Kelvin's double bridge and Ductor Ohmmeter method-Medium Resistance: Voltmeter Ammeter method, Substitution method, Wheatstone bridge method - High Resistance: Megger, Direct deflection method, Megohm bridge method.-Earth resistance measurement. Introduction to A.C. bridges - Sources and Detectors in A.C. bridges. Measurement of Self Inductance : Maxwell's bridge, Hay's bridge, and Anderson's bridge. Measurement of Mutual Inductance : Heaviside M.I. bridge, Measurement of Capacitance : Schering's bridge, De-Sauty's bridge Measurement of frequency using Wien's bridge.

UNIT IV - OSCILLOSCOPES & SIGNAL GENERATORS (8 hours)

CRO-general purpose and advanced type -sampling and storage scopes - Signal and function generators - noise generators - pulse and square wave generator - sweep generator - wobbluscope - pattern generator.

UNIT V - RECORDING DEVICES AND WAVE ANALYSERS (8 hours)

Bar graph display - seven segment and dot matrix displays - signal recorders - x-y recorder - magnetic tape recorders - digital recording and data loggers -basic wave analyzer - frequency selective and heterodyne spectrum analyzer - fundamental type harmonic distortion analyzers - distortion factor meter - Q meter - Distortion analyzers using resonance bridge, Wien bridge, bridge -T Method - Impedance measurement-Cathode ray oscilloscope.

TEXT BOOKS

1. Sawhney A. K., "*A Course in Electrical and Electronics Measurements and Instrumentation"*, 18th Edition 2007, reprint 2011 Dhanpat Rai and Sons, New Delhi.
2. Golding E. W. and Widdis F. E," *Electrical Measurements and Measuring Instruments"*, Sir Issac Pitman and Sons Pvt. Ltd., 1985.

3. Kalsi H. S., "*Electronic Instrumentation"*, 3rd Edition, Tata McGraw Hill company, New Delhi, 2010.
4. Cooper W. D. & Hlefrick A.D.,Modern, "*Electronic Instrumentation & Measurement Technique"*, I Edition, Prentice Hall of India – 2011.

REFERENCES

1. Rajendraprasad, "*Electrical Measurements and Measuring Instruments"*, Khanna Publishers, New Delhi, 2011
2. Gupta J.B., "*Electrical Measurements and Measuring Instruments"*, S.K. Kataria & Sons, New Delhi, 2009
3. B.M. Oliver and J.M.Gage," *Electronic Measurements and Instrumentation"*, McGraw Hill 2001
4. Bouwens A.J., "*Digital Instrumentation"*, McGraw Hill 2001

IC1004 MEASUREMENTS AND INSTRUMENTATION												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x									
2.	Mapping of instructional objectives with student outcome	1	2									
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electrical			Electronics		
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1005	**ELECTRONIC DEVICES AND CIRCUITS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to learn in detail about the characteristics, operation and limitations of semiconductor devices used in domestic / industrial applications. To introduce the transistor circuits, feedback amplifiers, oscillators, wave shaping circuit using transistor & analyzing different electronic circuits.

INSTRUCTIONAL OBJECTIVES	
1.	To understand the operational characteristics of a Semiconductor devices.
2.	To understand the basic model of BJT and FET.
3.	To understand the working of different types of feedback amplifiers & oscillators.
4.	To design wave shaping circuits.
5	To design oscillators and multivibrators.

UNIT I - SEMI CONDUCTOR DEVICES (9 hours)

Types of Field Effect Transistor - JFET - Working Principles of JFET - JFET as an Amplifier and its Output Characteristics - Punch off voltage and drain current - JFET Applications - MOSFET – types, Working Principle, comparison of BJT with MOSFET – thermal effect on MOSFET. SCR - Equivalent Circuit and V-I Characteristics. SCR as a Half wave and full wave rectifier - Application of SCR.

UNIT II - TRANSISTOR MODELS (9 hours)

BJT biasing: fixed bias, collector feedback, and voltage divider; – Small signal models for transistors and FET- Two port devices and network. h parameters, hybrid pi models, r-parameter equivalent circuit.

UNIT III - POWER AMPLIFIERS (9 hours)

Introduction, Series-fed Class A amplifier, Transformer coupled class A amplifier, Class B amplifier operation, Class B amplifier, Amplifier distortion, heat sinking, Class C and Class D amplifiers, Numerical problems.

UNIT IV - FEEDBACK AMPLIFIERS & WAVE SHAPING CIRCUITS (9 hours)

Basic concepts of feedback, four types of negative feedback – Effect of feedback on input resistance, output resistance, voltage gain and current gain, advantages of negative feedback. RC wave shaping circuits, diode clippers and clampers, voltage multipliers.

UNIT V - OSCILLATORS & MULTIVIBRATORS (9 hours)

Classification of oscillators - Barkhausenv criterion- RC phase shift, Wienbridge, Hartely, Colpitts and crystal oscillators operation and analysis.

Multivibrators - astable, monostable and bistable - Analysis of performance parameters of multivibrators using Schmitt Trigger - Blocking oscillators

TEXT BOOKS

1. N.P. Deshpande, "*Electronic devices and circuits- Principles and applications*", Tata McGraw-Hill Education, 2008.

2. R.S Sedha, "*A Text book of Applied Electronics*", S.Chand& company Ltd, 2010.
3. V.K. Mehta and Rohit Mehta, "*Principles of Electronics*", S.Chand& company Ltd, 2010.

REFERENCES

1. Robert L. Boylestad& Louis Nashelsky, "*Electronic devices and circuit Theory"*, Pearson education, 10th edition, 2009
2. HeodreF.Boghert, "*Electronic Devices & Circuits*" Pearson Education, VI Edition, 2003
3. David Bell "*Electronic Devices and Circuits*" 2009, PHI

WEB NOTES

1. ***NPTEL,*** *http://nptel.iitm.ac.in/video.php?subjectId=122106025*
2. ***MIT,****http://educhoices.org/article_directory/Undergraduate_Electronics_Engineering_OpenCourseWare.html*

IC1005 ELECTRONIC DEVICES AND CIRCUITS												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	A	B	c	d	e	f	g	h	i	j	K
		X	X	x		x		x				X
2.	Mapping of instructional objectives with student outcome	1,2	1,2	1,2		1,2		1,2				1,2
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
							X					
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1006	DIGITAL LOGIC AND DESIGN	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop a strong basics in the Digital Electronics.

The subject gives the students an in-depth knowledge about Digital logic families, Combinational circuits and enables them to analyze and design any sequential circuits.	
INSTRUCTIONAL OBJECTIVES	
1.	Students will be able to understand the fundamentals of Digital concepts
2.	Logically explain the Implementation of combinational and sequential circuits
3.	Design any synchronous and asynchronous sequential circuit
4.	The concepts enables students to understand memory design
5	This course helps in understanding integrated circuit families

UNIT I - NUMBER SYSTEM AND BOOLEAN ALGEBRA (13 hours)

Review of number systems :Types and Code Conversions, Binary Arithmetic, Signed binary-Codes – BCD, Excess-3 codes, Gray codes, Error detecting code (Hamming code)- Parity Generation and detection. Boolean Algebra –Demorgans Theorem- Minimization of Boolean functions using Karnaugh maps & Quine – Mclusky Methods.

UNIT II - DIGITAL INTEGRATED CIRCUITS (9 hours)

RTL, DTL, HTL, TTL, ECL, MOS & CMOS families. Circuit diagram and analysis characteristics and specifications, Tri-State Logic-Specification and Transfer characteristics of Basic TTL interfaces–interfacing of CMOS to TTL and Interfacing of TTL to CMOS.

UNIT III - COMBINATIONAL CIRCUITS (8 hours)

Half Adder, Full Adder, Decimal Adder, Subtractor, Code converters, Encoders, Decoders, Multiplexers and De Multiplexers, Comparators, Function realization using gates &Multiplexer.

UNIT IV - SEQUENTIAL CIRCUITS (9 hours)

Flip flops – SR, JK, T, D, Master slave FF, Truth table and Excitation table, Design of Synchronous and Asynchronous counters, Up-Down counter, Modulo Counter, Ring counter, Shift register, Analysis of clocked sequential circuits – their design, State Diagram, State minimization, State assignment.

UNIT V - SEMICONDUCTOR MEMORIES (6 hours)

Memories: ROM, RAM, EPROM, Memory expansion– PAL and PLA-Implementation of code converters using ROM, PAL and PLA.

TEXT BOOKS

1. Morris Mono, "*Digital Design"*, Prentice Hall of India, 2012.
2. Ronald J. Tocci, "*Digital System Principles and Applications"*, PHI, 11th Edition, 2003.
3. CharlesH.Roth, "*Fundamentals Logic Design"*, Jaico Publishing,V Edition,2004.
4. Floyd, "*Digital Fundamentals"*, Universal Book stall, New Delhi, 2009.

REFERENCES

1. Morris Mono, "*Digital Logic and Design"*, Prentice Hall of India, 2010.
2. R. P. Jain, "*Modern Digital Electronics"*, Tata McGraw Hill, 4th edition, 2010.
3. Malvino.A.P. and Donald.P.Leach, "*Digital Principal and Applications", 7*th Edition, Tata McGraw Hill, 2010.
4. John F Wakerly*,"Principles of digital design",* 4th edition, Pearson, 2008.

WEB NOTES

NPTEL, *http://nptel.iitm.ac.in/video.php?subjectId=117106086*

<table>
<tr><th colspan="13">IC1006 DIGITAL LOGIC AND DESIGN</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Instrumentation & Control Engineering</td></tr>
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<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
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IC1007	**OPERATIONAL AMPLIFIER AND LINEAR INTEGRATED CIRCUITS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to understand the fundamentals of Integrated circuits and designing electronic circuits using it.

INSTRUCTIONAL OBJECTIVES

1.	To design circuits like amplifiers using Op-Amps.
2.	To design waveform generating circuits.
3.	To design filter circuits for particular application.
4.	To gain knowledge in designing stable voltage regulators.

UNIT I - CHARACTERISTICS OF OPAMP IC741 AND ITS APPLICATIONS (9 hours)

Ideal Op-amp characteristic, DC characteristics, AC characteristics, and analysis of data sheet of IC 741. Linear application - Basic Op-amp applications, Instrumentation amplifier, AC amplifier, Summer, Integrator, Differentiator, Voltage Follower, V to I and I to V converter. Non linear application: rectifiers, clipper, clamper, sample and hold, log & antilog amplifiers, multiplier, divider.

UNIT II - COMPARATOR AND WAVEFORM GENERATORS (9 hours)

Introduction, basic comparator operation, regenerative comparator, monostable multivibrator, astable multivibrator (square wave generator), triangular wave generator, sawtooth wave generator, sine wave generator - Wien bridge and phase shift oscillator.

UNIT III - ACTIVE FILTERS & PLL (9 hours)

RC active filter - Low pass, High pass, Band pass, Band reject and notch filter, Butterworth & state variable filter, Switched Capacitor filter, PLL - Description and application - frequency multiplier, frequency divider, AM detector and FM demodulator.

UNIT IV - ANALOG / DIGITAL, DIGITAL / ANALOG CONVERTERS (9 hours)

Digital / Analog - Basic concepts, Analog switches, Types - weighted resistor, R-2R ladder and inverted R-2R ladder DAC. Analog / Digital - Basic Concepts,

Types- Flash, Counter, Successive approximation and Dual slope ADC. General ADC and DAC specifications.

UNIT V - VOLTAGE REGULATORS & TIMER (**9 hours)**

Op-amp voltage regulator-Series, shunt and switching regulators, three terminal voltage regulator, 723 general purpose voltage regulator. Timer (IC555) - Timer functional diagram, Monostable operation, Astable operation, Schmitt trigger and their applications.

TEXT BOOKS

1. D.Roy Choudhury and ShailJain, "*Linear Integrated circuits"*, New Age International, 2010.
2. Coughlin & Driscull, "*Operational Amplifiers & Linear Integrated Circuits"*, 6th ed., Prentice Hall Of India, 2009.
3. Gayakwad A.R., "*Op-Amp and Linear Integrated circuits"*, Prentice Hall of India, 2009.

REFERENCES

1. V S Kanchana Bhaaskaran, S Salivahanan, "*Linear Integrated Circuits",* 1st Edition Tata McGraw-Hill Education Released: 2007
2. Sergio Franco, "*Design with operational amplifier and analog integrated circuits"*, McGraw Hill, 2001.
3. Millman and Halkias*, "Integrated Electronics"*, 2nd edition, Tata McGraw-Hill Education, 2009.

WEB NOTES

1. ***NPTEL,*** *http://nptel.iitm.ac.in/video.php?subjectId=122106025*
2. ***MIT,****http://educhoices.org/article_directory/Undergraduate_Electronics_Engineering_OpenCourseWare.html*
3. ***MIT,*** *http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-20/*

IC1007 OPERATIONAL AMPLIFIER & LINEAR INTEGRATED CIRCUITS												
Course designed by		Department of Instrumentation & Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	l	j	k
				x		x						x
2.	Mapping of instructional objectives with student outcome			1								3
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										x		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
							x					
		As per the regulation										
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1008	ANALOG AND DIGITAL INTEGRATED CIRCUITS LAB	L	T	P	C
	Total Contact hours - 45	0	0	3	2
	Prerequisite				
	Nil				

PURPOSE

To study various Digital & Linear Integrated Circuits used in Simple System Configuration.

INSTRUCTIONAL OBJECTIVES

1.	To know about the design of counters using flip flops.
2.	To understand the various types of code converters.
3.	To study the Operational amplifier characteristics.

LIST OF EXPERIMENTS

1. Realization of Logic gates using Discrete Components.
2. Realization of Gates using Universal Building Block(NAND only)
3. Design of Combinational Logic Circuits like Half-Adder, Full-Adder, Half-Subtractor and Full-Subtractor.
4. Design of Multiplexers/De Multiplexers
5. Design of Shift register (To verify Serial to Parallel, Parallel to Serial ,Serial to Serial and

a. Parallel to Parallel Converters) using Flip-Flops.
6. Design of Code Converters.
7. Design Asynchronous Counter, Mod Counter, Up Counter, Down Counter and Up/Down
a. Counter
8. Design and test R-2R DAC using OP-AMP.
9. Design and Test the A stable and Mono Stable Multivibrators by using IC555.
10. Design of LPF, HPF, BPF and BRF.

REFERENCE

1. Linear and Digital Integrated Circuits Laboratory Manual.

IC1008 ANALOG AND DIGITAL INTEGRATED CIRCUITS LAB												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	J	k
		x	x									x
2.	Mapping of instructional objective with student outcome	1	1									1
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										x		
4.	Broad Area	Instrumentation			Control		Electrical			Electronics		
										x		
5	Approval	23rd Meeting of Academic Council, May 2013										

IC1009	**ELECTRICAL AND ELECTRONICS LAB**	**L**	**T**	**P**	**C**
	Total Contact hours - 45	**0**	**0**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

To gain practical knowledge in Electrical Machines and few applications of basic electronic components.

INSTRUCTIONAL OBJECTIVES

1.	Students will learn Characteristics of shunt generator
2.	Students will learn Characteristics of shunt motor

3.	Students will learn Speed control of series and shunt motor
4.	Students will learn. OC and SC test on single phase transformer
5.	Analyse the response of amplifier
6.	Students will learn Working of Multi vibrators and Voltage regulators

LIST OF EXPERIMENTS

1. Load characteristics of Shunt Generator
2. Speed control of Series motor
3. Speed control of Shunt motor
4. OC & SC test on single phase transformer
5. Load test on single phase transformer
6. Load test on single phase capacitor motor & (Universal motor)
7. Frequency response of CE and CC amplifier
8. Class B Power Amplifier
9. Differential Amplifier
10. Wein bridge Oscillator & RC Phase shift Oscillator
11. AstableMultivibrator
12. Transistor Series Voltage Regulator

REFERENCE

1. Electrical and Electronics Laboratory Manual.

IC1009 ELECTRICAL AND ELECTRONICS LAB												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	J	k
		x	x									x
2.	Mapping of instructional objective with student outcome	1	1									1
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								x				
4.	Broad Area	Instrumentation		Control		Electrical		Electronics				
						x		x				
5.	Approval	23rd Meeting of Academic Council, May 2013										

SEMESTER –IV

LE1008	**GERMAN LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1003-German Language Phase I				

PURPOSE

Familiarity in German language will be helpful for the students in preparing their resumes in German. Proficiency in the language will be an added asset for the students to have an edge in the present day highly competitive and global job market.

INSTRUCTIONAL OBJECTIVES

1.	To enable the students to speak and understand about most of the activities in the day to day life.
2.	The students will be able to narrate their experiences in Past Tense.
3.	The students will be able to understand and communicate even with German Nationals.
4.	By the end of Phase – II the students will have a reasonable level of conversational skills.

UNIT I **(6 hours)**

Wichtige Sprachhandlungen: Zimmersuche, Möbel

Grammatik: Verben mit trennbaren Vorsilben im Präsens und Perfekt. Verben mit trennbaren Vorsilben und Modalverben imPräsens. Verben mit untrennbaren Vorsilben im Perfekt. Unregelmäßige und gemischte Verben im Perfekt.

UNIT II **(6 hours)**

Wichtige Sprachhandlungen: Kleidung ,Farben , Materialien.

Grammatik : formelle Imperativsätze mit "Sie" informelle Imperativsätze Vorschläge mit "wir" – "sollen/wollen wir"—Soll ich? Modalpartikeln "doch" "mal" "doch mal.

UNIT III **(6 hours)**

Wichtige Sprachhandlungen : Sehenswürdigkeite (Prater, Brandenburger Tör,Kolossium, Eifeltürm)

Grammatik : Ortsangaben mit Akk. und Dativ "alle","man" Indefinitepronomen "etwas", "nichts",

UNIT IV **(6 hours)**

Wichtige Sprachhandlungen : Wegbeschreibung/ Einladung interkulturelle Erfahrung.

Grammatik : Verwendung von Präsens für zukünftigen Zeitpunkt.

UNIT V **(6 hours)**

Wichtige Sprachhandlungen: Essen und Trinken im Restaurant, Partyvorbereitung und Feier

Grammatik: Nomen aus Adjektiven nach "etwas"und "nichts" Nomen aus dem Infinitiv von Verben, zusammegesetzte Nomen und ihre Artikel. Adjektive im Nom. und Akk. nach unbestimmten Artikel, Negativartikel und Possessivartikel.

TEXT BOOK

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprachtraining).

REFERENCES

1. German for Dummies
2. Schulz Griesbach

LE1008 GERMAN LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
		x		--		--		--				
4.	Approval	23rd Meeting of Academic Council, May 2013										

LE1009	**FRENCH LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1004- French Language Phase I				

PURPOSE	
To enable the students communicate effectively with any French speaker and have a competitive edge in the international market.	
INSTRUCTIONAL OBJECTIVES	
1.	To enable students access information on the internet
2.	To receive and send e mails
3	To assist students in gaining a certain level of proficiency to enable them to give the level 1 exam conducted by Alliance Française de Madras.
4.	To enhance their lexical and technical competence.

