SRM
UNIVERSITY
(Under section 3 of UGC Act 1956)

B.Tech. (Full Time) - Electronics and Communication Engineering
Curriculum & Syllabus
2013 – 2014

Volume – I
(all courses except open electives)

FACULTY OF ENGINEERING AND 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. Electronics and Communication 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**
LE1002	G	VALUE EDUCATION	1	0	0	1
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
CE1001	E	BASIC CIVIL ENGINEERING	2	0	0	2
ME1001/ ME1005	E	BASIC MECHANICAL ENGINEERING/ ENGINEERING GRAPHICS	2/0	0/1	0/4	2/3
EC1001	E	BASIC ELECTRONICS ENGINEERING	2	0	0	2
EC1002	E	ELECTRONICS ENGINEERING PRACTICES	0	0	2	1
NC1001/ NS1001/SP 1001/ YG1001	G	NCC/NSS/NSO/YOGA	0	0	1	1
Total			**17/15**	**2/3**	**8/12**	**22/23**
Total Contact Hours			**27/30**			

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

SEMESTER II						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
LE1001	G	ENGLISH	1	2	0	2
CS1001	G	PROGRAMMING USING MATLAB	0	1	2	2
PD1002	G	SOFT SKILLS - II	1	0	1	1
MA1002	B	ADVANCED CALCULUS AND COMPLEX ANALYSIS	3	2	0	4
PY1003	B	MATERIAL SCIENCE	2	0	2	3
CY1003	B	PRINCIPLES OF ENVIRONMENTAL SCIENCE	2	0	0	2
BT1001	B	BIOLOGY FOR ENGINEERS	2	0	0	2
EE1001	E	BASIC ELECTRICAL ENGINEERING	2	0	0	2
ME1005/ ME1001	E	ENGINEERING GRAPHICS / BASIC MECHANICAL ENGINEERING	0/2	1/0	4/0	3/2
EE1002	E	ELECTRICAL ENGINEERING PRACTICES	0	0	2	1
EC1003	P	ELECTRIC CIRCUITS	3	0	0	3
EC1004	P	ELECTRIC CIRCUITS LAB	0	0	2	1
Total			**16/18**	**6/6**	**13/13**	**26/25**
Total Contact Hours			**35/35**			

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
EC1005	P	ELECTROMAGNETIC THEORY AND WAVEGUIDES	3	0	0	3
EC1006	P	ELECTRON DEVICES	3	0	0	3
EC1007	P	DIGITAL SYSTEMS	3	0	0	3
EC1008	P	SIGNALS AND SYSTEMS	3	1	0	4
EC1009	P	ELECTRON DEVICES LAB	0	0	3	2
EC1010	P	DIGITAL SYSTEMS LAB	0	0	3	2
TOTAL			**19**	**1**	**7**	**24**
Total Contact Hours			**27**			

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
MA1024	B	PROBABILITY AND RANDOM PROCESS	4	0	0	4
EC1011	P	TRANSMISSION LINES AND NETWORKS	3	0	0	3
EC1012	P	ELECTRONIC CIRCUITS	3	0	0	3

EC1013	P	LINEAR INTEGRATED CIRCUITS	3	0	0	3
EC1014	P	ELECTRONIC CIRCUITS LAB	0	0	3	2
EC1015	P	LINEAR INTEGRATED CIRCUITS LAB	0	0	3	2
	P	DEPARTMENT ELECTIVE - I	3	0	0	3
TOTAL			**19**	**0**	**7**	**23**
Total Contact Hours			**26**			

SEMESTER V						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1005	G	APTITUDE - III	1	0	1	1
MA1015	B	DISCRETE MATHEMATICS	4	0	0	4
EC1016	P	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3
EC1017	P	DIGITAL SIGNAL PROCESSING	3	1	0	4
EC1018	P	COMMUNICATION THEORY	3	0	0	3
EC1019	P	PROCESSOR LAB	0	0	3	2
EC1020	P	COMMUNICATION ENGINEERING LAB	0	0	3	2
EC1047	P	INDUSTRIAL TRAINING – I (training to be undergone after IV semester)	0	0	1	1
	P	DEPARTMENT ELECTIVE - II	3	0	0	3
	P	OPEN ELECTIVE - I	3	0	0	3
TOTAL			**20**	**1**	**8**	**26**
Total Contact Hours			**29**			

SEMESTER VI						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1006	G	APTITUDE - IV	1	0	1	1
EC1021	P	ANTENNA AND WAVE PROPAGATION	3	0	0	3
EC1022	P	MICROWAVE AND OPTICAL COMMUNICATION	3	0	0	3
EC1023	P	DIGITAL COMMUNICATION	3	0	0	3
EC1024	P	MICROWAVE AND OPTICAL COMMUNICATION LAB	0	0	3	2
EC1025	P	DIGITAL COMMUNICATION LAB	0	0	3	2

EC1049	P	MINOR PROJECT	0	0	2	1
	P	DEPARTMENT ELECTIVE - III	3	0	0	3
	P	OPEN ELECTIVE - II	3	0	0	3
	P	OPEN ELECTIVE - III	3	0	0	3
Total			**19**	**0**	**9**	**24**
Total Contact Hours			**28**			

SEMESTER VII						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
EC1026	P	WIRELESS COMMUNICATION	3	0	0	3
EC1027	P	COMPUTER COMMUNICATION	3	0	0	3
EC1028	P	ELEMENTS OF INFORMATION THEORY AND CODING	3	0	0	3
EC1029	P	VLSI DESIGN	3	0	0	3
EC1030	P	NETWORK SIMULATION LAB	0	0	3	2
EC1031	P	VLSI DESIGN LAB	0	0	3	2
EC1048	P	INDUSTRIAL TRAINING II (Training to be undergone after VI semester)	0	0	1	1
	P	DEPARTMENT ELECTIVE - IV	3	0	0	3
	P	DEPARTMENT ELECTIVE - V	3	0	0	3
Total			**18**	**0**	**7**	**23**
Total Contact Hours			**25**			

SEMESTER VIII						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
EC1050	P	MAJOR PROJECT / PRACTICE SCHOOL	0	0	24	12
Total			**0**	**0**	**24**	**12**
Total Contact Hours			**24**			

DEPARTMENTAL ELECTIVES

Course Code	Category	Course Name	L	T	P	C
EC1101	P	ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY	3	0	0	3
EC1102	P	FUNDAMENTALS OF MEMS	3	0	0	3
EC1103	P	FUNDAMENTALS OF NANOTECHNOLOGY	3	0	0	3
EC1104	P	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	3	0	0	3
EC1105	P	SENSORS AND TRANSDUCERS	3	0	0	3
EC1106	P	BIOMEDICAL INSTRUMENTATION	3	0	0	3
EC1107	P	CONTROL ENGINEERING	3	0	0	3
EC1108	P	COMPUTER ARCHITECTURE AND ORGANIZATION	3	0	0	3
EC1109	P	EMBEDDED SYSTEMS	3	0	0	3
EC1110	P	VIRTUAL INSTRUMENTATION USING LABVIEW	3	0	0	3
EC1111	P	DIGITAL TELEVISION	3	0	0	3
EC1112	P	DIGITAL IMAGE PROCESSING	3	0	0	3
EC1113	P	RADAR AND NAVIGATIONAL AIDS	3	0	0	3
EC1114	P	COMMUNICATION SWITCHING TECHNIQUES	3	0	0	3
EC1115	P	ASIC DESIGN	3	0	0	3
EC1116	P	EMBEDDED C AND MICRO CONTROLLER	3	0	0	3
EC1117	P	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3
EC1118	P	SATELLITE COMMUNICATION AND BROADCASTING	3	0	0	3
EC1119	P	MOBILE COMPUTING	3	0	0	3
EC1120	P	BLUETOOTH TECHNOLOGY	3	0	0	3
EC1121	P	COMMUNICATION NETWORK PROTOCOLS	3	0	0	3

EC1122	P	PHOTONICS AND OPTICAL NETWORKS	3	0	0	3
EC1123	P	RF SYSTEM DESIGN FOR WIRELESS COMMUNICATIONS	3	0	0	3
EC1124	P	NEURAL NETWORK AND FUZZY LOGIC	3	0	0	3
EC1125	P	DIGITAL LOGIC DESIGN WITH PLDS AND VHDL	3	0	0	3