UNIT I **(6 hours)**

1. Grammar and Vocabulary: The second group verbs: Finir, rougir, grossir, grandir . "Les preposition de temps": à, en, le, de 7h à 8h, jusqu' à, vers.
2. Listening and Speaking – the semi- vowels: Voilà, pollutant. Writing –the days of the week. Months, technical subjects, time, "les spécialités scientifiques et l' année universitaire, paragraph writing about time table.
3. Reading -- Reading of the text and comprehension – answering questions

UNIT II **(6 hours)**

Grammar and Vocabulary – The adjectives, the nationality, feminine & masculine noun forms "les métiers scientifiques".
Listening and Speaking – Vowels: soirée, année, près de, très.
Writing – Countries name, nationality, "les métiers scientifiques", numbers from: 69 to infitive and some measures of unit.
Reading Comprehension – reading a text.

UNIT III **(6 hours)**

Grammar and Vocabulary – near future, The demonstrative adjectives, Express the aim by using the verb, Listening and Speaking –"La liaison interdite – en haut". Writing – some scientific terms, French expressions to accept an invitation. Sentence framing. Reading Comprehension – reading a text.

UNIT IV **(6 hours)**

Grammar and Vocabulary –the verbs: manger, boire , the partitive articles Listening and Speaking – "le 'e' caduc Writing- the food, the ingredients, fruits, vegetables, expression of quantity, paragraph writing about food habits. Reading – reading a text.

UNIT V **(6 hours)**

Grammar and Vocabulary – " les prepositions de lieu": au à la, à l', chez, the reflexives verbs, verbs to nouns. Listening and Speaking – "le 'e' sans accents ne se prononce pas. C'est un "e" caduc. Ex: quatre, octobre. " les sons (s) et (z)- salut , besoin. Writing –paragraph writing about one's everyday life, French culture. Reading Comprehension -- reading a text or a song.

TEXT BOOK

1. Tech French

REFERENCES

1. French for Dummies
2. French made easy: Goyal publishers
3. Panorama

<table>
<tr><th colspan="13">LE1009 FRENCH LANGUAGE PHASE II</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of English and Foreign Languages</td></tr>
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<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td>Professional Subjects (P)</td></tr>
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<tr><td>4.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

LE 1010	**JAPANESE LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1005- Japanese Language Phase I				

PURPOSE

To enable students to learn a little advanced grammar in order to improve their conversational ability in Japanese.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn Katakana script (used to write foreign words)
2.	To improve their conversational skill.
3	To enable students to know about Japan and Japanese culture.
4.	To improve their employability by companies who are associated with Japan.

UNIT I **(8 hours)**

Introduction to Verbs; Ikimasu, okimasu, nemasu, tabemasu etc.
Grammar – usage of particles de, o, to, ga(but) and exercises
Common daily expressions and profession.
Katakana script and related vocabulary.
Religious beliefs, Japanese housing and living style.
Conversation – audio

UNIT II **(8 hours)**

Grammar :Verbs –Past tense, negative - ~mashita, ~masen deshita..
i-ending and na-ending adjectives - introduction
Food and transport (vocabulary)
Japanese food, transport and Japanese tea ceremony.
Kanji Seven elements of nature (Days of the week)
Conversation – audio

UNIT III **(6 hours)**

Grammar - ~masen ka, mashou
Adjectives (present/past – affirmative and negative)
Conversation – audio

UNIT IV **(4 hours)**

Grammar – ~te form

Kanji – 4 directions
Parts of the body
Japanese political system and economy
Conversation – audio

UNIT V **(4 hours)**

Stationery, fruits and vegetables
Counters – general, people, floor and pairs

TEXT BOOK

1. First lessons in Japanese, ALC Japan

REFERENCES

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation

LE1010 JAPANESE LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)	Basic Sciences (B)				Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
		x	--				--			--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

LE1011	**KOREAN LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours-30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1006-Korean Language Phase I				

PURPOSE

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES	
1.	To help students learn the scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Korean culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea.

UNIT I (**9 hours)**

Lesson 1 <Review of Vowels and Consonants>, Lesson2 < Various Usages of "To be">, Lesson3 < Informal form of "to be"> <Basic Conversation, Vocabularies and Listening>

UNIT II (**9 hours)**

Lesson 4 < Informal interrogative form of "to be">, Lesson 5 < To be, to have, to stay>, Lesson 5 < Advanced Interrogative practice>, Lesson 6 < Types of Negation>, <Basic Conversation, Vocabularies and Listening>

UNIT III (**9 hours)**

Lesson 7 < Honorific forms of noun and verb2>, Lesson8 < Formal Declarative2>, Lesson 9 < Korean Business Etiquette>, <Basic Conversation, Vocabularies and Listening>

UNIT IV (**3 hours)**

Lesson 10 <Field Korean as an Engineer1>, <Field Korean as an Engineer2> <Basic Conversation, Vocabularies and Listening>

TEXT BOOK

1. Korean through English 2 (Basic Korean Grammar and Conversation)

REFERENCES

1. Bharati Korean (Intermediate Korean Grammar)
2. Hand-outs
3. Various visual media such Movie CD, Audio CD, and music
4. Collection of vocabularies for engineering field.

LE1011 KOREAN LANGUAGE PHASE II												
Course designed by		Department of English and Foreign Languages										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd Meeting of Academic Council, May 2013										

LE1012	CHINESE LANGUAGE PHASE II	L	T	P	C
	Total Contact Hours-30	2	0	0	2
	Prerequisite				
	LE1007-Chinese Language Phase I				

PURPOSE

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the Chinese scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about China and Chinese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china.

UNIT I

A) Greetings
Questions and answers about names
Introducing oneself
Receiving a guest
Making corrections

New words: 你⌒you⌣ 好⌒good 'well⌣
工作⌒work 'job⌣人员⌒personnel 'staff member⌣ 请问⌒May I ask…⌣ 贵⌒expensive 'valuable⌣ 姓⌒one's family name is ⌣

B) Questions and answers about the number of people in a family
Expressing affirmation/negation
Questions and answers about the identity of a person same or not.

New words: 家ˆfamily 'homeˇ 有ˆhaveˇ 几ˆseveralˇ
爸爸 (fatherˇ 妈妈 (mother) 哥哥 (elderly brotherˇ

UNIT II

A. About places
B. About numbers
C. if one knows a certain person
D. Expressing apology
E. Expressing affirmation/negation
F. Expressing thanks.

New Words:

客人ˆguest,visitorˇ这儿ˆhereˇ中文ˆChineseˇ 对ˆright, correctˇ
学生ˆstudentˇ 多ˆmany, a lotˇ

Grammar: Sentences with a verbal predicate

UNIT III

Introducing people to each other

A. Exchanging amenities
B. Making/Negating conjectures
C. Questions and answers about nationality

Grammar: Sentences with an adjectival predicate

UNIT IV

A) About places to go
Indicating where to go and what to do
Referring to hearsay.
Saying good-bye

B) Making a request
Questions and answers about postcodes and telephone numbers
Reading dates postcodes and telephone numbers
Counting Renmibi

Grammar: Sentences with a subject-verb construction as its predicate
Sentences with a nominal predicate

UNIT V

A. Asking and answering if someone is free at a particular time
B. Making proposals
C. Questions about answers about time
D. Making an appointment
E. Telling the time
F. Making estimations

TEXT BOOK

1. A New Chinese Course 1- Beijing Language and Culture University Press

REFERENCES

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press
3. My Chinese Classroom - East China Normal University Press

LE1012 CHINESE LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
		x		--			--				--	
4.	Approval	23rd Meeting of Academic Council, May 2013										

PD1004	**APTITUDE-II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				
PURPOSE					
To enhance holistic development of students and improve their employability skills.					
INSTRUCTIONAL OBJECTIVES					
1.	To improve verbal aptitude, vocabulary enhancement and reasoning ability of the student.				

UNIT I **(6 hours)**
Critical Reasoning – Essay Writing

UNIT II **(6 hours)**
Synonyms – Antonyms - Odd Word - Idioms & Phrases

UNIT III **(6 hours)**
Word Analogy - Sentence Completion

UNITIV **(6 hours)**
Spotting Errors - Error Correction - Sentence Correction

UNIT V **(6 hours)**
Sentence Anagram - Paragraph Anagram - Reading Comprehension

ASSESSMENT
1. Objective type – Paper based /Online – Time based test

TEXT BOOK:
1. Personality Development -Verbal Work Book, Career Development Centre, SRM Publications

REFERENCE

1. Green Sharon Weiner M.A & Wolf Ira K.*Barron's New GRE*, *19th Edition*. Barron's Educational Series, Inc, 2011.
2. Lewis Norman, *Word Power Made Easy*, Published by W.R.Goyal Pub, 2011.
3. Thorpe Edgar and Thorpe Showich, *Objective English.* Pearson Education 2012.
4. Murphy Raymond, *Intermediate English Grammar*, (Second Edition), Cambridge University Press, 2012.

PD1004 - APTITUDE-II												
Course designed by		Career Development Centre										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1				

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
		x			
4.	Approval	23rd Meeting of Academic Council, May 2013			

MA1004	**NUMERICAL METHODS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	**4**	**0**	**0**	**4**
	(Common to Auto, Aero, Mech, Mechatronics, EEE, Civil , Chemical, ICE & EIE)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To familiarise with numerical solution of equations
2.	To get exposed to finite differences and interpolation
3.	To be thorough with the numerical Differentiation and integration
4.	To find numerical solutions of ordinary differential equations
5.	To find numerical solutions of partial differential equations

UNIT I - CURVE FITTING AND NUMERICAL SOLUTION OF EQUATIONS

(12 hours)

Method of Least Squares – Fitting a straight line – Fitting a parabola – Fitting an exponential curve – Fitting a curve of the form $y = ax^b$ – Calculation of the sum of the squares of the residuals.- Newton-Raphson method – Gauss Elimination method – Gauss Jacobi method – Gauss Seidel method.

UNIT II - FINITE DIFFERENCES AND INTERPOLATION (12 hours)

First and Higher order differences – Forward differences and backward differences and Central Differences – Differences of a polynomial – Properties of operators – Factorial polynomials – Shifting operator E – Relations between the operators. Interpolation – Newton-Gregory Forward and Backward Interpolation formulae - Divided differences – Newton's Divided difference formula – Lagrange's Interpolation formula – Inverse interpolation

UNIT III - NUMERICAL DIFFERENTIATION AND INTEGRATION (12 hours)

Newton's forward and backward differences formulae to compute first and higher order derivatives – The Trapezoidal rule – Simpson's one third rule and three eighth rule.

UNIT IV - NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS (12 hours)

Solution by Taylor's series – Euler's method – Improved and modified Euler method – Runge-Kutta methods of fourth order (No proof) – Milne's Method - Adam's Bashforth method.

UNIT V - NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS (12 hours)

Classification of Partial differential equations of the second order - Difference quotients – Laplace's equation and its solution by Liebmann's process – Solution of Poisson's equation – Solutions of Parabolic and Hyperbolic equations.

TEXT BOOKS

1. B.S. Grewal, "*Numerical Methods in engineering and science"*, Khanna Publishers, 42nd edition, 2012.
2. S.S. Sastry, "*Introductory Methods of Numerical Analysis",* 4th edition, 2005.

REFERENCES

1. Dr. M.K. Venkataraman*, "Numerical Methods in Science and Engineering"*, National Publishing Co., 2005.
2. E. Balagurusamy, "*Computer Oriented Statistical and Numerical Methods"* – Tata McGraw Hill., 2000.
3. M.K.Jain, SRK Iyengar and R.L.Jain, "*Numerical Methods for Scientific and Engineering Computation"*, Wiley Eastern Ltd., 4th edition, 2003.
4. M.K.Jain, "*Numerical Solution of Differential Equations"*, 2nd edition (Reprint), 2002.
5. P.Kandasamy etal., "*Numerical Methods"*, S.Chand & Co., New Delhi, 2003.

MA1004 NUMERICAL METHODS												
Course designed by		Department of Mathematics										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
		--		x		--		--				
4.	Approval	23rd Meeting of Academic Council, May 2013										

IC1010	TRANSDUCER ENGINEERING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To give an introduction to the analysis of linear control systems. This will permit an engineer to explore time domain and frequency domain tools to design and study linear control systems.

INSTRUCTIONAL OBJECTIVES

1.	To understand the methods of representation of systems and their transfer function models
2.	To provide adequate knowledge in time response of systems and steady state error analysis.
3.	To understand the concept of stability of control system and methods of stability analysis
4.	To give basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.

UNIT I- INTRODUCTION **(9 hours)**

Units and systems-Dimensions and standards-Calibration methods-Static calibration-Generalized Measurement System-Sensor-Transducer-Basic requirements of a transducer-Classifications of transducer-Error analysis-

Statistical methods-Odds and uncertainty-Choice of transducer, factor influencing choice of transducer.

UNIT II- CHARACTERISTICS OF A TRANSDUCER (9 hours)

Static characteristics - Accuracy, Precision, Sensitivity, Linearity, Hysteresis, Threshold, Resolution, Dead time, Dead zone, Scale range, Scale span - Dynamic characteristics - Speed of response, Measuring lag, Fidelity, Dynamic error-mathematical model of transducer - Zero, I,II, order transducer-Response to step,ramp, impulse inputs.

UNIT III- RESISTANCE TRANSDUCERS (9 hours)

Principle of operation, construction, Characteristics and applications of potentiometer - loading effects-Straingauge - theory, types, temperature compensation, applications – RTD – Thermistors - Hotwire anemometer - piezo resistive sensor - load cell – LDR - Humidity sensor - Photo conductive cell.

UNIT IV-INDUCTIVE AND CAPACITIVE TRANSDUCERS (9 hours)

Self inductance-Mutual inductance transducer - Induction potentiometer - Variable reluctance transducers - EI pick up – LVDT – RVDT – Synchros - Capacitive transducers - Variable air gap type -Variable area type - Variable permittivity type - Capacitor displacement transducer - Capacitor microphone - Applications(Measurement of level, pressure, thickness, sound).

UNIT V-ANALOG AND DIGITAL TRANSDUCERS (9 hours)

Thermo electric transducer - Photovolatic cell-Hall effect-Sound sensor - Sesimic transducer - Piezo electric – Magnetostrictive - Fibre optic - Digital displacement transducer - Shaft angle encoder - Digital speed transducer - Introduction to MEMS and NANO sensors.

TEXT BOOKS

1. Doebelin E.A., "*Measurement Systems-Applications and Design*", Tata McGraw Hill , New York ,2004.
2. Sawhney A.K.,"*A course in Electrical& Electronic Measurement and Instrumentation*", Dhanpat Rai and Co(P)Ltd.,reprint 2013.
3. Patranabis D., "*Sensors and Transducers*",PHI,2003.

REFERENCES

1. Murthy,D.V.S., "*Transducers and Instrumentation*",PHI,2011
2. Renganathan.S., "*Transducer Engineering*", Allied Publisher, Chennai,1999.

3. John Bentley, *"Principles of measurement systems"*, 3rd edition, Pearson, 2004.

WEB NOTES

1. **MIT**, http://ocw.mit.edu/courses/media-arts-and-sciences/mas-836-sensor-technologies-for interactive-environments-spring-2011/lecture-notes/

IC1010 TRANSDUCER ENGINEERING												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	I	j	k
		x		x		x						
2.	Mapping of instructional objectives with student outcome	2		1		3						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								x				
4.	Broad Area	Instrumentation		Control		Electrical		Electronics				
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1011	**APPLIED DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Basics of Digital Signals				

PURPOSE

To gain knowledge in state variable analysis, non-linear systems and optimal control.

INSTRUCTIONAL OBJECTIVES

1.	To study the signals and its types.
2.	To provide adequate knowledge in the analysis of linear time invariant systems.
3.	To design and implement the digital FIR filters.
4.	To design and implement the digital IIR filters.
5.	To have the knowledge in wide use of DSP processors.

UNIT I-SIGNALS AND ITS TYPES (9 hours)

Continuous and discrete time signals: Classification of Signals – Periodic aperiodic even – odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – properties of discrete time complex exponential unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling, time shifting

UNIT II-ANALYSIS OF LINEAR TIME INVARIANT SYSTEMS (9 hours)

Basic properties of continuous time systems: Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LTI systems -Analysis and characterization of LTI systems using Laplace transform. Z transform – Inverse Z transform and its application to system analysis and characterization of discrete time systems.

UNIT III-IMPLEMENTATION AND DESIGN OF DIGITAL FIR FILTERS (9 hours)

Basic elements of Digital Signal Processing, LTI system as Frequency selective filters. Design of digital FIR filters using – Frequency sampling method- Fourier series method – using window techniques, DFT-its properties and applications.

UNIT IV-IMPLEMENTATION AND DESIGN OF DIGITAL IIR FILTERS (9 hours)

Review of analog filters using Butterworth and Chebyshev approximations – Frequency transformations - Design of digital IIR filters using – Bilinear transformation method – Impulse Invariant transformation method, FFT-its properties and applications.

UNIT V-APPLICATIONS OF DSP PROCESSORS (9 hours)

Architecture and features of TMS &ADSPsignal processing chips. DSP processor packaging(Embodiments) - Fixed point Vs floating point DSP processor data paths - Memory architecture of a DSP processor (Von Neumann - Harvard) - Addressing modes - pipelining - TMS320 family of DSPs (architecture of C5x).

TEXT BOOKS

1. E.C. Ifeachor and B.W. Jervis, "*Digital signal processing – A Practical approach*", Second edition, Pearson, 2009.
2. Johny R. Johnson*," Introduction to Digital Signal Processing*", PHI, 2011.
3. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, " *Digital Signal Processing*", TMH/McGraw Hill International, 2007.

REFERENCES

1. John G Proakis and Manolakis, " *Digital Signal Processing Principles, Algorithms and Applications*", Pearson, Fourth Edition, 2007.
2. Haykin, Simon, and Barry Van Veen, *"Signals and Systems", 2nd* ed. New York, NY: John Wiley & Sons, 2005.
3. Oppenheim-Schafer, *"Discrete time signal processing", 2nd edition, Pearson, 2002 .*

WEB NOTES

1. ***MIT,*** *http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-071j-introduction-to-electronics-signals-and-measurement-spring-2006/lecture-notes/*
2. ***NPTEL,*** *http://www.nptel.iitm.ac.in/courses/117104074/1*

IC1011 APPLIED DIGITAL SIGNAL PROCESSING													
Course designed by		**Department of Instrumentation and Control Engineering**											
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k	
		x		x	x	X		x				x	
2.	Mapping of instructional objectives with student outcome	1,2, 3,4, 5	5	1,2, 3,4, 5	1,2, 3,4, 5	1,2, 3,4, 5						1,5	
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)				
									x				
4.	Broad Area	Instrumentation		Control		Electronics			Electrical				
						x							
5.	Approval	23rd Meeting of Academic Council, May 2013											

IC1012	**CONTROL SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	**4**	**0**	**0**	**4**
	Prerequisite				
	Nil				

PURPOSE

To give an introduction to the analysis of linear control systems. This will permit an engineer to exploit time domain and frequency domain tools to design and study linear control systems

INSTRUCTIONAL OBJECTIVES	
1.	To understand the methods of representation of systems and their transfer function models.
2.	To provide adequate knowledge in time response of systems and steady state error analysis.
3.	To understand the concept of stability of control system and methods of stability Analysis
4.	To give basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.

UNIT I-TRANSFER FUNCTIONS (13 hours)

Introduction and classification of control systems-linear, nonlinear, time varying, time in-variant, continuous, discrete, SISO and MIMO systems – definitions. Transfer function – Mathematical modeling of mechanical (translation and rotational), Electrical systems- mechanical-electrical analogies– Block Diagram reduction technique and Signal flow graphs.

UNIT II-CONTROL SYSTEM COMPONENTS (10 hours)

Transfer function of potentiometers, armature controlled and field controlled dc motor. –tachogenerators -gear trains- controllers (On – Off, P, PI,PD, PID) – Electronic Controllers (P, PI,PD, PID) using Op-Amp

UNIT III-TRANSIENT AND STEADY STATE ANALYSIS (15 hours)

Transient and steady state response-definitions-mathematical expression for standard test signals-type and order of systems-step, ramp and impulse response of first order and second order under damped systems - Step response of second order critically damped and over damped systems - Time domain specifications of second order under damped systems - Generalized error series- Steady state error analysis.

UNIT IV-STABILITY ANALYSIS (12 hours)

Stability analysis – characteristic equation – location of roots in S-plane for stability -Routh's stability criterion-relative stability analysis-Root locus technique--- Nyquist stability criterion

UNIT V-FREQUENCY DOMAIN ANALYSIS (10hours)

Frequency response analysis-frequency domain specifications of second order systems- Correlation between time and frequency response -Bode plots and stability (gain and phase) margins- polar plots-constant M and N circles-Nichols chart

TEXT BOOKS

1. Gopal, M., "*Control Systems, Principles and Design*", Tata McGraw-Hill Pub. Co., 2nd Edition, New Delhi, 2012.
2. Nagrath, I.J. and Gopal, M., "*Control System Engineering*", New-age International (P), 5th Edition Ltd., New Delhi, 2009.

REFERENCES

1. Ogata, K., "*Modern Control Engineering*", Prentice Hall of India Ltd., 5th Edition, New Delhi, 2010.
2. Kuo, B.C., "*Automatic Control Systems*", Prentice Hall of India Ltd., New Delhi, 2012.

WEB NOTES

NPTEL, *http://www.nptel.iitm.ac.in/video.php?subjectId=108102043*

<table>
<tr><th colspan="14">IC1012 CONTROL SYSTEMS</th></tr>
<tr><th colspan="2">Course designed by</th><td colspan="12">Department of Instrumentation & Control Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>a</td><td>B</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>x</td><td></td><td>x</td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>2</td><td></td><td>1</td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="2">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
<tr><td colspan="3"></td><td colspan="2"></td><td colspan="3"></td><td colspan="3">x</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Instrumentation</td><td colspan="2">Control</td><td colspan="3">Electrical</td><td colspan="3">Electronics</td></tr>
<tr><td colspan="3"></td><td colspan="2">x</td><td colspan="3"></td><td colspan="3"></td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
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IC1013	COMMUNICATION ENGINEERING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To know about the basics of communication engineering such as Analog modulation (AM, FM, Transmission, Reception) and digital pulse modulation methods. .

INSTRUCTIONAL OBJECTIVES

1.	Understand AM Modulation and Demodulation – DSB-FC, DSB-SC, SSB, VSB.
2.	Understand Characteristics and model of transmission medium.
3.	Understand about FM Modulation and Demodulation
4.	Understand about PAM, PPM, PWM, PCM, TDM AND FDM.
5.	Understand about the Fundamentals of TV, satellite and fiber optic communication.

UNIT I - AMPLITUDE MODULATION (9 hours)

Need for Modulation_ Amplitude Modulation – Generation of AM waves (DSB-FC) - Suppressed carrier systems (DSB-SC) – Single side band modulation (SSB) – Vestigial side band modulation (VSM) - comparison of various AM systems - Source of noise -Types – Demodulation of AM waves – Envelope Detectors .AM Transmitters - Low level and High level transmitters – AM Receivers – TRF receiver, super heterodyne receiver.

UNIT II - FREQUENCY MODULATION AND DEMODULATION (9 hours)

Introduction to angle modulation systems – Definitions for FM & PM – Narrow band FM – Wide band FM – FM Modulators - Direct method – FM Transmitters - FM Demodulators – Slope detector - Frequency discriminator –PLL - FM Receivers - Comparison between AM & FM.

UNIT III -TRANSMISSION MEDIUM (9 hours)

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

UNIT IV-DIGITAL COMMUNICATION (9 hours)

Pulse modulations -concepts of sampling and sampling theorems, PAM, PWM, PPM, PTM, quantization and coding ASK, FSK, PSK, BSK, QPSK, applications of Data communication.-Time division multiplexing –synchronous and asynchronous – Frequency Division Multiplexing

UNIT V-SATELLITE AND OPTICAL FIBRE COMMUNICATIONS (9 hours)

Orbital satellites, Geostationary satellites, Look angles, Satellite system link models, Satellite system link equations; Advantages of optical fibre communication - Light propagation through fibre, Fibre loss, light sources and detectors.

TEXT BOOKS

1. Wayne Tomasi, "*Electronic Communication Systems*", Pearson Education, 4th Edition, 2008.
2. Roy Blake, "*Electronic Communication Systems*", Thomson Delmar, 2nd Edition, 2012.
3. Kennedy, "*Electronics of Communication Systems",* McGraw Hill , 5th edition -2012.
4. Roddy D. and Coolen J., "*Electronic communications"*, Prentice Hall of India P. Ltd. 4th edition 2012.
5. Anokh Singh, "*Principles of communication Engineering*" – S.Chand& Co. October 2006.

REFERENCES

1. Simon Haykin*, "Communication systems"* Wiley, 5th edition 2009.
2. Taub and Schilling*,"Principles of communication systems"* Tata McGraw-Hill , 3rd edition, 2007.
3. Singh and Sapre *"Communication systems"* Tata-Mcgraw Hill, 3rd edition2012.
4. P.Lathi*,"Modern digital and analog communication systems"* Oxford University Press,2009.

WEB NOTES

1. ***NPTEL,*** *http://www.nptel.iitm.ac.in/video.php?subjectId=117102059*
2. ***NPTEL,*** http://www.nptel.iitm.ac.in/video.php?subjectId=117101051

IC1013 COMMUNICATION ENGINEERING												
Course designed by		Department of Instrumentation & Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1,2, 3,4, 5	1,2, 3,4, 5			1,2, 3,4, 5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								X				
4.	Broad Area	Instrumentation		Control		Electrical		Electronics				
								X				
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1014	TRANSDUCER ENGINEERING LAB	L	T	P	C
	Total Contact hours - 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To apply the concepts of transducer and develop technical skills for applications in engineering.

INSTRUCTIONAL OBJECTIVES

1. To enable the students to understand the basic concepts involved in the various transducers.

List of Experiments

1. To verify the characteristics of LDR.
2. To verify the characteristics of RTD
3. To verify the characteristics of THERMISTOR
4. To verify the characteristics of THERMOCOUPLE
5. To plot the characteristics of SYNCHROS
6. To verify the characteristics of LVDT
7. To study the loading effects of POTENTIOMETER
8. To plot the characteristics of STROBOSCOPE
9. To study the characteristics of HALL EFFECT TRANSDUCER
10. To calibrate a PRESSURE GAUGE USING DEAD WEIGHT TESTER

REFERENCE

1. Transducer engineering lab manual.

IC1014 TRANSDUCER ENGINEERING LAB												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	K
		x	**x**									**X**
2.	Mapping of instructional objective with student outcome	1	1									1
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								X				
4.	Broad Area	Instrumentation		Control		Electrical		Electronics				
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1015	CONTROL SYSTEMS LAB	L	T	P	C
	Total Contact hours - 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with control system components in a practical approach.

INSTRUCTIONAL OBJECTIVES

1.	To enable the students to understand-Transfer function concepts, Time response, Frequency response and PID controller

List of Experiments

1. Generation of standard test signals
2. Step, Ramp, Impulse response for the given transfer function.
3. Time domain specification for the given transfer function.
4. Digital simulation of I order system using Simulink and mat lab program
5. Digital simulation of II order system using Simulink and mat lab program
6. Responses of the given transfer function with respect to change in damping factor.

7. Stability analysis of linear systems using root locus plot
8. Stability analysis of linear systems using bode plot
9. Stability analysis of linear systems using Nyquist plot
10. Step response of P, PI, PID for a given transfer function.

REFERENCE

1. Control Systems lab manual.

<table>
<tr><th colspan="13">IC1015 CONTROL SYSTEMS LAB</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Instrumentation and Control Engg.</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>K</td></tr>
<tr><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>2.</td><td>Mapping of instructional objective with student outcome</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
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<tr><td colspan="3"></td><td colspan="3">X</td><td colspan="3"></td><td colspan="3"></td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

SEMESTER V

PD1005	**APTITUDE-III**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	Understand the importance of effective communication in the workplace.
2.	Enhance presentation skills – Technical or general in nature.
3.	Improve employability scope through Mock GD, Interview

UNIT I **(6 hours)**

Video Profile

UNIT II **(6 hours)**

Tech Talk / Area of Interest / Extempore / Company Profile

UNIT III **(6 hours)**

Curriculum Vitae

UNITIV **(6 hours)**

Mock Interview

UNIT V **(6 hours)**

Group Discussion / Case Study

ASSESSMENT

1. Objective type – Paper based / Online – Time based test
2. 50% marks based on test, 50 % based on Continuous Communication assessment

REFERENCES

1. Bovee Courtland and Throill John, *Business Communication Essentials: A skills-Based Approach to Vital Business English*. Pearson Education Inc., 2011

2. Dhanavel, S.P., *English & Communication Skills for Students of Science and Engineering*. Orient Black Swan, 2009
3. Rizvi M. Ashraf *Effective Technical Communication*, Tata McGraw-Hill Publishing Company Limited, 2006.

PD1005 – APTITUDE-III												
Course designed by		Career Development Centre										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								X		X	X	
2.	Mapping of instructional objectives with student outcome							1,2,3		1,2		2,3
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
		X										
4.	Approval	23rd Meeting of Academic Council, May 2013										

MA 1005	PROBABILITY AND STATISTICS	L	T	P	C
	Total contact hours - 60 hours	4	0	0	4
	(Common to Auto, Aero, Mech, Mectr, Civil , Chemical, ICE & EIE)				

PURPOSE

To develop an understanding of the methods of probability and statistics which are used to model engineering problems.

INSTRUCTIONAL OBJECTIVES

1.	To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
2.	To appropriately choose, define and/or derive probability distributions such as the Binomial, Poisson and Normal etc to model and solve engineering problems.
3.	To learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests.
4.	To understand how regression analysis can be used to develop an equation that estimates how two variables are related and how the analysis of variance procedure can be used to determine if means of more than two populations are equal.
5.	To understand the fundamentals of quality control and the methods used to control systems and processes.

UNIT I-PROBABILITY AND RANDOM VARIABLES (12 hours)

Sample space, Random experiments and random variables, Concept of probability, Conditional probability, Addition and multiplication laws, Baye's theorem - One dimensional Random Variables- Expectation, Variance, Covariance, and Moments.

UNIT II-THEORETICAL DISTRIBUTIONS (12 hours)

Discrete: Binomial, Poisson, Geometric, Negative Binomial; Continuous: Exponential and Normal Distributions, their properties and applications to industrial problems.

UNIT III-TESTING OF HYPOTHESIS (12 hours)

Introduction – Large sample tests based on normal distribution - Test for single mean, difference between means, proportion, difference between proportions - Small sample tests based on t, F distributions- Test for single mean, difference between means, standard deviation, difference between standard deviation - Chisquare test for goodness of fit - Independence of attributes.

UNIT IV-CORRELATION, REGRESSION AND ANALYSIS OF VARIANCE(12 hours)

Pearson's Correlation coefficient- Spearman's Rank correlation coefficient. Regression-Concepts – Regression lines – Multiple correlation and regression. Analysis of Variance- One-way classification and two way classification.

UNIT V-STATISTICAL QUALITY CONTROL (12 hours)

Introduction – Process control – control charts for variables - X and R, X and S charts control charts for attributes: p chart, np chart, c chart and their applications in process control.

TEXT BOOKS

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th extensively revised edition, Sultan Chand & Sons, 2007.
2. Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill,3rd edition, 2008.

REFERENCES

1. Ross. S., "A first Course in Probability", Fifth Edition, Pearson Education, Delhi 2002.
2. Johnson. R. A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000.

3. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "*Probability and Statistics for Engineers and Scientists*", Seventh Edition, Pearsons Education, Delhi, 2002.
4. Lipschutz. S and Schiller. J, "*Schaum's outlines - Introduction to Probability and Statistics*", McGraw-Hill, New Delhi, 1998.

MA 1005 - PROBABILITY AND STATISTICS												
Course Designed by		**Department of Mathematics**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				X						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
				X								
4.	Approval	23rd Meeting of Academic Council, May 2013										

IC1016	**INDUSTRIAL INSTRUMENTATION -I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to understand the fundamentals of various types of measurements.

INSTRUCTIONAL OBJECTIVES

1.	Discussion of load cells, torque meter and various velocity pick-ups.
2.	Exposure to various accelerometer pick-ups, vibrometers, density and viscosity pick-ups.
3.	To have a sound knowledge about thermocouples and pyrometry techniques
4.	To have an adequate knowledge about pressure transducers.
5.	Discussion of load cells, torque meter and various velocity pick-ups.

UNIT I-MEASUREMENT OF FORCE, TORQUE AND VELOCITY (7 hours)

Electric balance – Different types of load cells – Magnets – Elastic load cells - Strain gauge load cell – Different methods of torque measurement – Strain gauge, relative regular twist – Speed measurement – Revolution counter – Capacitive tacho-drag cup type tacho – D.C and A.C tacho generators – Stroboscope.

UNIT –II MEASUREMENT OF ACCELERATION, VIBRATION, DENSITY ANDVISCOSITY (8 hours)

Accelerometers – LVDT, piezoelectric, strain gauge and variable reluctance type accelerometers – Mechanical type vibration instruments – 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 – Saybolt viscometer – Rotameter type.

UNIT III- PRESSURE MEASUREMENT (12 hours)

Units of pressure - Manometers – Different types – Elastic type pressure gauges – Bourdon type 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 – Thermal conductivity gauges – Ionization gauge, cold cathode and hot cathode types – Testing and calibration of pressure gauges – Dead weight tester.

UNIT IV-TEMPERATURE MEASUREMENT (9 hours)

Definitions and standards – Primary and secondary fixed points – Calibration of thermometer, different types of filled in system thermometer – Sources of errors in filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement – Signal conditioning of industrial RTDs and their characteristics – Three lead and four lead RTDs.

UNIT V-THERMOCOUPLES AND PYROMETERS (9 hours)

Thermocouples – Laws of thermocouple – Fabrication of industrial thermocouples – Signal conditioning of thermocouples output – Thermal block reference functions – Commercial circuits for cold junction compensation – Response of thermocouple – Special techniques for measuring high temperature using thermocouples – Radiation methods of temperature measurement – Radiation fundamentals – Total radiation & selective radiation pyrometers – Optical pyrometer – Two colour radiation pyrometers.

TEXT BOOKS

1. E.O. Doebelin, "*Measurement Systems – Application and Design"*, Tata McGraw Hill publishing company, 2008.
2. A.K. Sawhney and P. Sawhney, "*A Course on Mechanical Measurements, Instrumentation and Control"*, Dhanpath Rai and Co, 2013.
3. B.E Nolting,"*Jones Instrument Technology"*, Vol. 3, Elsevier Edition,2005.
4. D. Patranabis, "*Principles of Industrial Instrumentation"*, Tata McGraw Hill Publishing Company Ltd, 2008.

REFERENCES

1. Nakra B.C. & Chaudary K.K., "*Instrumentation Measurement & Analysis"*, Tata McGraw Hill Publishing Ltd, 2004.
2. Singh S.K., "*Industrial Instrumentation and Control*", Tata McGraw Hill, 2008.
3. Eckman D.P., "*Industrial Instrumentation"*, Wiley Eastern Ltd.,
4. Jain R.K.,"*Mechanical and Industrial Measurements"*, Khanna Publishers, New Delhi,2008.

WEB NOTES

1. **NPTEL,** http://www.nptel.iitm.ac.in/video.php?subjectId=108105064

<table>
<tr><th colspan="13">IC1016 INDUSTRIAL INSTRUMENTATION –I</th></tr>
<tr><th colspan="2">Course designed by</th><th colspan="11">Department of Instrumentation & Control Engineering</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>A</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>l</td><td>j</td><td>k</td></tr>
<tr><td>X</td><td></td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
<tr><td colspan="3"></td><td colspan="3"></td><td colspan="3"></td><td colspan="3">X</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Instrumentation</td><td colspan="3">Control</td><td colspan="3">Electronics</td><td colspan="3">Electrical</td></tr>
<tr><td colspan="3">X</td><td colspan="3"></td><td colspan="3"></td><td colspan="3"></td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

IC1017	MODERN CONTROL SYSTEMS	L	T	P	C
	Total Contact Hours – 75	3	2	0	4
	Prerequisite				
	Basic knowledge in control systems				

PURPOSE

To gain a working knowledge of the basic linear system design techniques and nonlinearities in control systems in order to enable students to deal with real-life applications

INSTRUCTIONAL OBJECTIVES

1.	To design cascade compensators in time domain and frequency domain
2.	To develop an understanding of sampling
3.	To understand and develop state space model for different systems
4.	To gain a working knowledge of z-transform theory

UNIT I- DESIGN OF COMPENSATORS (15 hours)

Introduction to design- Effect of adding a pole and zero to a system-compensating networks types-cascade and feedback-design of cascade lead and cascade lag compensation in time domain and frequency domain

UNIT II- SAMPLE DATA CONTROL SYSTEM (15 hours)

Sampled data control systems - functional elements-sampling process - z-transforms- properties - inverse z-Transforms-ZOH and First order Hold process-pulse transfer functions - step response - stability analysis-Jury's stability test.

UNIT III- STATE SPACE ANALYSIS (15 hours)

Concepts of State, State variable and State space model- State space representation of linear continuous time systems using physical variables, phase variables and canonical variables-diagonalization-State space representation of discrete time systems-Solution of state equations-computation of state transition matrix.

UNIT IV-STATE FEEDBACK CONTROL AND OBSERVERS (15 hours)

Concepts of Controllability and Observability - linear time invariant systems-pole placement by state feedback-Ackerman's Formula-Observers-full order and reduced order.