Summary of credits										
Category	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**	**%**
G (Excluding open and departmental electives)	8		3	3	1	1	-	-	16	8.9
B (Excluding open and departmental electives)	23		4	4	4	-	-	-	35	19.4
E (Excluding open and departmental electives)	13		-	-	-	-	-	-	13	7.2
P (Excluding open and departmental electives)	4		17	13	15	14	17	12	92	51.8
Open Elective	--				3	6			9	5
Dep. Elective	--			3	3	3	6		15	8.3
Total	**48**		**24**	**23**	**26**	**24**	**23**	**12**	**180**	**100**

SEMESTER I

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										

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 oals.

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 (15 hours)

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. Ganesan K, 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. Souires G.L, "*Practical Physics:*", 4th Edition, Cambridge University, UK, 2001.
2. Chattopadhyay D, Rakshit P.C. and Saha B, "*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. Dara S.S, *"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.

<table>
<tr><th colspan="13">CY1001 CHEMISTRY</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="11">Department of Chemistry</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>2.</td><td>Mapping of instructional objective with student outcome</td><td>1-6</td><td>1,5</td><td>3</td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td>4</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>

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. Conductometric titration - determination of strength of an acid
4. Estimation of iron by potentiometry.
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			Engineering Sciences and			Professional Subjects		

			(B)	Technical Arts(E)	(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.

TEXT BOOKS

1. Raju K.V.B, Ravichandran P.T, "*Basics of Civil Engineering"*, Ayyappa Publications, Chennai, 2012.
2. Rangwala S.C, " *Engineering Materials"*, Charotar Publishing House, Anand, 2012.

REFERENCES

1. Ramesh Babu, "*Civil Engineering"* , VRB Publishers, Chennai, 2000.
2. National Building Code of India, Part V, "*Building Material"s*, 2005.
3. Surendra Singh, "*Building Material"s*, Vikas Publishing Company, New Delhi, 1996.

<table>
<tr><th colspan="13">CE1001 - BASIC CIVIL ENGINEERING</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="11">Department of Civil 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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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 Hajra Choudhary 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										

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										

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.

Expt.1: 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.

Expt. 2: SCHEMATIC CAPTURE (6 hours)

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

Expt. 3: 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

Expt. 4: PCB FABRICATION PROCESS **(6 hours)**

Etching, cleaning, drying and drilling

Expt. 5: 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.

<table>
<tr><th colspan="13">EC1002 ELECTRONICS ENGINEERING PRACTICE</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="11">Department of Electronics and Communication 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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</table>

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.

<table>
<tr><td colspan="2">NC1001/ NS1001/ SP1001/ YG1001</td><td colspan="11">NATIONAL CADET CORPS (NCC)/
NATIONAL SERVICE SCHEME (NSS)/
NATIONAL SPORTS ORGANIZATION (NSO)/YOGA</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

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										

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. Bansal R.K, Goel A.K, Sharma M.K, "*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										

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.

REFERENCES

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)				
	Nil				

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. Ganesan K, Sundarammal Kesavan, Ganapathy Subramanian K.S & Srinivasan V, "*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. Silver F and Dillion C, "*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. Cao G, "*Nanostructures and Nanomaterials: Synthesis, Properties and Applications*", Imperial College Press, 2004.
8. Pradeep T, "*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										

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. ThyagaRajan S, Selvamurugan N, Rajesh M. P, Nazeer R. A, Richard W. Thilagaraj, Barathi S, and Jaganathan M. K, "*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**, 2**004.
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										

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 CIRCUIT (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. Metha V.K, 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.