UNIT V-NON-LINEAR SYSTEMS **(15 hours)**

Non-linear systems-properties-common physical non-linearities-dead zone, relay, saturation nonlinearities-phase plane method-singular points-phase trajectories-stability analysis by describing function method-Liapunov's stability criterion.

TEXT BOOKS

1. Katsuhiko Ogata, "*Modern Control Engineering"*, Fifth edition, Prentice Hall of India Private Ltd, NewDelhi, 2010.
2. Nagrath I J and M Gopal, "*Control Systems Engineering",* New Age International Pvt.Ltd, 2009.
3. D.Roy Chowdhary, "*Modern Control Engineering",* Prentice Hall of India Private Ltd, New Delhi, 2005

REFERENCES

1. Benjamin C Kuo, "*Automatic Control System"*, 7th edition, Prentice Hall of India Private Ltd, New Delhi, 1993
2. Gopal .M, "*Modern Control Systems Theory"*, New Age International Pvt.Ltd, 1996

IC1017 MODERN CONTROL SYSTEMS												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	a	B	c	d	e	f	g	h	i	j	k
		x		x		x						
2.	Mapping of instructional objectives with student outcome	2		1		3						
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electrical			Electronics		
					x							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1018	MICRO CONTROLLER AND ITS APPLICATIONS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To understand different types of microprocessors and micro controllers and to use microprocessor and microcontroller for different applications.

INSTRUCTIONAL OBJECTIVES

1.	To learn the concepts of basic microprocessors.
2.	To get knowledge in interfacing devices
3.	To know the concepts of microcontroller and its applications
4.	To develop skill in simple program writing
5	To learn the concepts of basic microprocessors.

UNIT I- INTEL 8086/8088 MICROPROCESSOR (9 hours)

Architecture of 8086/8088-Register organization – Signal Description of 8086 – Minimum mode – Maximum mode and timings –8086 Instruction set – Addressing modes – Assembler Directives and operators- simple programs.

UNIT II-PERIPHERAL INTERFACING (9 hours)

Programmable Peripheral Interface 8255 – Programmable Communication Interface 8251 USART – Programmable Interrupt Controller 8259A - Programmable Interval Timer 8253 – Keyboard/Display Controller 8279 – DMA Controller 8237 – CRT Controller 8275

UNIT III-8031/8051 MICROCONTROLLER (9 hours)

Single chip microcontroller – Introduction to 8 bit microcontroller – architecture of 8031/8051- Signal descriptions of 8051- Register set of 8051, operational features of 8051- Ports – Memory and I/O Interfacing-Interrupts –Instruction set – Addressing mode –simple programs

UNIT IV-ATMEL ATMEGA16 MICRO CONTROLLER (9 hours)

ATmega16 Architecture - Memories, Port; Peripheral Features - Physical and Operating Parameters – Serial Communication - USART Overview, Registers, Operation and Programming- Serial Peripheral Interface- Operation, Registers, Programming, Two-Wire Serial Interface; ADC System –Block Diagram, Registers, Programming the ADC, Digital-to-Analog Conversion.

UNIT V-INTERFACING **(9 hours)**

Microprocessor based level control system, Weather monitoring system– interfacing alphanumeric displays speed control of stepper motor – A/D and D/A interfacingInput Devices- Switches, Debouncing, Keypads; Digital and Analog Sensors; Output Devices- LED, LCD, High-Power DC Devices, DC Motor Speed and Direction Control

TEXT BOOKS

1. A.K Roy, K.M Bhurchandi, " *Intel Microprocessors Architecture, Programming and Interfacing"*, McGraw Hill International Edition – 2001.
2. Kenneth J Ayala , "*The 8051 microcontroller*", 3 rd Edition, International Thomson publishing, India- 2004.
3. Steven F. Barrett and Daniel J. Pack, "*Atmel AVR Microcontroller Primer: Programming and Interfacing*", Morgan & Claypool Publishers, 2008.

REFERENCES

1. Douglas V.Hall, "*Microprocessors and Interfacing programming and hardware"*, Tata McGraw Hill Edition 1997.
2. Myke Predko, "*Programming and customizing the 8051 Microcontroller"*, Tata McGraw Hill, New Delhi –Second Edition, 2001.
3. Muhammad Ali Mazidi and Janica Gilli Mazidi, "*The 8051 microcontroller and embedded systems"*, Pearson Education, 5th Indian reprint, 2003.

IC1018 MICRO CONTROLLER AND ITS APPLICATIONS												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x		x	x	x		x				x
2.	Mapping of instructional objectives with student outcome	1,2,3 ,4,5		5	1,2,3 ,4,5	1,2,3, 4,5		1,2, 3,4, 5				1,5
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad Area	Instrumentation			Control		Electronics				Electrical	
					x							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1019	MICRO CONTROLLER LAB	L	T	P	C
	Total Contact hours - 45	0	0	3	2
	Prerequisite				
	Nil				

PURPOSE

To enable the students to do basic programming in microprocessors and microcontrollers and interfacing various I/O devices.

INSTRUCTIONAL OBJECTIVES

1	To understand code conversion
2	To carry out basic arithmetic and logical calculations
3	To get knowledge in interfacing devices

LIST OF EXPERIMENTS

1. To perform addition and subtraction of 8 bit numbers
2. To perform addition and subtraction of 16 bit numbers
3. To do multi byte subtraction
4. To perform multiplication of two 8 bit numbers
5. To do division of two 8 bit numbers
6. To perform sorting of numbers in ascending and descending order
7. To do block data transfer in both forward and reverse order
8. To perform sum of a series of N numbers
9. To do conversion of Decimal to Hexadecimal and Hexadecimal to Decimal digits
10. To perform an experiment to control a Stepper motor
11. To implement interface of Analog to digital (ADC) conversion
12. To implement of interface of Digital to Analog converter (DAC)
13. To implement the interfacing of traffic light control systems
14. To implement Keyboard/Display Interface for

a. Rolling display
b. Flashing display

15. To study the basics of ATmega16 Serial communication and ADC/DAC
16. To implement DC Motor Speed and Direction Control
17. To interface LCD with ATmega16 micro controller
18. To implement real time project using micro controller

The above experiments can be done using Intel 8086, 8051 and ATmega16

REFERENCE

1. Microprocessor & Microcontrollers Lab manual

IC1019 MICRO CONTROLLERS LAB												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	K
		x		x	x	x		x				X
2.	Mapping of instructional objectives with student outcome	1		2								3
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
					x							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1020	INDUSTRIAL INSTRUMENTATION LAB	L	T	P	C
	Total Contact Hours - 45	0	0	3	2
	Prerequisite				
	Nil				

PURPOSE

To enable the students to know about measuring instruments used for the measurement of various physical quantities.

INSTRUCTIONAL OBJECTIVES

1.	To learn about transducers
2.	To gain practical knowledge of the instruments used for the measurement of flow, pressure, torque, P^H and conductivity.

LIST OF EXPERIMENTS

1. Discharge coefficient of orifice plate
2. Deadweight Tester pressure gauge
3. Vacuum pressure measurement
4. Torque measurement
5. Capacitive liquid level measurement
6. Level measurement using d/p transmitter

7. Measurement of viscosity using (i) say bolt viscometer (ii)redwood viscometer
8. Measurement of P^H using digital P^H meter.
9. Measurement of conductivity using conductivity meter.
10. Design of cold junction compensation for thermocouple.

IC1020 INDUSTRIAL INSTRUMENTATION LAB												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1		4		2						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation		Control		Electronics				Electrical		
		X		--		--				--		
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1047	INDUSTRIAL TRAINING I (Training to be undergone after IV semester)	L	T	P	C
	2 weeks practical training in industry	0	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To provide hands-on experience at site / planning or design office where civil engineering projects are carried out

INSTRUCTIONAL OBJECTIVES

1.	Students have to undergo two – week practical training in Instrumentation and Control Engineering related project site or design / planning office so that they become aware of the practical application of theoretical concepts studied in the class rooms.

Students have to undergo two-week practical training in Instrumentation and Control Engineering related project site or design / planning office of their choice

but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment process

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

SEMESTER – VI

PD1006	**APTITUDE-IV**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE
To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES	
1.	To improve aptitude, problem solving skills and reasoning ability of the student.
2.	To collectively solve problems in teams & group.

UNIT I - ARITHMETIC - II **(6 hours)**
Ratios & Proportions, Averages, Mixtures & Solutions

UNIT II - ARITHMETIC – III **(6 hours)**
Time, Speed & Distance, Time & Work

UNIT III - ALGEBRA – II **(6 hours)**
Quadratic Equations, Linear equations & inequalities

UNIT IV– GEOMETRY **(6 hours)**
2D Geometry, Trigonometry, Mensuration

UNIT V – MODERN MATHEMATICS – II **(6 hours)**
Sets & Functions, Sequences & Series, Data Interpretation, Data Sufficiency

ASSESSMENT
1. Objective type – Paper based / Online – Time based test

REFERENCES

1. Agarwal.R.S – *Quantitative Aptitude for Competitive Examinations,* S Chand Limited 2011
2. Abhijit Guha*, Quantitative Aptitude for Competitive Examinations,* Tata Mcgraw Hill, 3rd Edition

3. Edgar Thrope, *Test Of Reasoning For Competitive Examinations,* Tata Mcgraw Hill, 4th Edition
4. Other material related to quantitative aptitude

PD1006 - APTITUDE-IV												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X							
2.	Mapping of instructional objectives with student outcome	1			2							
3.	Category	General (G)			Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)	
		X										
4.	Approval	23rd Meeting of Academic Council, May 2013										

IC1021	PROCESS CONTROL	L	T	P	C
	Total Contact Hours - 60	**4**	**0**	**0**	**4**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to learn the basic concepts of process control and to develop sufficient knowledge of the various control actions and controllers used to control any process.

INSTRUCTIONAL OBJECTIVES

1.	The students will be able to understand the behavior of various physical systems and mathematically model them.
2.	To learn the basic control actions and characteristics of different types of controllers.
3.	The students will be able to select and tune a controller to suit a particular process
4.	The students will study about the characteristics of final control elements
5.	The students will learn about the control schemes applied to various processes.

UNIT I-INTRODUCTION **(15 hours)**

Process control – Need for process control – Hardware elements of a process control system – Degrees of freedom – Mathematical model of thermal, hydraulic and gaseous processes – Interacting and Non-interacting systems - Servo and Regulator Operation – Batch & Continuous Process – concept of self-regulation-Dead time

UNIT II-CHARACTERISTICS OF CONTROLLERS **(15 hours)**

Direct and Reverse action of a controller with suitable examples- Control modes - Characteristics of ON- OFF, Single speed floating, Proportional, Integral and derivative controllers - Characteristics of P+I, P+D and P+I+D controllers – Response of controllers to Step & Ramp input signals – Servo and Regulatory response of P and PI controllers – Reset Wind-up and prevention – Derivative and Proportional kick – Bumpless transfer – Pneumatic and Electronic realization of Controllers. Selection of a controller for a particular process.

UNIT III-CONTROLLER TUNING **(8 hours)**

Need for controller tuning – Evaluation criteria – Quarter Decay Ratio, IAE, ISE and ITAE - Types of controller tuning: Process reaction curve method, Continuous cycling method and Damped oscillation method.

UNIT IV-FINAL CONTROL ELEMENTS **(12 hours)**

I/P, P/I converters – Final control elements – Pneumatic and electric actuators – Types of control valves – Valve positioner and its importance – Inherent and Installed characteristics of control valve – Control valve sizing - Cavitation and flashing.

UNIT V-MULTILOOP CONTROL **(10 hours)**

Cascade control – Feed forward control – Ratio Control – Inferential control – Split-range control- Application in Distillation columns, Chemical Reactors, Heat Exchangers and Boiler– Introduction to adaptive control.

TEXT BOOKS

1. Stephanopoulis, G, "*Chemical Process Control"*, Prentice Hall of India, New Delhi, 2009.
2. Eckman. D.P., "*Automatic Process Control"*, Wiley Eastern Ltd., New Delhi, 2011.
3. Johnson .C.D., "*Process Control Instrument Technology"*, Prentice Hall Inc. 2009.
4. Wayne Bequette *.,"Process Control: Modeling design and Simulation*",2008.

REFERENCES

1. Harriott .P.," *Process Control"*, Tata McGraw Hill, 2000.
2. Anderson .N.A., "*Instrumentation for Process Measurement and Control"*, Chilton company 1997.

IC1021 PROCESS CONTROL												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x		x						x
2.	Mapping of instructional objectives with student outcome	1,3, 4,5	2,3, 4	2,3, 4		2,3, 4						2,3, 4
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
							x			x		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
					x							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1022	INDUSTRIAL INSTRUMENTATION-II	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Industrial Instrumentation-I				

PURPOSE

To equip the student with relevant knowledge to suit the industrial requirement.

INSTRUCTIONAL OBJECTIVES

1.	To study about humidity and moisture measurements
2.	To study about mechanical flow meters and their installation.
3.	To study about area flow meters ,mass flow meters and calibration
4.	To know about non-contact type flow meters
5.	To know about various types of level measurements adopted in industry environment.

UNIT I-VARIABLE HEAD TYPE FLOWMETERS (**9 hours)**

Orifice plate-Venturi tube-Flow nozzle-Dall tube-installation of head flow meters – Pitot tube

UNIT II- QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS (**9 hours)**

Positive displacement flow meters-Nutating disc,Reciprocating piston,Oval gear and helix type flow meters-inferential meter-Turbine flow meter-Area flow meter-Rota meter-Theory and installation-Mass flow meter-angular momentum-Thermal-Coriolis type mass flow meters-Calibration of flow meters-Dynamic weighing methods.

UNIT III- ELECTRICAL TYPE FOW METER (**9 hours)**

Principle and construction details of electromagnetic flow meter-Ultrasonic flowmeter-Laser Doppler anemometer-Vortex shedding flow meter-Target flow meter-Guidelines of selection of flow meter-open channel flow measurement-Soild flow rate measurement

UNIT IV-LEVEL MEASUREMENT (**9 hours)**

Float,displacer type-bubbler system-electrical level gauge-Resistance-Capacitance-Nuclear radiation and ultrasonic type-Boiler drum level control measurement-Differential pressure method-Hydro static method.

UNIT V-MEASUREMENT OF HUMIDITY AND MOISTURE (**9 hours)**

Dry and wet bulb psychrometers - Hot wire electrode type hygrometer - Dew cell - Electrolysis type hygrometer - Commercial type dew point meter - Moisture measurement - Different methods of moisture measurement - Applications moisture measurement.

TEXT BOOKS

1. E.O. Doebelin, "*Measurement Systems – Application and Design*", Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney and P. Sawhney, "*A Course on Mechanical Measurements, Instrumentation and Contro"*', Dhanpath Rai and Co, 2004.
3. Jones, " *Instrument Technology*",Vol .2, Butterworth-Heinemann,International Edition,2003.

REFERENCES

1. Patranabis, "*Principles of Industrial Instrumentation"*, Tata McGraw Hill Publishing Company Ltd, 2008.

2. Nakra B.C. & K.K.Chaudary, "*Instrumentation Measurement & Analysis*", Tata McGraw Hill Publishing Ltd, 2004.
3. Singh S.K, "*Industrial Instrumentation and Control"*, Tata McGraw Hill, 2003.
4. Eckman D.P, *" Industrial Instrumentation*", Wiley Eastern Ltd.,
5. Jain R.K, "*Mechanical and Industrial Measurements"*, Khanna Publishers, New Delhi,2008

IC1022 INDUSTRIAL INSTRUMENTATION-II												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1		4		2						
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
		X			X		--			--		
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1023	**INTRODUCTION TO MEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				
PURPOSE					
This course fulfills the objective of introducing the learner to MEMS & fabrication technology aspects, Microelectronics, Materials, design, packaging and simulation of various MEMS devices					
INSTRUCTIONAL OBJECTIVES					
1.	Imparting thorough knowledge on MEMS & Micro fabrication				
2.	Introduce the students to basics of MEMS Design & simulation				

UNIT I-MEMS AND MICROSYSTEMS **(9 hours)**

MEMS and Microsystems - MEMS markets - Scaling rules – Miniaturization - MEMS devices - Microsystems & Microelectronics- Working principle of microsystems- Micro sensors and actuators

UNIT II-MEMS MATERIALS **(9 hours)**

Materials For MEMS - Silicon as a mechanical material - Silicon crystallography - Defects in silicon - Silicon dielectrics - Gallium Arsenide- Quartz - Piezoelectric crystals-Polymer MEMS

UNIT III- FABRICATION **(9 hours)**

Fabrication Process – Photolithography - Ion implantation- Oxidation- Chemical vapor deposition (CVD) - Physical vapor deposition (PVD) - Deposition by Epitaxy- Wet Etching- Dry etching - Manufacturing Process - Bulk Micromachining-Surface Micromachining-LIGA

UNIT IV-MEMS DEVICES **(9 hours)**

Pressure sensors- Accelerometers - Gyroscopes- RF MEMS Switch- Temperature sensors - Humidity sensors-Microfluidics -MEMS Simulation in Intellisuite-COMSOL-Coventorware

UNIT V-FLUID DYNAMICS AND MICROPUMPS **(9 hours)**

Viscosity, Density, Surface tension, Continuity equation, Newton's second law, Navier-Stokes equation and its interpretation, Flow types. Microfluidics: Electrokinetics, Electroosmosis, Electrophoresis, fabrication methods, Lab on a Chip, Micropumps, Microvalves.

TEXT BOOKS

1. Tai - Rai Hsu, "*MEMS and Microsystems: Design and Manufacturing*", Tata MC Graw Hill, Edition 2002.
2. Stephen D.Senturia, "*Microsystems Design*", Springer,2001.

REFERENCES

1. Gregory Kovacs, "*Micro machined Transducers*", Tata Mc Graw Hill,1998.
2. Mark Madou, "*Fundamentals of Microfabrication*", CRC Press, 2002.

IC1023 INTRODUCTION TO MEMS												
Course designed by		**Department of Instrumentation and Control Engineering.**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X	X						X
2.	Mapping of instructional objectives with student outcome	2			1	2						2
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
		--			X		X			--		
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1024	MEMS LAB	L	T	P	C
	Total Contact hours - 45	**0**	**0**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

To apply the concepts of micro fabrication and to develop analytical skills for applications in MEMS technology using numerical methodology (COMSOL multiphysics).

INSTRUCTIONAL OBJECTIVES

1.	Introduce the students to basics of MEMS Design & simulation
2.	To enable the students to understand the basic concepts involved in the analyses.

LIST OF EXPERIMENTS

1. To find out the relation between applied load and deflection of a square and circular membrane.
2. To find out the pressure drop in case of a circular channel and compare it with analytical solutions.
3. To find out the pressure drop in case of a nozzle with wide angle and small angle.
4. To find out the deflection of a cantilever beam for an applied load.
5. To design and give the numerical solution for a square piezoelectric actuator

6. To design and numerically solve circular piezoelectric actuator
7. To design and simulate fluid-structure interaction problem
8. To design and simulate a thermoelectric generator with a temperature boundary condition and voltage output
9. To design and simulate a H-channel mixer
10. Find out the natural frequencies of a diaphragm and comment on the results.