<table>
<tr><th colspan="13">EE1001 - BASIC ELECTRICAL ENGINEERING</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="11">Department of Electrical and Electronics Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcomes</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>1-3</td><td></td><td></td><td></td><td>1</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="2">General (G)</td><td colspan="2">Basic Sciences (B)</td><td colspan="4">Engineering Sciences and Technical Arts(E)</td><td colspan="3">Professional Subjects(P)</td></tr>
<tr><td colspan="2">--</td><td colspan="2">--</td><td colspan="4">x</td><td colspan="3">--</td></tr>
<tr><td>4.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

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

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										

	ELECTICAL ENGINEERING PRACTICE	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
EE1002	Total Contact Hours - 30				
	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. Jeyachandran K, Natarajan S & Balasubramanian S, "*A Primer on engineering practices laboratory*", Anuradha Publications, 2007.
3. Jeyapoovan T, Saravanapandian M & Pranitha S, "*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										

EC1003	ELECTRIC CIRCUITS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				
	Common for ECE & ITCE				

PURPOSE

To expose basic circuit concepts, circuit modeling and methods of circuit analysis in time domain and frequency domain for solving simple and multi dimensional circuits including coupled circuits and tuned circuits.

INSTRUCTIONAL OBJECTIVES

1.	To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction.
2.	To solve the electrical network using mesh and nodal analysis by applying network theorems.
3.	To understand the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits.
4.	To know the basic concepts of coupled circuits and tuned circuits.
5.	To analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform.

UNIT I - BASIC CIRCUIT CONCEPTS & LAWS (9 hours)

Classification of Circuit Elements – Node, Loop, Path & Branch – Incidence Matrix – Network topology Analysis of Incidence Matrix- Tie Set & Cut Set – Kirchoff's Laws – Series and Parallel – Voltage and Current division rule.

Introduction to AC Analysis – Complex Impedance – Analysis: Mesh – Supermesh – Nodal – Supernodal.

UNIT II - NETWORK THEOREMS: (Both DC & AC Circuit Analysis) (9 hours)

Source Transformation Theorem - Super Position Principle - Thevenin's & Norton's Theorem - Reciprocity Theorem - Compensation Theorem - Millman's Theorem - Maximum Power Transfer theorem - Star - Delta Theorem.

UNIT III - RESONANCE & COUPLED CIRCUITS (9 hours)

Resonance: Introduction – series resonance – parallel resonance – Definition: Q Factor- Half power frequency resonant frequency – Bandwidth.

Coupled Circuits: Mutual inductance – Co-efficient of Coupling – Dot Convention – Energy Consideration – Analysis of Coupled Circuits.

UNIT IV - TRANSIENT ANALYSIS (9 hours)

Basics - Source free and Forced Response of RL, RC and RLC Series Circuits – Forced Response of RL, RC & RLC Series circuits with Sinusoidal Excitation - Time Constant & Natural frequency of Oscillation - Laplace Transform Application to the Solution of RL, RC & RLC Transient Circuits.

UNIT V - TUNED CIRCUITS & PSPICE (9 hours)

Tuned Circuits – Single Tuned Circuits – Double Tuned Circuits – Analysis

Pspice (Elementary treatment only) – DC Analysis and Control Statements - AC Analysis and Control Statements – Transient analysis.

TEXT BOOKS

1. Sudhakar A & Shyammohan S Palli, "*Circuits & Network Analysis & Synthesis*", 4th Edition, Tata McGraw Hill, 2010.
2. Soni M.L & Gupta J.C, "*Course in Electrical Circuits Analysis*", Dhanpat Rai & Sons, New Delhi, 1999.
3. Muhammed H Rashid, "*SPICE for Circuits and Electronics using PSPICE*", PHI, 2nd Edition, 2011.

REFERENCES

1. William H.Hyte, Jr, J.E.Kemmerly & Steven M.Durban, "*Engineering Circuit Analysis*", 7th Edition, McGraw Hill, 2010.
2. Joseph Edminster, "*Electric Circuits", Schaum's Outline Series"*, McGrawHill, 5th Edition, 2011.

EC1003 ELECTRIC CIRCUITS												
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						X
2.	Mapping of instructional objectives with student outcome	1,3, 4	2,5	2,5		2,5						1,2, 5
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences &Technical Arts (E)					Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing		Electronics			VLSI		Embedded	
						X						
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1004	ELECTRIC CIRCUITS LAB	L	T	P	C
	Total Contact Hours – 30	0	0	2	1
	Prerequisite				
	Nil				
	Common for ECE & ITCE				

PURPOSE

To inculcate strong practical skills on the fundamental theorems and transient circuit analysis.

INSTRUCTIONAL OBJECTIVES

1.	To impart hands on experience in verification of circuit laws and theorems.
2.	To measure circuit parameters.
3.	To study circuit characteristics and simulation of time response.