REFERENCE

1. MEMS lab manual

IC1024 MEMS LAB													
Course designed by		**Department of Instrumentation and Control Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
		X			X	X						X	
2.	Mapping of instructional objectives with student outcome	2			1	2						2	
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)			
										X			
4.	Broad Area	Instrumentation			Control		Electronics			Electrical			
		--			X		X			--			
5.	Approval	23rd Meeting of Academic Council, May 2013											

IC1025	**PROCESS CONTROL LAB**	**L**	**T**	**P**	**C**
	Total Contact hours - 45	**0**	**0**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to understand the fundamentals of process control, types of processes, characteristics of different types of controllers for controlling a process and process automation.

INSTRUCTIONAL OBJECTIVES

1.	To understand basic components of process control loop
2.	To understand control of a process using personal computer
3.	To understand control of processes using PID and ON-OFF controllers
4.	To study control of processes using DCS and MATLAB

LIST OF EXPERIMENTS

1. Characteristics of I/P and P/I converter
2. Interacting and Non interacting tank system
3. Control valve characteristics
4. Control valve characteristics with and without positioner
5. Pressure process controller
6. Temperature process controller
7. Level process controller
8. Flow process controller
9. Cascade control system using Multiprocess Trainer
10. Feed forward control system using Multiprocess Trainer
11. Ratio control system using Multiprocess Trainer
12. Cascade control system using MATLAB
13. Tuning of controllers using MATLAB
14. Response of different order processes with and without transportation delay using MATLAB
15. Study of DCS.

REFERENCE

Process Control Lab manual

<table>
<tr><th colspan="13">IC1025 PROCESS CONTROL LAB</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Instrumentation and Control Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
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<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>5.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

IC1049	MINOR PROJECT	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	--				

PURPOSE

To carry out a design project in one of the specializations of the program with substantial multidisciplinary component

INSTRUCTIONAL OBJECTIVES

1.	To guide the students in such a way so that they carry out a work on a topic as a forerunner to the full fledged project work to be taken subsequently in VIII semester. The project work shall consist of substantial multidisciplinary component

The students will carry out a project in one of the specializations of program under study with substantial multidisciplinary component

Student groups will be formed and a faculty member will be allocated to guide them. Assessment will be based on internal reviews. Based on the reviews marks will be allotted out of 100.

IC1049 MINOR PROJECT												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X	X	X	X	X	X	X	X	X	X
2.	Mapping of instructional objectives with student outcome	1	1	1	1	1	1	1	1	1	1	1
3.	Approval	23rd Meeting of Academic Council, May 2013										

SEMESTER VII

IC1026	COMPUTER CONTROL OF PROCESS	L	T	P	C
	Total Contact Hours - 75	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To provide students with fundamentals and some special knowledge in computer based process control. Based on the fundamental the advancement of process automation can be understood.

INSTRUCTIONAL OBJECTIVES

1.	The need of computer in process industry.
2.	Modeling and Identification of processes.
3.	Control algorithms and its implementation.
4.	To study about adaptive control
5.	Multivariable control system.

UNIT I –INTRODUCTION (15 hours)

Need of computer in a control system-Functional block diagram of a computer control system-Data loggers- Supervisory computer control- Direct digital control-Digital control interfacing-SCADA.

UNIT II – MODELLING AND IDENTIFICATION (15 hours)

System modeling and identification - Mathematical model for processes - first order - second order processes Without and with pure delay - higher order systems - pulse testing for process identification –linear least square algorithm.
Implementation of digital controllers Digital temperature control system - digital position control system - stepping motors and their control.

UNIT III –CONTROL ALGORITHMS (15 hours)

Design of control algorithms using Z transforms: dead beat algorithm - Dahlin's method -Ringing - Kalman's approach - discrete equivalent to an analog controller - design for load changes-PID algorithms -position and velocity forms-Tuning the algorithms- tuning techniques-Selection of a sampling time.

UNIT IV –ADAPTIVE CONTROL (15 hours)

Adaptive control- Self Tuning, Gain Scheduling- Model Reference Adaptive Control- Self Tuning Regulator- Feed forward Control- Cascade Control.

UNIT V – MULTIVARIABLE CONTROL **(15 hours)**

Multivariable Control System- Interaction Analysis- Singular value decomposition- Internal model control- Simplified model predictive control

TEXT BOOKS

1. Deshpande P.B. & Ash R.H, "*Computer Process Control - ISA publication"*, USA 1995
2. George Stephanopoulos, *" Chemical Process Control - An Introduction to Theory & Practice",* PHI Learning , 2009
3. Franklin G.F., "*Michael Workman & Powel J.D - Digital Control of Dynamic Systems*", Pearson Education; Third edition (fifth Indian reprint) edition, 2005.

REFERENCES

1. M.Gopal, "*Digital Control & Static variable methods"*, 4th edition Tata McGraw-Hill Education 2012
2. M.Chidambaram, "*Computer Process Control",* CRC PressINC, 2002

<table>
<tr><th colspan="14">IC1026 COMPUTER CONTROL OF PROCESS</th></tr>
<tr><th colspan="2">Course designed by</th><th colspan="12">Department of Instrumentation and Control Engineering</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>A</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>X</td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>2</td><td></td><td></td><td>1</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td>2</td></tr>
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<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Instrumentation</td><td colspan="2">Control</td><td colspan="3">Electronics</td><td colspan="3">Electrical</td></tr>
<tr><td colspan="3">--</td><td colspan="2">X</td><td colspan="3">X</td><td colspan="3">--</td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

IC1027	PLC AND DCS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to understand basics, programming techniques and interfacing techniques of PLC, DCS and SCADA

INSTRUCTIONAL OBJECTIVES

1.	The students will be able Know fundamentals of PLC and DCS.
2.	The students will be able to Programming in PLC and DCS.
3.	To get better understanding of Hardware structure of PLC and DCS.
4.	The students can have an exposure to different interfacing techniques.
5.	The students can able to design some real time application using SCADA.

UNIT I- INTRODUCTION TO PLC (9 hours)

Automation: fundamentals of industrial automation, need and role of automation, evolution of automation. PLC introduction **:** types of processes, comparison, evolution of PLC, definition, functions, advantages, Architecture, DI-DO-AI-AO examples and ratings, I/O module, working of PLC, scan time, Installation of PLC, Rack installation, Grounding and shielding, physical, electrical, maintenance requirements, planning, verifying. Troubleshooting, Fault diagnosis techniques. Choosing PLC for application, Types and Specifications of PLC.

UNIT II-PLC PROGRAMMING AND INTERFACING (9 hours)

PLC programming**:** Development of Relay Logic Ladder Diagram, Introduction to PLC Programming, Programming devices and languages as per IEC 61131-3 like IL, ST, FBD, CFC, SFC, PLC Timers and Counters, Installation and Troubleshooting. PLC Interfacing: PID Control using PLC, PID instruction. PLC Interface to Hydraulic/Pneumatic circuits, solid-state devices, Need of interfacing. PLC Selection, PLC interface to temperature control loop.

UNIT III-SCADA SYSTEM (9 hours)

SCADA Concept of SCADA systems, Programming techniques for : Creation of pages, Sequencing of pages, Creating graphics & animation, Dynamos programming with variables, Trending, Historical data storage & Reporting, Alarm management, reporting of events and parameters. Comparison of different SCADA packages. Application Development using SCADA system.

UNIT IV-DISTRIBUTED CONTROL SYSTEM (9 hours)

DCS Introduction, Location of DCS in Plant, functions, advantages and limitations, Comparison of DCS with PLC,.DCS components/ block diagram, Architecture, Functional requirements at each level, Database management. Latest trends and developments of DCS, DCS Specification. Layout of DCS, Controller Details, Redundancy, I/O Card Details, Junction Box and Marshalling Cabinets, Operator Interface, Workstation Layout, different types of control panels, types of Operating Station, various display configurations.

UNIT V-PC BASED INSTRUMENTATION (9 hours)

Introduction - Evolution of signal Standard - HART Communication protocol - Communication modes - HART networks - control system interface - HART commands -HART field controller implementation - HART and the OSI model - Field bus –Introduction - General field bus architecture - Basic requirements of field bus standard -field bus topology - Interoperability – interchangeability - Instrumentation buses-Mod bus - GPIB - Network buses – Ethernet - TCP/IP protocols

TEXT BOOKS

1. John Webb, "*Programmable Logic Controllers*", Prentice Hall of India, 2003.
2. Gary Dunning, "*Introduction to Programmable Logic Controllers*", Delmar Thomson Learning., 2006.
3. Popovik-Bhatkar, Dekkar, "*Distributed Computer Control for Industrial Automation*", Publications, 2000.

REFERENCES

1. Singh S. K., "*Computer Aided Process Control*", Prentice Hall of India, 2004.
2. Krishna Kant, "*Computer Based Process Control*", Prentice Hall of India, 2004.
3. Stuart A. Boyer , "*Supervisory Control And Data Acquisition"*, 4th edition, International Society Of Automation 2010.
4. Michael Lucas, "*Distributed Control Systems"*, Van Nostrand Reinhold Co.,1986.

IC1027 PLC AND DCS												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x		x						x
2.	Mapping of instructional objectives with student outcome	1,3, 4,5	2,5	2,5		2,4, 5						2,3, 4
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
											x	
4.	Broad Area	Instrumentation			Control		Electronics				Electrical	
		X			x							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1028	DESIGN PROJECT LAB	L	T	P	C
	Total Contact hours - 45	0	0	3	2
	Prerequisite				
	Knowledge in electronics and transducer				

PURPOSE

To acquire knowledge to design instruments and to prepare a documentation of Instrumentation project. To operate MATLAB tool box

INSTRUCTIONAL OBJECTIVES

1.	To learn the design of compensators
2.	To learn the design of controllers
3.	To understand design of various circuits related to instrumentation
4.	To do a complete project

LIST OF EXPIRIMENTS

1. Design of Cascade lead compensator using MATLAB (Root Locus approach)
2. Design of Cascade lead compensator using MATLAB (frequency domain approach)
3. Design of Cascade lag compensator using MATLAB (Root Locus approach)
4. Design of Cascade lag compensator using MATLAB (frequency domain approach)
5. Design PID Controllers for set point & gain adjustment.

6. Design of RPS and Design of Instrumentation Amplifiers.
7. Piping and Instrumentation diagram case study.
8. Design of Signal Conditioning circuit for Strain gauge & RTD
9. Design of Control valve sizing & flow lift characteristics
10. Piping and Instrumentation diagram- Case study
11. Preparation of Documentation of Instrumentation project (process flow, instrument index Sheet and

a. Instrument specifications sheet)

12. Preparation of project scheduling (job scheduling, installation procedure and safety regulations
13. Home automation using arduino- Mini Project
14. Design of Filters (LPF,HPF,BPF and BRF)
15. Design of I- V and V-I Converters

REFERENCE

Design project Lab manual

IC1028 DESIGN PROJECT LAB												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	A	b	c	d	e	f	g	h	i	j	k
		X		x	x	x		x				x
2.	Mapping of instructional objectives with student outcome	1		2								4
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad Area	Instrumentation			Control		Electronics				Electrical	
							X					
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1029	AUTOMATION LAB	L	T	P	C
	Total Contact hours - 45	0	0	3	2
	Prerequisite				
	Nil				

PURPOSE

To enable the students to understand basics, programming techniques and interfacing techniques of PLC

INSTRUCTIONAL OBJECTIVES

1.	The students will be able Know fundamentals of PLC and DCS.
2.	The students will be able to Programming in PLC .

LIST OF EXPERIMENTS

1. Study Of Plc
2. Water Level Controller
3. Material Handling System
4. Bottle Filling System
5. Speed Control Of Motor
6. Temperature Control Sustem
7. Sequential Operation Of Motor
8. Star To Delta Starter
9. Batch Process
10. Smart Room Design
11. Square Of A 3 Bit Number
12. Code Convertor(Binary To Gray & Gray To Binary)
13. Implementation Of Mux. & Demux.
14. Trafic Light Control System

REFERENCE

Automation lab manual

IC1029 AUTOMATION LAB												
Course designed by		**Department of Instrumentation and Control Engineering**										
1	Student Outcome	a	B	C	d	e	f	g	h	i	j	K
		X			X	X						X
2	Mapping of instructional objectives with student outcome	2			1	2						2
3	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4	Broad Area	Instrumentation			Control		Electronics			Electrical		
		--			X					--		
5	Approval	23rd Meeting of Academic Council, May 2013										

ICI1048	**INDUSTRIAL TRAINING II (Training to be undergone after VI semester)**	**L**	**T**	**P**	**C**
	2 week practical training in industry	**0**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE

To provide hands-on experience at site / planning or design office where Electronics & Instrumentals engineering projects are carried out

INSTRUCTIONAL OBJECTIVES

1.	Students have to undergo two – week practical training in Instrumentation Engineering related project site or design / planning office so that they become aware of the practical application of theoretical concepts studied in the class rooms.

Students have to undergo two-week practical training in Instrumentation Engineering related project site or design / planning office of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment process

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

<table>
<tr><td colspan="13">ICI1048 INDUSTRIAL TRAINING I</td></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Instrumentation and Control Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td></td><td></td><td></td><td>X</td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td></td><td></td><td></td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences & Technical Arts(E)</td><td colspan="3">Professional Subjects (P)</td></tr>
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<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Electronics Engineering</td><td colspan="3">Instrumentation Engineering</td><td colspan="3">Control Engineering</td><td colspan="3">Electrical Engineering</td></tr>
<tr><td colspan="3">x</td><td colspan="3">x</td><td colspan="3">x</td><td colspan="3">x</td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
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SEMESTER VIII

IC1050	MAJOR PROJECT / PRACTICE SCHOOL	L	T	P	C
	Total Contact Hours - 360	**0**	**0**	**24**	**12**
	Prerequisite				
	--				

PURPOSE

To simulate real life situations related to the program and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.

INSTRUCTIONAL OBJECTIVES

1.	To guide the students such a way that the they carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations. The project work so chosen by the student shall culminate in gaining of major design experience in the related area of specialization.

MAJOR PROJECT

Each project will cover all the aspects (to the extent possible) of real life application of concepts studied under the program. . Alternately, a few research problems also may be identified for investigation. The project shall be driven by realistic constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability. The outcomes to be attained by students by doing the project work shall be spelt out clearly. A project report is to be submitted on the topic which will be evaluated during the final review. Assessment procedure will be as spelt out in the regulations.

PRACTICE SCHOOL

Alternately, a student is encouraged to take an industrial project with reputed organizations or firms chosen by the institute. In such cases the student will stay with the firm and carry out the project. The project will be guided by the faculty member and the concerned officer in the industry. All the requirements spelt out under 'MAJOR PROJECT' above, shall be incorporated under this work also. However reviews will be conducted in the institute which the student shall attend.

IC1050 MAJOR PROJECT												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X	X	X	X	X	X	X	X	X	X
2.	Mapping of instructional objectives with student outcome	1	1	1	1	1	1	1	1	1	1	1
3.	Approval	23rd Meeting of Academic Council, May 2013										

DEPARTMENT ELECTIVES

IC1101	BIOMEDICAL INSTRUMENTATION	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to develop knowledge of how instruments work in the various department and laboratories of a hospital and thereby recognize their limitations.

INSTRUCTIONAL OBJECTIVES

1.	The students will be able to Interpret technical aspects of medicine.
2.	To Understand medical diagnosis and therapy.

UNIT I-BASIC PHYSIOLOGY (9 hours)

Cell and their structures, neuron, axon, synapse, action and resting potential, electro physiology of cardio pulmonary system, respiration and blood circulation, central nervous system and peripheral nervous system, electrode theory, bipolar and unipolar electrodes, surface electrodes- sensors used in medical diagnosis.

UNIT II- ELECTRO PHYSIOLOGICAL MEASUREMENT (9 hours)

ECG, phonocardiography,, EEG, EMG, ERG – lead system and recording methods, typical waveforms, computer diagnosis.

UNIT III-NON- ELECTRICAL PARAMETER MEASUREMENTS (9 hours)

Measurement of blood pressure, blood flow, cardiac output, plethysmography, cardiac rate, heart sound, measurement of gas volume, flow rate of Co2 and O2 in exhaust air, pH of blood.

UNIT IV-MEDICAL IMAGING AND TELEMETRY (9 hours)

X-ray machine, echocardiography, computer tomography, MRI/NMR, ultrasonography, endoscopy, different types of telemetry system, laser in bio medicine.

UNIT V-ASSISTING AND THERAPEUTIC DEVICES (9 hours)

Cardiac pacemakers, defibrillators, ventilators, muscle stimulator, diathermy, Dialyser - centralized and Bedside patient monitoring system - artificial heart- lung machine.

TEXT BOOKS

1. Leslie Cromwell, Fred J. Weibell and Erich A. Pleiffer, "*Biomedical Instrumentation and Measurements"*, PrenticeHall of India, 2007
2. L.A. Geddes and L.E. Baker, "*Principles of Applied Biomedical Instrumentation"*, John Wiley & Sons, Inc, 1989.

REFERENCES

1. Kandpur R.S. "*Hand book of Biomedical Instrumentation"*, Tata McGraw Hill, 2010
2. Richard Aston, "*Principles of Biomedical Instrumentation and Measurement"*, Merrill Publishing Company, 1990
3. Jacobson B. and Webster J.G., "*Medical Clinical Engineers"*, Prentice Hall, 1999.
4. John .G Webster, Editor, "*Medical Instrumentation, Application and Design"*, John Wiley and Sons Inc 2009

IC1101 BIOMEDICAL INSTRUMENTATION												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	K
		x	**x**	**x**								
2.	Mapping of instructional objectives with student outcome	1,2	2	2								
3.	Category	General			Basic		Engineering			Professional		

		(G)	Sciences (B)	Sciences and Technical Arts (E)	Subjects (P)
					X
4.	Broad Area	Instrumentation	Control	Electronics	Electrical
		x			
5.	Approval	23rd Meeting of Academic Council, May 2013			

IC1102	**DATA STRUCTURE**	**L**	**T**	**P**	**C**
	Total Contact Hours -45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To master the design and application of linear, tree and graph structures. To understand various algorithm design and analysis techniques.

INSTRUCTIONAL OBJECTIVES

1.	To learn algorithms using that how to solve problems
2.	To know about the .fundamentals of problem solving techniques

UNIT-I INTRODUCTION TO ALGORITHMS AND LINEAR DATA STRUCTURE (9 hours)

Basic terminology-elementry data organization-algorithm-effficiency of an algorithm-time and space complexity-abstract data type-arrays-linked list.

UNIT-II STACKS AND QUEUES (9 hours)

Primitive stack operations-application of stack-prefix and postfix expressions, evaluation of postfix expression-recursion-Queues-operations of queues-circular queues-dequeue-priority queue.