LIST OF EXPERIMENTS

1. Verification of Kirchoff's voltage and Current Laws
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem & Norton's Theorem
4. Verification of Maximum Power Transfer Theorem
5. Verification of Tellegen's and Reciprocity Theorem
6. Time domain response of RL Transient Circuit.
7. Time domain response of RC Transient Circuit.

8. Series RLC Resonance Circuits (Frequency response& Resonant frequency)
9. Parallel RLC Resonance Circuits (Frequency response & Resonant frequency)
10. Simulation experiments using PSPICE or MultiSim.

REFERENCES

1. LAB MANUAL, Department of ECE, SRM University.
2. David A Bell, "*Laboratory Manual for Electric Circuits*", 6th Edition, PHI.
3. Muhammed H Rashid, "*SPICE for Circuits and Electronics using PSPICE*", 2nd Edition, PHI, 1995.
4. Maheswari.L.K and Anand.M.M.S, "*Laboratory Manual for Introductory Electronic Experiments*", New Age, 2010.

<table>
<tr><th colspan="13">EC1004 ELECTRIC CIRCUITS LAB</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="11">Department of Electronics and Communication 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>1,2, 3</td><td>1,2, 3</td><td></td><td>1,2, 3</td><td></td><td></td><td></td><td>3</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>
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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><th colspan="13">LE1003 GERMAN LANGUAGE PHASE I</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="11">Department of English and Foreign Languages</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>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)**

Grammar and Vocabulary: Usage of the French verb "se presenter", a verb of self- introduction and how to greet a person- "saluer"

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.

Writing – correct spellings of French scientific and technical vocabulary.

Reading -- Reading of the text and comprehension – answering questions.

UNIT II **(6 hours)**

Grammar and Vocabulary – Definite articles , "prepositions de lieu" subject pron ouns

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

Writing – particulars in filling an enrollment / registration form

Reading Comprehension – reading a text of a famous scientist and answering questions.

UNIT III **(6 hours)**

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

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.

Writing –conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person.

Reading Comprehension – reading a text that speaks of one's profile and answering questions

UNIT IV **(6 hours)**

Grammar and Vocabulary –negative sentences, numbers from 20 to 69, verb "aimer"and seasons of the year and leisure activities.

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

Writing- conjugations of the irregular verbs – faire and savoir and their usage. Paragraph writing on one's leisure activity- (passé temps favori)

Reading- a text on seasons and leisure activities – answering questions.

UNIT V **(6 hours)**

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.

Listening and Speaking – to read and understand the metro map and hence to give one directions – dialogue between two people.

Writing –paragraph writing describing the accommodation using the different prepositions like en face de, derriere- to locate .

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 **(4 hours)**

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

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.

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

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*,* 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.	Approval	23rd Meeting of Academic Council, May 2013										

MA1003	**TRANSFORMS AND BOUNDARY VALUE PROBLEMS**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**
	Total Contact Hours - 60				
	(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

<table>
<tr><th colspan="13">MA1003 TRANSFORMS AND BOUNDARY VALUE PROBLEMS</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="11">Department of Mathematics</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>4.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
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EC1005	**ELECTROMAGNETIC THEORY AND WAVEGUIDES**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	MA1101, MA1102				

PURPOSE

To enable the students understand the universal theoretical concepts in three dimensional real world and find solution to problems related to electro magnetic wave propagation.

INSTRUCTIONAL OBJECTIVES

1.	To impart knowledge on the basic concepts of electric and magnetic fields.
2.	To educate scientifically about Maxwell's equations and Poynting theorem
3.	To interpret the Wave propagation in between parallel plates.
4.	To emphasize the significance of different types of waveguides.

UNIT I - STATIC ELECTRIC FIELDS (11 hours)

Introduction to co-ordinate system – Rectangular Cylindrical and Spherical – The experimental law of Coulomb. Electric Field Intensity – field of line charge, sheet charge, continuous volume charge distribution – Streamline and sketches of fields - Electric flux density – Gauss Law – Applications of Gauss Law - Some symmetrical charge distributions – Differential volume element – Concept of divergence. Definition of Electric potential, work, Energy potential difference – Potential field of different types of charges – Potential gradient – The dipole and field due to a dipole. Energy density in the electric field.