UNIT-III TREES (9 hours)

Trees-binary trees-basic concepts-implementation-traversal-application-binary search tree-balanced search trees-B trees-AVL trees-tree traversal algorithms

UNIT-IV GRAPHS (9 hours)

Graphs-basic concepts-representation-traversal-minimum spanning tree-applications-networks-single source shortest path algorithm-all pairs shortest path algorithm-topological sort-string pattern matching techniques-nalve string matching algorithm-rabin karp algorithm

UNIT-V SORTING AND SEARCHING (**9 hours)**

Internal sorting-selection sort-insertion sort-bubble sort-quick sort-heap sort-merge sort-analysing of sorting techniques-external sorting-tape sort-disk sort-searching-quantity based searching-linear search-binary search-density based searching-hash search-hashing-hash function-hashing methods-collision resolution techniques.

TEXT BOOKS

1. Thomas H corman,E.Leiserson ,"*Introduction to Algorithms*",MIT Press ,3 rd edition 2010.
2. Aaron M.Tenenbaum,V Langsam ,"*Data structures using C and C++*",PHI, 2nd edition 2009.

REFERENCES

1. Weiss M.A., "*Data structures and algorithm analysis in C*",Pearson Education Asia,2002
2. ISRD Group," *Data structures using C* ",TMH 2nd edition 2012.

IC1102 DATA STRUCTURE												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X		X						X
2.	Mapping of instructional objectives with student outcome	1		4		2						
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
		---			--		X			--		
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1103	DIGITAL SYSTEM DESIGN	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Basic Digital Logic Design				

PURPOSE

Learning design of digital circuits is a fundamental necessity for designing embedded systems. This subject provides necessary instruments to achieve that goal.

INSTRUCTIONAL OBJECTIVES

1.	The students will be able to familiarize the theory of logic and logic functions
2.	The students will be able to design simple digital circuits
3.	To get basic knowledge of VHDL language.
4.	The students can have an exposure to finite state machines concepts.
5	The students will be able to design simple digital circuits inVHDL

UNIT I- COMBINATIONAL LOGIC FUNCTIONS (9 hours)

Binary codes, Symmetric functions, Synthesis of symmetric networks, Identification of symmetric functions, Introductory concepts of Threshold Logic, Decoders, Encoders, Multiplexers, Implementing functions using Multiplexers, Demultiplexers, Magnitude Comparators, Parity Generators and Checkers, Signed Binary Arithmetic, Binary Adders and Subtractors, BCD Adders.

UNIT II- COUNTERS- SHIFT REGISTERS AND STATE MACHINES (9 hours)

Digital counters and shift registers, Mealy machine, Moore machine, State diagrams, State table minimization, Incompletely Specified Sequential Machines-State Assignments.

UNIT III- PROGRAMMABLE LOGIC DEVICES (9 hours)

Basic concepts, Programming technologies, Programmable Logic Element (PLE), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Structure of standard PLDs, complex PLDs (CPLD). Design of combinational and sequential circuits using PLD's, Introduction to Field Programmable Gate Arrays-types of FPGA- XILINX XC 3000 series and 4000 series FPGAs. Altera CPLDs- Altera FLEX 10K Series CPLDs. Design examples.

UNIT IV- FINITE STATE MACHINES (FSM) **(9 hours)**

State transition table- state assignment for FPGAs, State Machine Charts, Derivation of SM Charts, Realization of SM charts, Linked state machines. Encoded state machines, Architectures centered around Non-registered PLDs. State machine designs centered around shift registers. One-hot design method, Application of one-hot method.

UNIT V- DIGITAL DESIGN WITH VHDL **(9 hours)**

Basic Concepts: Data Objects, Data Types, Operators, Concurrent and Sequential Assignment Statements, Different Styles of Modeling, Simple Examples.

TEXT BOOKS

1. M.Morris Mano, "*Digital logic and Computer Design*", EBSCO Publishing, Inc., 2004.
2. Charles.H.Roth, Jr, "*Digital Systems Design using VHDL*", PWS Publishing Company, 2nd edition, 2007.

REFERENCES

1. Tinder R.F., "*Engineering Digital Design*", Academic Press, 2nd edition,2001.
2. Zvi Kohavi, "*Switching and Finite Automata Theory*", Tata McGraw Hill, 3rd edition, 2011.

IC1103 DIGITAL SYSTEM DESIGN												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	C	d	e	f	g	H	i	j	K
		x	**x**	**X**	**x**	**x**						**X**
2.	Mapping of instructional objectives with student outcome	1,3, 4,5	2,5	2,5	2,5	2,4, 5						2,3, 4
3	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
											X	
4	Broad Area	Instrumentation			Control		Electronics				Electrical	
							X					
5	Approval	23rd Meeting of Academic Council, May 2013										

IC1104	POWER ELECTRONICS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To develop Analysis skills for Basic Power Electronics Circuit.

INSTRUCTIONAL OBJECTIVES

1.	To learn fundamentals of power Semi Conductor Devices, Commutation Techniques
2.	To learn converters ,choppers ,inverters, AC voltage regulators, AC& DC Drives

UNIT I-POWER SEMICONDUCTOR DEVICES (9 hours)

Power diodes - power transistor, Triac, power MOSFET - IGBT - MCT - LASCR - SCR- SCR turn on, turn off characteristics - thyristor specifications - thyristor protection circuits.

UNIT II- TRIGGERING AND COMMUTATION CIRCUITS (9 hours)

Thyristor trigger circuits - R, RC triggering - Single pulse and train of pulses - triggering with microprocessor - Natural commutation and forced commutation techniques - series and parallel operation of SCRs.

UNIT III- CONVERTERS (9 hours)

single phase - three phase - half controlled and fully controlled rectifiers - effect of source and load inductance - dual converters - cyclo converters.

UNIT IV- INVERTERS AND CHOPPERS (9 hours)

Voltage source inverters - series, parallel and bridge inverters - current source inverters - PWM inverters - DC chopper - step up and step down chopper – Four quadrant chopper- AC chopper

UNIT V- TYPICAL APPLICATION (9 hours)

Control of DC and AC drives - stepper and switched reluctance motor drive - SMPS - uninterrupted power supply

TEXT BOOKS

1. M.H.Rashid, "*Power Electronics - circuits, devices and applications"*, Pearson Education India, 2nd edition, 2010.
2. M.D.Singh, K.B.Khanchandani, "*Power Electronics*", TataMcGraw-Hill 2008.

REFERENCES

1. Bimbhra P.S., *Power Electronics*, Khanna Publishers, New Delhi, 2010.
2. Sen P.C., *Modern Power Electronics*, Wheeler Publishers, New Delhi, 2010

IC1104 POWER ELECTRONICS												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	A	b	c	d	e	f	g	h	i	j	k
		X				x			x			
2.	Mapping of instructional objectives with student outcome					1,2, 3,4 &5			1,2, 3,4 &5			
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										x		
4.	Broad Area	Instrumentation			Control		Electrical			Electronics		
										x		
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1105	**APPLIED SOFT COMPUTING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

On completion of this course students will:
Learn to design of Neural network, Genetic algorithm and Fuzzy Logic Controllers for various applications.
Acquire basic understanding of the various algorithms involved in Neural Networks, Genetic & Fuzzy.

INSTRUCTIONAL OBJECTIVES

1.	Introduction and different architecture of neural networks, fuzzy logic and genetic algorithm
2.	Application of Neural Network using MATLAB
3.	Application of Fuzzy logic using MATLAB.
4.	Application of Genetic algorithm using MATLAB.

UNIT I- INTRODUCTION **(9 hours)**

Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.

UNIT II- ARTIFICIAL NEURAL NETWORKS **(9 hours)**

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and Training the neural network. Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations. Hopfield network, Self-organizing network and recurrent network. Neural Network based controller

UNIT III- GENETIC ALGORITHM **(9 hours)**

Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters.Solution of typical control problems using genetic algorithm. Concept on some other searchtechniques like tabu search and ant-colony search techniques for solving optimization problems.

UNIT IV- FUZZY LOGIC SYSTEM **(9 hours)**

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning.Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modeling and control schemes for nonlinear systems. Selforganizingfuzzy logic control. Fuzzy logic control for nonlinear time-delay system.

UNIT V- APPLICATIONS **(9 hours)**

GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox.Stability analysis of Neural-Network interconnection systems. Implementation of fuzzy logic controller using Matlab fuzzy-logic toolbox. Stability analysis of fuzzy control systems.

TEXT BOOKS

1. Padhy.N.P, "*Artificial Intelligence and Intelligent System*", Oxford University Press, 1st edition, 2005
2. KOSKO, B. "*Neural Networks and Fuzzy Systems*", Prentice-Hall of India Pvt. Ltd., 2009.
3. Jacek.M.Zurada, "*Introduction to Artificial Neural Systems*", Jaico Publishing House, 1999.

REFERENCES

1. KLIR G.J. & FOLGER T.A. "*Fuzzy sets, uncertainty and Information*", Prentice-Hall of India Pvt.Ltd, 1993.
2. Zimmerman H.J. "*Fuzzy set theory-and its Applications*"-Kluwer Academic Publishers,4th edition,2009.

IC1105 APPLIED SOFT COMPUTING												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x	x	x						x
2.	Mapping of instructional objectives with student outcome	2,3,4	2,3,4	2,3,4	1,2,3,4	2,3,4						1,2,3,4
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
										x		
4.	Broad Area	Instrumentation		Control		Electronics				Electrical		
				x								
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1106	INDUSTRIAL DRIVES AND CONTROL	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students identify the need and choice for various drives. The students will be exposed to different speed control methods in d.c. and a.c motors .To enable the students to understand the various special machines.

INSTRUCTIONAL OBJECTIVES

1.	Select the drives for various industrial applications
2.	Gain the knowledge about operation of d.c motor speed control using converters and choppers

3.	Get an insight into a.c. motor speed control using converters, inverters and choppers
4.	Identify the use for drives in industries and latest trends
5.	understand the various special machines.

UNIT I- SELECTION OF MOTORS (**9 hours)**

Introduction, selection of drive, Rating of motors, speed - torque characteristics of various types of loads & drive motors, starting braking and reversing operations.

UNIT II- DC DRIVES (QUALITATIVE TREATMENT ONLY)

(**9 hours)**

Speed control of DC motors - Thyristor converter fed DC drives : Single, two and four quadrant operations. Chopper Drives - control strategies, operation of step-up and step-down choppers, chopper configuration - operation of class A, B, C, D & E.

UNIT III- THREE - PHASE INDUCTION MOTOR DRIVES (**9 hours)**

Speed control of Induction motors - Stator voltage control - stator voltage and frequency control, AC chopper, Inverter ,cycloconverter fed induction motor drives. Rotor control - Rotor resistance control and slip-power recovery schemes, static control of rotor resistance using DC chopper, static kramer and scherbius drives

UNIT IV- SYNCHRONOUS MOTOR DRIVES (**9 hours)**

Speed control of 3-phase synchronous motors - VSI & CSI fed synchronous motors, cyclo converter fed synchronous motors. Effects of harmonics on the performance of AC motors PWM inverter fed synchronous motors.

UNIT V- SPECIAL MACHINES **(9 hours)**

Special Machines :Construction, principle of operation and drive circuits of variable reluctance stepper motors.- Construction, principle of operation of Switched Reluctance Motors- Construction, principle of operation of Permanent Magnet Brushless D.C. Motors- Construction, principle of operation of Synchronous Reluctance Motors

TEXT BOOKS

1. Dubey G.K. , "*Fundamentals of Electric Drives*", Alpha Science International LtdNarosa Publications, 2002.

2. Vedam Subramaniyam, "*Thyristor control of Electric drives"*, Tata McGraw Hill Publishing Ltd, 2008.

REFERENCES

1. Vedam Subramaniyam, "*Electric Drives concepts and applications"*, Tata McGraw Hill Ltd, 2011.
2. Pillai S.K.," *A First course on Electric Drives"*, New age international, 2004.

IC1106 INDUSTRIAL DRIVES AND CONTROL												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student Outcome	a	b	c	D	e	f	g	h	I	j	k
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1		4		2						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								X				
4.	Broad Area	Instrumentation		Control		Electronics		Electrical				
		--		X		--		--				
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1107	**ADVANCED CONTROL THEORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Basics of Control System				

PURPOSE

To gain knowledge in state variable analysis, non-linear systems and optimal control.

INSTRUCTIONAL OBJECTIVES

1.	To study the state variable analysis
2.	To provide adequate knowledge in the phase plane analysis.
3.	To give a basic knowledge in describing function analysis.
4.	To analyze the stability of the systems using different techniques.
5.	To study the design of optimal controller.

UNIT I- STATE VARIABLE ANALYSIS **(9 hours)**

Concept of state, State Variable and State Model, State models for linear and continuous time systems, Solution of state and output equation, controllability and observability, Pole Placement, State observer Design of Control Systems with observers.

UNIT II- PHASE PLANE ANALYSIS **(9 hours)**

Features of linear and non-linear systems, Common physical non-linearities, Methods of linearising non-linear systems, 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 **(9 hours)**

Basic concepts, derivation of describing functions for common non-linearity, Describing function analysis of non-linear systems, Conditions for stability, Stability of oscillations.

UNIT IV- STABILITY ANALYSIS **(9 hours)**

Introduction to Liapunov's stability concept, Liapunov's direct method, Lure's transformation, Aizerman's and Kalman's conjecture, Popov's criterion, Circle criterion.

UNIT V- OPTIMAL CONTROL **(9 hours)**

Introduction to optimal control, Decoupling, Time varying optimal control, LQR steady state optimal control, optimal estimation, Multivariable control design.

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, "*Control Systems Engineering"*, Fourth Edition, New Age International Publishers, 2006.
2. S.K. Bhattacharya, "*Control Systems Engineering*'', Dorling Kindersely Pvt.Ltd, 2009.
3. Katsuhiko Ogata, "*Modern Control Engineering*", Prentice Hall, 2010.

REFERENCES

1. Farid Golnaraghi, Benjamin C. Kuo, "*Automatic Control Systems"*, Wiley, 2009.
2. Richard C.Dorf, Robert H.Bishop, "*Modern control system theory*", 11e, Pearson Education Ltd, 2008.

IC1107 ADVANCED CONTROL THEORY												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x		**x**	**x**	**x**		**x**				**x**
2.	Mapping of instructional objectives with student outcome	1,2, 3,4, 5		5	1,2, 3,4, 5	1,2, 3,4, 5		1,2, 3,4, 5,				1,5
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
					X							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1108	**WIRELESS SENSOR NETWORKS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Transducer Engineering				

PURPOSE

The purpose of this course is to understand the concept of wireless sensor networks.

INSTRUCTIONAL OBJECTIVES

1.	Students can be able to understand the fundamentals of wireless communication
2.	Logically explain the Implementation of sensor networks
3.	The concepts allows students to understand about monitoring sensor communication

UNIT I-INTRODUCTION **(9 hours)**

Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network, Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios,

types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks.

UNIT II-PHYSICAL LAYER (9 hours)

Wireless channel and communication fundamentals – frequency allocation, modulation and demodulation, wave propagation effects and noise, channels models, spread spectrum communication , packet transmission and synchronization, quality of wireless channels and measures for improvement, physical layer and transceiver design consideration in wireless sensor networks, energy usage profile, choice of modulation, power management.

UNIT III-DATA LINK LAYER (9 hours)

MAC protocols –fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols, Link Layer protocols –fundamentals task and requirements ,error control ,framing, link management

UNIT IV-NETWORK LAYER (9 hours)

Gossiping and agent-based uni-cast forwarding , Energy-efficient unicast, Broadcast and multicast, geographic routing , mobile nodes, Data –centric and content-based networking –Data –centric routing, Data aggregation, Data-centric storage, Higher layer design issue

UNIT V-CASE STUDIES (9 hours)

Target detection and tracking, Habitat monitoring, Environmental disaster monitoring, Practical implementation issues, IEEE 802.15.4 low rate WPAN, Sensor Network Platforms and tools-Sensor node hardware, Node-level software platforms, node –level simulators.

TEXT BOOKS

1. Feng Zhao and Leonidas J. Guibas, "*Wireless Sensor Networks : An Information Processing Approach*", Elsevier, 2004.
2. Holger Karl and Andreas Willig, "*Protocols And Architectures for Wireless Sensor Networks*", John Wiley, 2007.

REFERENCES

1. Ivan Stojmenovic, "*Handbook of Sensor Networks: Algorithms and Architectures*", Wiley, 2005.
2. KazemSohraby, Daniel Minoli and TaiebZnati, "*Wireless Sensor Networks :Technology, Protocols and Applications*", John Wiley, 2007.

3. BhaskarKrishnamachari, "*Networking Wireless Sensors*", Cambridge University Press, 2011.

IC1108 WIRELESS SENSOR NETWORKS												
Course designed by		Department of Instrumentation & Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	**x**			**x**						**x**
2.	Mapping of instructional objectives with student outcome	1	3			2						
3.	Category	General (G)			Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)	
											X	
4.	Broad Area	Instrumentation			Control			Electrical			Electronics	
											X	
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1109	ANALYTICAL INSTRUMENTATION	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE	
To enable the students to understand the operation of Analytical Instruments.	
INSTRUCTIONAL OBJECTIVES	
1.	To enhance the knowledge on Analytical Instruments
2.	To know the operation of Gas Analyzers
3.	To know the operation of Chromatography Instruments
4.	To know the operation of Spectrophotometers and NMR Techniques

UNIT I- PH CONDUCTIVITY & DISSOLVED COMPONENT ANALYSER (9 hours)

Sampling systems – ion selective electrodes – conductivity meters – pH meters - dissolved oxygen analyser – sodiumanalyser – silica analyser – moisture measurement.

UNIT II- GAS ANALYSER (9 hours)

Oxygen analyser – CO monitor – Nox analyser – H2S analyser – dust and smoke measurement- thermal conductivitytype – thermal analyser – industrial analysers.

UNIT III- CHROMATOGRAPHY **(9 hours)**

Gas chromatography – liquid chromatography – principles, types and applications – high-pressure liquid chromatography – detectors.

UNIT IV- SPECTRO PHOTOMETERS **(9 hours)**

Spectral methods of analysis – Beer's law UV – visible spectrophotometers – single beam and double beaminstruments – source and detectors – IR spectrophotometers – sources and detectors – FTIR spectrometers – atomic absorption spectrophotometer – flame emission spectrophotometers – sources of flame photometry – applications.

UNIT V- NUCLEAR MAGNETIC RESONANCE AND RADIATION TECHNIQUES **(9 hours)**

NMR – basic principle – NMR spectrometers – applications – introduction to mass spectrophotometers – nuclearradiation detectors – GM counter – proportional counter – solid state detectors – introduction – to x-ray spectroscopy.

TEXT BOOKS

1. Gillian Mcmohan,"*Analytical Instrumentation-A Hnadbook*", CRC Press, 2008.
2. Graham Currell, Currell, "*Analytical Instrumentation"*, John Wiley sons , 2000.
3. Willard, H.H., Merrit L.L., Dean J.A Seattle F.L., "*Instrumental Methods of Analysis"*, CBS Publishing and Distribution, 1995.

REFERENCES

1. Robert D.Braun, "*Introduction to Instrumental Analysis"*, McGraw–Hill, Singapore, 1987.
2. Skoog, D.A. and West D.M., "*Principles of Instrumental Analysis"*, Holt Sounder Publication, Philadelphia, 1985.

IC1109 ANALYTICAL INSTRUMENTATION												
Course designed by		Department of Instrumentation & Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
				x		x						x
2.	Mapping of instructional objectives with student outcome			1								
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								X				
4.	Broad Area	Instrumentation Engineering		Control Engineering		Electronics Engineering		Electrical Engineering				
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1110	OPTIMAL CONTROL	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course is intended to introduce optimal control with enough theoretical background to justify the techniques and to provide a foundation for advanced research.

INSTRUCTIONAL OBJECTIVES

1.	Provide students with the skills to formulate, solve and analyze solutions to certain optimal control problems and to certain related optimization problems.
2.	The student should be able to design optimal controllers for both linear and nonlinear systems

UNIT I- INTRODUCTION **(9 hours)**

Problem formulation – Mathematical model – Physical constraints –Performance measure – Optimal control problem – Form of optimal control – Performance measures for optimal control problem – Selection of performance measure.

UNIT II- DYNAMIC PROGRAMMING (9 hours)

Optimal control law – Principle of optimality – An optimal control system – A recurrence relation of dynamic programming – Computational procedure – Characteristics of dynamic programming solution – Hamilton – Jacobi – Bellman equation –Continuous linear regulator problems.

UNIT III- CALCULUS OF VARIATIONS (9 hours)

Functions and Functional – Maxima and minima of function– Variation of functional – Extremal of functional – Euler Lagrange equation

UNIT IV- VARIATIONAL APPROACH TO OPTIMAL CONTROL PROBLEMS (9 hours)

Necessary conditions for optimal control – Linear regulator problems – Linear tracking problems –Pontryagin's minimum principle and state inequality constraints

UNIT V- MINIMUM TIME PROBLEMS (9 hours)

Minimum control effort problems – Singular intervals in optimal control problems – Numerical determination of optimal trajectories – Two point boundary value problems – Methods of steepest descent – Variation of extremals – Quasilinearization – Gradient projection algorithm

TEXT BOOKS

1. Donald E. Kirk, "*Optimal Control Theory: An Introduction*", Prentice – Hall networks series, New Jersey, 2004.
2. Singiresu S. Rao "*Engineering Optimization: Theory and Practice*" New Age International (P) Ltd., Publishers New Delhi – 2004.

REFERENCES

1. GopalM, "*Digital Control and State Variable Methods*", Tata McGraw – Hill Companies New Delhi, 2009.
2. Dimitri P. Bertsekas."*Dynamic Programming and Optimal Control",* Vol –1 Athena Scientific, Bell mount MA, 2000.

IC1110 OPTIMAL CONTROL												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	C	d	e	f	g	h	i	j	k
		x		X								
2.	Mapping of instructional objectives with student outcome	1,2		1,2				,				
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad Area	Instrumentation			Control		Electronics				Electrical	
					X							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1111	ADAPTIVE CONTROL	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Basics of Control System				

PURPOSE

To gain knowledge in state variable analysis, non-linear systems, adaptive systems and optimal control.

INSTRUCTIONAL OBJECTIVES

1.	To study the introduction to an adaptive control and state feedback control
2.	To provide adequate knowledge in the adaptive control schemes
3.	To give a basic knowledge in lyapunov stability criterion.
4.	To analyze the Issues and application of adaptive control.
5.	To study the design of Robust controller.

UNIT I-INTRODUCTION TO AN ADAPTIVE CONTROL (9 hours)

Introduction to adaptive control, Effects of process variations, Adaptive control schemes, Adaptive control problem, Non-parametric identification, Step response method, Impulse response method, and Frequency response method.

UNIT II-ADAPTIVE CONTROL SCHEMES (9 hours)

Least square estimation, Recursive least square estimation, Extended least square estimation, Maximum likelihood estimation, Introduction to non-linear systems identification, Pseudo random binary sequence. Self-tuning regulator: deterministic in-direct self-tuning regulators, Deterministic direct self-tuning regulators, Introduction to stochastic self-tuning regulators.

UNIT III-LYAPUNOV STABILITY CRITERION (9 hours)

Model reference adaptive controller: The MIT rule, Lyapunov theory, Design of model reference adaptive controller using MIT rule and Lyapunov theory, Relation between model reference adaptive controller and self-tuning regulator.

UNIT IV-ADAPTIVE CONTROL ISSUES AND ITS APPLICATION (9 hours)

Tuning of controllers and case studies:Design of gain scheduling controller – Autotuning of PID regulator, Stability analysis of adaptive controllers – Application of adaptive control in chemical reactor, distillation column and variable area tank system, LaSalle extensions, Barbalat's Lemma– Application of adaptive control.

UNIT V ROBUST CONTROL

Review of Linear Control Theory, Optimal Control and the Robustness, H-infinity Optimal Control, Robust Output Feedback Controls, Kalman Filter Theory and Design.

TEXT BOOKS

1. Karl J.Astrom and Bjorn Wittenmark, "Adaptive Conrol", Pearson Education, 2nd Editon, 2003.
2. C.H.A. Hsia ," System Identification", Lexington books, 2003
3. Stephanopoulis G , " Chemical Process Control", Prentice Hall of India, New Delhi, 2005

REFERENCES

1. Donald E. Kirk," Optimal Control Theory – An introduction", Pearson Education, 2003.
2. Kemin Zbou, J.C. Doyle, "Robust & Optimal Control", Pearson Education, 2003.

IC1111 ADAPTIVE CONTROL												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x		x	x	x		x				x
2.	Mapping of instructional objectives with student outcome	1to5		4,5	2,3, 4,5	2,3, 4,5	1to5	1to5				1to5

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
					x
4.	Broad Area	Instrumentation	Control	Electronics	Electrical
			x		
5.	Approval	23rd Meeting of Academic Council, May 2013			

IC1112	**SYSTEM IDENTIFICATION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to understand the concepts of system identification

INSTRUCTIONAL OBJECTIVES

1.	To study about the Parametric methods and Transient Analysis
2.	To know the concepts of least square method
3.	To identify the Direct, Indirect and Real Time Identification

UNIT I- PARAMETRIC METHODS **(9 hours)**

Nonparametric methods - A parametric method- Bias, consistency and model approximation- A degenerate experimental condition- the influence of feedback

UNIT II- TRANSIENT ANALYSIS **(9 hours)**

Transient analysis-frequency analysis-Correlation analysis-spectral analysis. The least Square estimate- determining the model dimension- Best linear unbiased estimation under linear constraints-updating the parameter estimates for linear regression models- Best linear unbiased estimates for linear regression models

with possibly singular residual covariance matrix. Input Signals and Model parameterizations.

UNIT III- LEAST SQUARE METHOD (9 hours)

The least squares method revisited-description of prediction error methods-optimal prediction-relationships between prediction error methods and other identification methods theoretical analysis.

UNIT IV- RECURESIVE IDENTIFICATION (9 hours)

Description of instrumental variable methods- theoretical analysis-covariance matrix of VI estimates-comparison of optimal IV and prediction error estimates. The recursive least squares method-real time identification-the recursive instrumental variable method-the recursive prediction error method.

UNIT V- DIRECT AND INDIRECT IDENTIFICATION (9 hours)

Identifiability considerations-direct identification-indirect identification-joint input-output identification.The parsimony principle-comparison of model structures-analysis of tests on covariancefunctions-asymptotic distribution of the relative decrease in the criterion function compliment. Some practical aspects

TEXT BOOKS

1. Johan Schoukens Yves Rolain Mastering "*System Identification in 100 Exercises*", IEEE Computer Society Press, 2012.
2. Karel J. Keesman, "*System Identification*", Springer Publications, 2011.
3. Tohru katavama, "*Subspace methods for System identification*", Springer Publications, 2005.

REFERENCES

1. Ljung .L, "*System Identification: Theory for the user",* Prentice Hall, Englewood Cliffs,1998,Lennart Ljung, System Identification
2. Ljung, L. and Soderstorm, T., "*Theory and Practice of Recursive Identification*", MIT Press,Cambridge, 1987.

IC1112 SYSTEM IDENTIFICATION												
Course designed by		Department of Instrumentation & Control Engineering										
1.	Student outcome	A	b	c	d	e	f	g	h	i	j	k
				x		x						x
2.	Mapping of instructional objectives with student outcome			1								
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
					X							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1113	NON LINEAR CONTROL	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

Nonlinear control deals with the analysis and control of systems that are nonlinear, time-varying, or both. To investigate how nonlinear systems can be analyzed as well as controlled.

INSTRUCTIONAL OBJECTIVES

1	To understand the concepts Nonlinear Systems
2	To design control system for a Nonlinear Systems

UNIT I-INTRODUCTION **(5 hours)**

Nonlinear system behavior, Common nonlinearities in control systems, Autonomy - analysis and design methods of Non-linear control systems.

UNIT II-DESCRIBING FUNCTION **(10 hours)**

Describing Function Fundamentals -Describing functions of common nonlinearities – Describing function analysis of nonlinear systems: Existence and stability of limit cycles.

UNIT III-PHASE PLANE ANALYSIS **(10 hours)**

Singular points - Construction of phase plane using Isocline, and Delta methods - Existence of Limit cycles: Poincare index and Bendixon theorems, Stability.

UNIT IV- LYAPUNOV STABILITY THEORY **(10 hours)**

Concepts of Stability-Linearization and Local Stability-Lyapunov's Direct Method -Krasovski's Method-Variable Gradient Method.

UNIT V-NONLINEAR CONTROL SYSTEMS DESIGN **(10 hours)**

Method of Feedback Linearization-Mathematical Tools- Input-State Linearization of SISO systems- Input-Output Linearization of SISO Systems- Basic concepts of variable structure systems - Sliding surfaces- Conditions for existence of sliding regions – Case Study

TEXT BOOKS

1. Jean Jacques Slotine and Weiping Li, "*Applied Nonlinear Control*", Prentice Hall Inc., 1991.
2. Zoran Vukic, Ljubomir Kuljaca, Dali Donlagic and Sejid Tesnjak, "*Nonlinear Control Systems*", Marcel Dekker Inc, 2003.

REFERENCES

1. Shankar Sastry, "*Nonlinear systems: Analysis, Stability and Control*", Springer-Verlag Newyork, Inc, 1999.
2. Horacio J. Marquez, "*Nonlinear Control Systems: Analysis and Design*", John Wiley & Sons Inc, 2003.

<table>
<tr><th colspan="14">IC1113 NON-LINEAR CONTROL</th></tr>
<tr><th colspan="2">Course designed by</th><th colspan="12">Department of Instrumentation & Control Engineering</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
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<tr><td colspan="3"></td><td colspan="2"></td><td colspan="3"></td><td colspan="3">x</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Broad Area</td><td colspan="3">Instrumentation</td><td colspan="2">Control</td><td colspan="3">Electrical</td><td colspan="3">Electronics</td></tr>
<tr><td colspan="3"></td><td colspan="2">x</td><td colspan="3"></td><td colspan="3"></td></tr>
<tr><td>5</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
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IC1114	MULTISENSOR DATA FUSION	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To understand the concept of sensors and multiple sensors and the interface hierarchy using mathematical tools. To estimate the performance of practical filters.

INSTRUCTIONAL OBJECTIVES

1.	To understand the concept of sensors, architecture, mathematical tools.
2.	To understand the algorithms for multi sensor data fusion.
3.	To understand the practical Filter.
4.	To understand the performance of data structures.

UNIT-I **(9 hours)**

Multi sensor data fusion: Introduction, sensors and sensor data, Use of multiple sensors, Fusion applications. The inference hierarchy: output data, Data fusion model. Architectural concepts and issues. Benefits of data fusion, Mathematical tools used: Algorithms, co-ordinate transformations, rigid body motion, Dependability and Markov chains, Meta – heuristics.

UNIT-II **(9 hours)**

Taxonomy of algorithms for multi sensor data fusion, Data association, Identity declaration.

UNIT-III **(9 hours)**

Estimation: Kalman filtering, practical aspects of Kalman filtering extended Kalman filters. Decision levels identify fusion. Knowledge based approaches.

UNIT-IV **(9 hours)**

Data information filter, extended information filter, Decentralized and scalable decentralized estimation, Sensor fusion and approximate agreement. Optimal sensor fusion using range trees recursively, Distributed dynamic sensor fusion.

UNIT-V **(9 hours)**

High performance data structures: Tessellated, trees, graphs and function, Representing ranges and uncertainty in data structures, Designing optimal sensor systems within dependability bounds, implementing data fusion system.

TEXT BOOKS

1. David L. Hall, "*Mathematical techniques in Multisensor data fusion*", Artech House, Boston, 1992.
2. R.R. Brooks and S.S. Iyengar, "*Multisensor Fusion: Fundamentals and Applications with Software*", Prentice Hall Inc., New Jersey, 1998.

REFERENCES

1. Arthur Gelb, "*Applied Optimal Estimation"*, The M.I.T. Press, 1982.
2. James V. Candy, *"Signal Processing: The Model Based Approach"*, McGraw –Hill Book Company, 1987.

IC1114 MULTISENSOR DATA FUSION												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	K
		x				x						X
2.	Mapping of instructional objectives with student outcome	1				3						1,4
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										x		
4.	Broad Area	Instrumentation			Control		Electrical			Electronics		
		x								x		
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1115	INSTRUMENTATION AND CONTROL IN PETROCHEMICAL, IRON AND STEEL INDUSTRIES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To provide a window of applications of instrumentation and automation in processing industries to senior students with specialization in Instrumentation Engineering.

INSTRUCTIONAL OBJECTIVES

1.	Have an in-depth understanding of the various unit operations in the industry
2.	Evolve the appropriate controls and schematics for specific applications
3.	Have cases world-class mills employing IT-enabled applications
4.	Economic and social implications of the industry
5.	Appreciate the role of Instrumentation Engineer in such industries

UNIT I- PETROCHEMICAL INTRODUCTION: **(9 hours)**

Petroleum Exploration, Production and Refining -Constituents of Crude Oil. P & I diagram of petroleum refinery – Atmospheric and Vacuum Distillation of Crude oil Thermal Conversion process – Control of Distillation Column – Temperature and Pressure Control –Feed control,Reflux Control , Reboiler Control.

UNIT II- CONTROLS OF CHEMICAL REACTORS: **(9 hours)**

Temperature and Pressure Control in reactors– Control of Dryers – Batch and Continuous Dryers. Control of Heat Exchangers and Evaporators – variables and Degrees of freedom – Liquid to Liquid Heat Exchangers – Steam Heaters – Condensers – Reboilers and Vaporizers – Cascade Control – Feed forward Control. .Evaporators: Types of Evaporators. Control of Pumps: Centrifugal pump: On-Off level control – Pressure control – Flow control – Throttling control. Reciprocating Pumps: On-Off control and Throttling control.

UNIT III- IRON AND STEEL **(9 hours)**

The need for iron and steel in the civilised world; history of steel making -Process description in diagrammatic and functional block details; raw materials preparation; operation of blast furnace (BF) and auxiliary units including stoves;

basic oxygen furnace (BoF); electric furnace (EF); open hearth furnace (OHF); relative merits of various steel making furnaces.

UNIT IV QUALITY OF STEEL (9 hours)

Impurities present and allowed limits for usable steel; waste recycling. casting of steel; primary and secondary rolling,cold rolling; steel finishing operations. Identification of various process parameters in the industry; weighing and proportioning; special gauges for measurement of thickness and shape.

UNIT V- SPECIAL APPLICATIONS FOR CONTROLS (9 hours)

Blast Furnace, Stove combustion control system; gas and water control system in Basic Oxygen Furnace ; Mould Level control system in Sand Casting operations. Evolution of computer applications in the industry; Practices for model calculating and data logging; steel rolling mill control; annealing process control; utilities management with computer system.

TEXT BOOKS

1. Dr. Ram Prasad, "*Petroleum Refining Technology*", Khanna Publisher, 1stEdition,2000.
2. Liptak B.G., "*Instrumentation in Process Industries*", Chilton Book Company,1973.
3. Considine D. M., "*Process/Industrial Instruments and control Handbook*" ,McGraw Hill, 5thedition 2009.

REFERENCES

1. Liptak B.G., "*Instrument Engineers Handbook*", Volume II, 2005
2. Robert H. Perry, D.W. Green and J.O. Maloney, Perry's, "*Chemical Engineers,Handbook"*, McGraw Hill Inc, New York, 8th, 2007
3. Serope Kalpakjian, "*Manufacturing Engineering and Technology*", Addison Wesley Publishing Company, Massachusetts,4th edition, 2009.

IC1115 INSTRUMENTATION AND CONTROL IN PETROCHEMICAL, IRON AND STEEL INDUSTRIES												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x		x	x				x		x	x
2.	Mapping of instructional objectives with student outcome	1,3, 4,5		2,5	2,5				2,4, 5		1,2, 3,4, 5	2,3, 4
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										x		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
		x			x							
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1116	ROBOTICS AND AUTOMATION	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE	
To enable the students to know the concepts of Robotics and its application	
INSTRUCTIONAL OBJECTIVES	
1.	To know the operation of Power sources and Sensors
2.	To know the working principle of Manipulators, Actuators and Grippers
3	To know the concepts of Kinematics and path Planning

UNIT I- BASIC CONCEPTS **(9 hours)**

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom –Asimov's laws of robotics – dynamic stabilization of robots.

UNIT II- POWER SOURCES AND SENSORS (9 hours)

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speedarrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic –magnetic, fiber optic and tactile sensors.

UNIT III- MANIPULATROS, ACTUATORS AND GRIPPERS (9 hours)

Construction of manipulators – manipulator dynamics and force control – electronic andpneumatic manipulator control circuits – end effectors – Û various types of grippers – design considerations.

UNIT IV- KINEMATICS AND PATH PLANNING (9 hours)

Solution of inverse kinematics problem – multiple solution jacobian work envelope – hill climbing techniques – robotprogramming languages.

UNIT V- CASE STUDIES (9 hours)

Multiple robots – machine interface – robots in manufacturing and non-manufacturing application – robot cell design– selection of a robot.

TEXT BOOKS

1. Rajput R.K., "*Robotics and Industrial Automation*", S.Chand Publishers, 2012.
2. Asfahl C.R., "*Robots and manufacturing Automation"*, John Wiley, USA 2010
3. Deb.S.R., "*Robotics technology and flexible Automation"*, John Wiley, USA 2009.

REFERENCES

1. Ghosh, "*Control in Robotics and Automation: Sensor Based Integration"*, Allied Publishers, Chennai, 1999.
2. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "*Industrial Robotics",* McGraw Hill Singapore, 1996.

IC1116 ROBOTICS AND AUTOMATION												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
				x		x						x
2.	Mapping of instructional objectives with student outcome			1								2

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
					X
4.	Broad Area	Instrumentation	Control	Electronics	Electrical
			X		
5.	Approval	23rd Meeting of Academic Council, May 2013			

IC1117	INSTRUMENTATION IN AEROSPACE AND NAVIGATION	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

The purpose of this subject is to understand the technical aspects of aerospace and navigation. Since this subject is practical oriented, the student can realize the application of various instrumentation based topics.