UNIT II - STEADY MAGNETIC FIELDS (9 hours)

Biot Savart Law – Applications of Biot Savart Law - Ampere's circuital law - Applications circuital law – Curl – Stoke's Theorem - Magnetic flux and magnetic flux density – The scalar and vector magnetic potentials – Derivation of the steady magnetic field laws.

UNIT III - TIME VARYING FIELDS AND MAXWELLS EQUATIONS (7 hours)

Faraday's law – Displacement current –Maxwell's equations in point form and integral form for steady fields and time varying fields – Retarted potentials - Comparison of field and circuit theory - Poynting vector and Poynting Theorem.

UNIT IV - GUIDED WAVES **(9 hours)**

Waves between parallel planes: Transverse electric waves-Transverse magnetic waves-Characteristic of TE and TM waves-TEM waves. Velocity of propagation-Attenuation in parallel plane guides-Wave impedance

UNIT V - WAVEGUIDE THEORY **(9 hours)**

Rectangular wave guides: TE waves and TM waves in Rectangular waveguides – Dominant mode – cutoff frequency in wave guides – Impossibility of TEM waves in waveguides.

Circular waveguides: Wave impedance and characteristic impedance – Power flow in wave guides – Attenuation factor and Q of wave guides – Transmission line analogy for waveguides

TEXT BOOKS

1. William H.Hayt,Jr and John A.Buck., *"Engineering Electromagnetics",* Tata McGraw-Hill Publishing Ltd, 8th Edition, 2012.
2. Raju.G.S.N, *"Electromagnetic Field Theory and Transmission Lines",* Pearson Education, First Indian print, 2005.

REFERENCES

1. Edward Jordan and Balmain. KG, *"Electromagnetic Waves and Radiating Systems",* Pearson education, 2nd Edition, 2001.
2. Matthew N. Sadiku. O, *"Elements of Electromagnetics",* Oxford University Press, 3rd Edition, First Indian Edition, 2006.
3. John D. Kraus, *"Electromagnetics",* McGraw Hill book Company, New York, Fourth Edition, 1991.

<table>
<tr><th colspan="14">EC1005 ELECTROMAGNETIC THEORY AND WAVEGUIDES</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="12">Department of Electronics and Communication 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>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
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EC1006	ELECTRON DEVICES	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1001				

PURPOSE

The purpose of this course is to provide a basis for understanding the characteristics, operation and limitations of semiconductor and optoelectronic devices. This course brings together the semiconductor device physics, optoelectronic device principles and complete description of power supply circuit.

INSTRUCTIONAL OBJECTIVES

1.	To understand the physical construction, working and operational characteristics of Semiconductor devices.
2.	To understand the operation of power supply circuits built using filters, rectifiers and voltage regulators.
3.	To discuss the manufacturing process of monolithic ICs & the fabrication of components on monolithic IC.

UNIT I - SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES(12 hours)

Overview on Physics and Properties of Semiconductors: Intrinsic semiconductor – extrinsic semiconductor – Fermi level in an intrinsic semiconductor – conductivity of a metal, intrinsic semiconductor and extrinsic semiconductor – drift – diffusion – recombination – carrier life time.

Semiconductor diodes : Formation of PN junction – working principle – VI characteristics – PN diode currents – diode current equation – diode resistance – transition and diffusion capacitance – diode models – voltage breakdown in diodes.

Special purpose diodes : Zener diode – point-contact diode – backward diode – varactor diode – step-recovery diode – schottky diode, PNPN diode – RF diode.

UNIT II - BIPOLAR TRANSISTORS (6 hours)

Bipolar Transistors : Construction – working – transistor currents – transistor configurations and input-output characteristics – Early effect (base-width modulation) – Ebers Moll model – transistor as an amplifier – Transistor as a switch.

UNIT III - FIELD-EFFECT TRANSISTORS (6 hours)

Field-Effect Transistors : construction, working and VI characteristics of JFET – comparison of BJT and JFET – MOSFET – enhancement MOSFET, depletion

MOSFET, their working principle and VI characteristics, comparison of MOSFET with JFET, comparison of D MOSFET with E MOSFET, CMOS, MESFET, CCD.