INSTRUCTIONAL OBJECTIVES

1.	While studying this subject the student will know
2.	The basics of aerospace and navigation
3.	The technical aspects of this subject
4.	The idea of modern technology

UNIT I - BASIC ENGINE INSTRUMENTS (9 hours)

Capacitive fuel content-Gauges. Standard atmosphere-Altimeters-Aneroid and radio altimeters. Aircraft compass-Remote indicating magnetic compass-Rate of climb indicator-Pitot static systems-Air speed indicator-Mach meters-Integrated flight instruments.

UNIT II- RADIO NAVIGATION AIDS (9 hours)

Automatic direction fnder-distance measuring equipments-instruments landing system-visual omni range-radar-optical instruments-pressure measuremts-thermal meter control-tachometer-smoke and fire detection.

UNIT III- SATELLITE AND SPACE VEHICLE INSTRUMENTATION (9 hours)

Satellite navigation systems-GPS and GNSS – augmented satellite navigation – Hybrid navigation concepts-Stabilization sensors-Sun sensors-Horizon sensors-Star trackers.

UNIT IV- AIRCRAFT FLIGHT SIMULATION INSTRUMENTATION (9 hours)

Basic description of a flight simulator-simulation of abnormal conditions-jet engine power plant troubles-Flight controls and autopilot troubles.

UNIT V INTRODUCTION TO NAVIGATION AND GUIDANCE INSTRUMENTATION (9 hours)

Principle, Construction and applications of inertial sensors-Gyroscopes-Ring laser gyroscope-Fiberoptic gyroscope-MEMS gyroscopes and accelerometers-Directional gyros-Rate gyros-Radars.

TEXT BOOKS

1. John D Anderson Jr., "*Introduction to Flight*", McGraw-Hill, 2009.
2. Pallet.E.H.J., "*Aircraft Instruments-Principles and applications*", Pitman Publ., 2008.

REFERENCES

1. Nagararja.M.S, "*Elements of electronic navigation*", TMH, 2010.
2. San Darite, "*Radio aids to navigation''*, TMH, 2011.

IC1117 INSTRUMENTATION IN AEROSPACE AND NAVIGATION												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		X		X		X						X
2.	Mapping of instructional objectives with student outcome	1		4		2						
3.	Category	General (G)			Basic Sciences (B)			Engineering Sciences and Technical Arts			Professional Subjects (P)	

				(E)	
					X
4.	Broad Area	Instrumentation	Control	Electronics	Electrical
		X	x	--	--
5.	Approval	23rd Meeting of Academic Council, May 2013			

IC1118	**VLSI AND EMBEDDED SYSTEM**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Basics of VLSI and Embedded System				

PURPOSE

To gain knowledge in state variable analysis, non-linear systems and optimal control.

INSTRUCTIONAL OBJECTIVES

1.	To study the state variable analysis
2.	To provide adequate knowledge in the phase plane analysis.
3.	To give a basic knowledge in describing function analysis.
4.	To analyze the stability of the systems using different techniques.
5.	To study the design of optimal controller.

UNIT I- INTRODUCTION OF FABRICATION (9 hours)

Monolithic components: Isolation of components- junction isolation and dielectric isolation- Transistor fabrication- buried layer- impurity profile- parasitic effects- monolithic diodes- schottky diodes and transistors- FET structures- JFET- MOSFET- PMOS and NMOS, control of threshold voltage (Vth)- silicon gate technology- Monolithic resistors- sheet resistance and resistor designresistors in diffused regions- MOS resistors- monolithic capacitors- junction and MOS structures- IC crossovers and vias.

UNIT II-FABRICATION TECHNOLOGY (9 hours)

CMOS technology: Metal gate and silicon gate- oxide isolation- Twin well process- Latch up-BiCMOS technology- fabrication steps- circuit design process- stick diagrams- design rules- Capacitance of layers- Delay- Driving large capacitance loads- Wiring capacitance- Basic circuit concepts- scaling of MOS structures- scaling factors- effects of miniaturization.

UNIT III-DESIGN AND LAYOUT (9 hours)

Subsystem design and layout- Simple logic circuits- inverter, NAND gates, BiCMOS circuit, NOR gates, CMOS logic systems – bus lines- arrangements- power dissipation- power supply rail distribution- subsystem design process- design of a 4 bit shifter.

UNIT IV-INTRODUCTION OF EMBEDDED SYSTEMS (9 hours)

Embedded Processing Systems – Introduction, Components of Embedded Systems, Embedded Processors: Microprocessors, Microcontrollers, DSP and ASICs, Comparative Assessment of Embedded Processors

UNIT V-PROGRAMMING AND MEMORY FAMILIES (9 hours)

Pipelining, Memory Devices: ROM family, RAM family, Interfacing memory, Embedded Programming - C and C++, Programming languages for embedded systems: desirable, characteristics of programming languages for embedded systems, low-level versus high-level languages, Input-output Ports and Interfacing, I/O Programming

TEXT BOOKS

1. S M Sze , "*VLSI technology*", Mc Graw Hill pub, 2007.
2. Raj Kumar, "*Embedded Systems: Architecture, Programming and Design*", Tata McGraw Hill, Third Reprint, (2003).
3. John Catsoulis, O'Reilly, "*Designing Embedded Hardware*", First Indian Reprint, 2003.

REFERENCES

1. David E. Simon, "An *Embedded Software Primer*", Pearson Education Asia, Fifth Indian Reprint, 2002.
2. Valvano J.W.,"*Embedded Micro computer System: Real Time Interfacing*",Brooks/Cole, 2000.

IC1118 VLSI AND EMBEDDED SYSTEM												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	K
		x		x	x	x		x				X
2.	Mapping of instructional objectives with student outcome	1to5		5	1to5	1to5		1to5				1,5

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
					X
4.	Broad Area	Instrumentation	Control	Electronics	Electrical
				x	
5.	Approval	23rd Meeting of Academic Council, May 2013			

IC1119	**DIGITAL IMAGE PROCESSING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Basics of Digital Image Processing				

PURPOSE

To gain knowledge in state variable analysis, non-linear systems and optimal control.

INSTRUCTIONAL OBJECTIVES

1.	To study the digital image fundamentals
2.	To provide adequate knowledge in enhancing the image.
3.	To give a basic knowledge in restoring the image.
4.	To segment the image.
5.	To study the compression of image.

UNIT I- DIGITAL IMAGE FUNDAMENTALS (9 hours)

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II- IMAGE ENHANCEMENT (9 hours)

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT III- IMAGE RESTORATION (9 hours)

Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by

uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV- IMAGE SEGMENTATION (9 hours)

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V- IMAGE COMPRESSION (9 hours)

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TEXT BOOKS

1. Kenneth R. Castleman, "*Digital Image Processing*", Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "*Digital Image Processing using MATLAB*", Pearson Education, Inc., 2004.
3. William K. Pratt, "*Digital Image Processing"* , John Wiley, New York, 2002.

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, "*Digital Image Processing"*, Pearson, Second Edition, 2004.
2. Anil K. Jain, "*Fundamentals of Digital Image Processing"*, Pearson 2002

IC1119 DIGITAL IMAGE PROCESSING												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		X		x	x	x		x				x
2.	Mapping of instructional objectives with student outcome	1to5		1,5	1,2,	1to5		1to5				1,5
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)		Professional Subjects (P)				
								x				
4.	Broad Area	Instrumentation		Control		Electronics		Electrical				
						X						
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1120	VIRTUAL INSTRUMENTATION USING Lab VIEW	L	T	P	C
	Prerequisite	3	0	0	3
	Nil				

PURPOSE

To enable the students to understand basics, programming techniques, data acquisition and interfacing techniques of virtual instrumentation and to use VI for different applications.

INSTRUCTIONAL OBJECTIVES

1.	The students will be able to familiarize the basics and need of VI.
2.	The students will be able to learn LabVIEW software basics.
3.	To get better understanding of data acquisition techniques.
4.	The students can have an exposure to different interfacing techniques.
5.	The students can able to design some real time application using LabVIEW software.

UNIT I-VIRTUAL INSTRUMENTATION (9 hours)

Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II-VI PROGRAMMING TECHNIQUES (9 hours)

VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local and global variable, string & file input.

UNIT III-DATA ACQUISITION USING LabVIEW (9 hours)

Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses.ADC, DAC, DIO, Software used in DAQ, Hardware used, NI USB, MyDAQ, NI ELVIS, wireless DAQ with some interfacing examples.

UNIT VI- VI CHASSIS REQUIREMENTS (9 hours)

Current loop, RS 232C/RS 485, GPIB, System basics, interface basics: USB, PCMCIA, VXI, SCXI, PXI etc, networking basics for office & industrial application VISA & IVI.

UNIT V-APPLICATION OF VI (9 hours)

Fourier transform, Power spectrum, Correlation methods, windowing & flittering. Application in Process Control projects, Major equipments- Oscilloscope, Digital

Multimeter, Pentium Computers, temperature data acquisition system, motion control employing stepper motor.

TEXT BOOKS

1. S.Sumathi & P.Surekha, " *LabVIEW based Advanced Instrumentation*" Springer, 2007.
2. Jovitha Jerome, "*Virtual Instrumentation Using LabVIEW*", PHI Learning Pvt. Ltd,2010.
3. Herbert. A. J., " *The structure of Technical English"*, Orient Longman 1995

REFERENCES

1. Sanjay Gupta, Joseph John, "*Virtual Instrumentation using LabVIEW"*, 2nd Edition, Tata McGraw Hill Education Private Limited, 2010.
2. Gary W. Johnson, Richard Jennings , "*LabVIEW Graphical Programming*", Fourth Edition, McGraw-Hill publications, 2006
3. Technical Manuals for DAS Modules of Advantech and National Instruments.

<table>
<tr><th colspan="13">IC1120 VIRTUAL INSTRUMENTATION</th></tr>
<tr><th colspan="2">Course designed by</th><th colspan="11">Department of Instrumentation and Control Engineering</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcome</td><td>A</td><td>b</td><td>C</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>I</td><td>j</td><td>k</td></tr>
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<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
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IC1121	FIBRE OPTICS AND LASER INSTRUMENTS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To contribute to the knowledge of Fiber optics and Laser Instrumentation and its Industrial & Medical Application.

INSTRUCTIONAL OBJECTIVES

1.	To expose the students to the basic concepts of optical fibers and their properties.
2.	To provide adequate knowledge about the Industrial applications of optical fibers.
3.	To expose the students to the Laser fundamentals.
4.	To provide adequate knowledgpe about Industrial application of lasers.

UNIT I-OPTICAL FIBRES AND THEIR PROPERTIES (9 hours)

Principles of light propagation through a fiber, Different types of fibers and their properties, fiber characteristics, Absorption losses, Scattering losses, Dispersion, Connectors & splicers, Fiber termination, Optical sources, Optical detectors.

UNIT II-INDUSTRIAL APPLICATION OF OPTICAL FIBRES (9 hours)

Fiber optic sensors, Fiber optic instrumentation system, Different types of modulators, Interferometric method of measurement of length, Moire fringes, Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III-LASER FUNDAMENTALS (9 hours)

Fundamental characteristics of lasers, Three level and four level lasers, Properties of laser, Laser modes, Resonator configuration, Q-switching and mode locking, Cavity damping, Types of lasers, Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV-INDUSTRIAL APPLICATION OF LASERS (9 hours)

Laser for measurement of distance, length, atmospheric effects and pollutants, material processing, laser heating, melting, scribing, trimming, welding, material removal and vaporization, calculation of power requirement of laser for material processing

UNIT V-HOLOGRAM AND MEDICAL APPLICATIONS (9 hours)

Holography, basic principles, methods of holographic interferometry and applications, Holography for NDT, medical application of lasers, laser and tissue interaction, laser instruments for surgery, removal of tumors of vocal chords, brain surgery, plastic surgery, gynecology, oncology.

TEXT BOOKS

1. John M. Senior, M. Yousif Jamro, "*Optical Fiber Communications: Principles and Practice*", Financial Times/Prentice Hall, 2008.
2. Govind P.Agarwal, "*Fiber Optic Communication system*", Wiley Publications, 2011.

REFERENCES

1. Bagad V.S., "*Optical Fiber Communication*", Technical Publication, 2009.
2. Breck C. Hitz, J.J. Ewing, Jeff Hecht, "*Introduction to Laser Technology*", Wiley Publications, 4e, 2012.
3. Nagabushana S., N.Sathyanarayana, "Lasers *and Optical Instrumentation*", I.K International Publishing House Pvt.Ltd, 2010.

IC1121 FIBRE OPTICS AND LASER INSTRUMENTS												
Course designed by		**Department of Instrumentation and Control Engineering**										
1.	Student outcome	a	B	c	d	e	f	g	h	i	j	K
		x	X	x	x	x		x				
2.	Mapping of instructional objectives with student outcome	1to5	2,5	2,4, 5	1to5	1to5		1to5				
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad Area	Instrumentation			Control		Electronics				Electrical	
		x					**x**					
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1122	REAL TIME EMBEDDED SYSTEMS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To understand different embedded controllers and their application in real time scenario.

INSTRUCTIONAL OBJECTIVES

1.	To understand concepts of embedded system
2.	To understand the features of MSP processor
3.	To understand the programming concepts and apply it in real time applications

UNIT I-EMBEDDED ELECTRONIC SYSTEMS AND MICROCONTROLLERS(9 hours)

What is Embedded System- Approaches – Microcontrollers – Anatomy – Memory – Software – Where does MSP430 Fit – Development Environment – Demonstration Boards –Hardware – Equipment

UNIT II-MSP430 ARCHITECTURE (9 hours)

Block Diagram – Pin configuration – Memory – Central Processing Units – Memory – Mapped Input and Output – Clock Generator – Interrupts and Resets – Addressing Modes – Constant Generator and Emulated Instruction – Instruction Set

UNIT III-PROGRAMMING CONCEPTS (9 hours)

The C Programming Language – Assembly language – Programming & Debugging – Functions and Subroutines – Local Variables – Mixing C and Assembly - Interrupts – Code Composer Studio – Graphical tool – Visual Solution (VisSim)

UNIT IV-RTOS & EMBEDDED HARDWARE (9 hours)

Principles - Semaphores – Queues – Hard Real Time Scheduling – Saving Memory and Power – Example RTOS like μC-OS – Host and Target machines – Linker/Locators – Embedded Hardware – MSP430 USB Stick –Stellaris Cortex M3 – Stellaris Evalbot – Brushed DC Motor control with CAN – AC Induction Motor – 3 phase BLDC motor with DRV8312 and Piccolo MCU - DK – LM3S9D96 μCOS – II RTOS\

UNIT V-APPLICATIONS **(9hours)**

Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube - Temperature Measurement using internal ADC & DAC Blocks - Seven segment display interface using MCU - Utilizing the internal Architecture and Accessing GPIO of ARM processor for LED Blinking - Accessing the advanced Bit- Banding concepts in ARM Processor - Accessing the PHY/Eth port for remote video Surveillance - Stepper and DC Motor Control using ARM Processor – Obstacle Avoidance Robot - Write C code for implementation of four tasks using RTOS on ARM Processor - Semaphore implementation using RTOS on ARM processor - Queue implementation using RTOS on ARM Processor - RTOS on ARM Cortex M3 Processor - Priority inversion problem using RTOS on ARM Processor

TEXT BOOKS

1. John H. Davies, Keith Watso, "*MSP430 Microcontroller Basic*" Newnes – 2011.
2. David E. Simon, "*An Embedded Software Primer*", Addison-Wesley Professional 1999.

REFERENCE

1. Jonathan W. Valvano, "Embedded Microcomputer Systems: Real Time Interfacing ", 3rd edition-Brooks Cole Publishers 2011.

IC1122 REAL TIME EMBEDDED SYSTEMS												
Course designed by		**Department of Instrumentation & Control Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	I	j	K
		x		**x**		**x**						**X**
2.	Mapping of instructional objectives with student outcome	**2**		**1**		**3**						
3.	Category	General (G)			Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)	
											X	
4.	Broad Area	Instrumentation			Control			Electrical			Electronics	
											X	
5.	Approval	23rd Meeting of Academic Council, May 2013										

IC1123	INSTRUMENTATION AND CONTROL IN POWER PLANT INDUSTRIES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

We can know about the various methods of power generation and its control methods.

INSTRUCTIONAL OBJECTIVES

1.	Familiarises about different power generation process
2.	Important parameter that has to be monitored and controlled
3.	Various parameters that has to be analysed and monitored
4.	Various instruments involved in and its controlling process

UNIT I- OVERVIEW OF POWER GENERATION (9 hours)

Brief survey of methods of power generation-Wind, Solar, Tidal, Geothermal, MHD, Fuel cells, Biomass-Conventional energy resources-Hydro, Nuclear, Gas, Thermal-Comparison of various conventional power plants-Importance of Instrumentation and control in power generation-P&I diagrams-P&I diagram of boiler-co-generation.

UNIT II- TURBINE MONITORING AND CONTROL (9 hours)

Electrical parameters-Current, Voltage, Power, Energy, Frequency, Power factor etc-Non-electrical parameters-Flow of feed water, fuel, air and steam with correction factor for temperature and pressure-Speed, vibration, shell temperature monitoring and control-Steam pressure control-Lubricant oil temperature control-cooling system.

UNIT III-ANALYTICAL MEASUREMENT (9 hours)

Oxygen measurement in flue gas-CO_2 in flue gas-Combustibles analyzers-Infrared flue gas analyzers-Smoke detector-Dust monitor-Closed Circuit Television-Fuel analyzers-Pollution monitoring instruments

UNIT IV-CONTROL LOOPS IN BOILERS (9 hours)

Combustion control-air-fuel ratio control-furnace draft control-drum level control-main steam and reheat steam temperature control-super heater control-attemperator-deaerator control-Distributed Control System in power plant-interlocks in boiler operation.

UNIT V-NUCLEAR POWER PLANT INSTRUMENTATION (9 hours)

Introduction-Nuclear physics-Classification of nuclear reactors-Basic reactor systems-P&I diagram of Nuclear power plant-Radiation detection instruments-nuclear reactor control systems and allied instrumentation

TEXT BOOKS

1. P.K.Nag.'Power Plant Engineering', TMH, 2001.
2. Sam G.Dukelow,'The Control of Boilers',ISA,1991

REFERENCES

1. R.K.Jain,'Mechanical and Industrial Measurements', Hanna Publishers, New Delhi,1995.
2. Liptak B.G., Instrumentation in Process Industries,Chilton,1973.

IC1123 INSTRUMENTATION AND CONTROL IN POWER PLANT INDUSTRIES												
Course designed by		Department of Instrumentation and Control Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1		4		2						
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad Area	Instrumentation			Control		Electronics			Electrical		
		X			X		--			--		
5.	Approval	23rd Meeting of Academic Council, May 2013										