UNIT IV - DC POWER SUPPLIES (12 hours)

Rectifiers and Filters : Block schematic of a typical DC power supply, single phase HWR, FWR, full-wave bridge rectifier, power supply filters (ripple factor and efficiency analysis), bleeder resistor, voltage dividers.

Voltage regulators : voltage regulation, zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators, design of complete DC power supply circuit.

UNITV - INTEGRATED CIRCUIT FABRICATION (9 hours)

Integrated circuit – advantages and drawback of ICs – scale of integration – classification of ICs – definition of linear IC and digital IC with examples – manufacturing process of monolithic ICs – fabrication of components (diode, capacitor, bipolar transistor, resistor and field – effect transistor) on monolithic IC – comparison of MOS ICs and bipolar ICs.

TEXT BOOKS

1. Robert L. Boylestad and Louis Nashelsky, *"Electronic Devices and Circuit Theory",* Pearson Education, 9th Edition, 2009.
2. Somanathan Nair B, *"Electronic Devices and Applications",* PHI, 2006.

REFERENCES

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, *"Electron Devices and Circuits",* Tata McGraw Hill, 2010.
2. David A Bell, *"Fundamentals of Electronic Devices and Circuits",* Oxford Press, 2009.
3. Theraja.B.L, Sedha.R.S, *"Principles of Electronic Devices and Circuits",* Chand. S, 2004.

EC1006 ELECTRON DEVICES												
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
2.	Mapping of instructional objectives with student outcome	1,2, 3	1,2,3									1,2,3

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)		Professional Subjects (P)
						X
4.	Broad Area	Communication	Signal Processing	Electronics	VLSI	Embedded
				X		
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1007	**DIGITAL SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1001				

PURPOSE

The purpose of this course is to develop a strong foundation in analysis and design of digital electronics.

INSTRUCTIONAL OBJECTIVES

At the end of the course students should be able to

1.	Understand concepts of combinational and sequential circuits.
2.	Analyze the synchronous and asynchronous logic circuits.
3.	Understand concepts of memory, programmable logic and digital integrated circuits.
4.	Design Combinational and sequential systems.

UNIT I-BASIC CONCEPTS, BOOLEAN ALGEBRA, THEOREMS AND FUNCTIONS (10 hours)

Number Systems: Decimal number system, binary number system, octal number system , hexadecimal number system, BCD number system, Excess-3 code, Gray code, Alpha numeric code, error detecting and error correcting codes.

Arithmetic: Arithmetic number representation, Binary arithmetic, Hexadecimal arithmetic, BCD arithmetic.

Boolean Algebra and Theorems: Logic gates and logic operations, Boolean theorems and postulates, SOP's & POS's, Minterms and Maxterms.

Minimization of Boolean Functions: Algebraic simplification, Karnaugh map simplification, Quine-Mc Cluskey or Tabulation method.

UNIT II-LOGIC GATES (9 hours)

Logic Families: Metal Oxide Semiconductor logic families- switching properties of NMOS and PMOS transistors, static NMOS, dynamic NMOS, Static CMOS and

dynamic CMOS logic families, CMOS Transmission gate circuits, Bipolar logic families- switching properties of NPN and PNP transistors, TTL, Schottkey TTL, Comparison of MOS logic circuits(CMOS) with that of a TTL digital circuit, tristate gates.

Electrical characteristics: Meanings of speed, propagation delay, operating frequency, and power dissipated per gate, supply voltage levels, operational voltage levels of various logic families.

UNIT III-COMBINATIONAL SYSTEMS (9 hours)

Binary arithmetic units (Adder, subtractor, n-bit parallel adder & subtractor, look ahead carry generator), decoder, encoder, multiplexer, demultiplexer, code converters, Magnitude comparators, parity generators.
Implementation of combinational logic by standard IC's.

UNIT IV-SEQUENTIAL SYSTEMS (10 hours)

Flip-flop and Latch: SR latch, JK flip-flop, T flip-flop, D flip-flop and latch, Master-slave RS flip-flop, Master-slave JK flip-flop, asynchronous inputs.
Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), universal shift register. Counters-Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter, asynchronous clear, preset and load in a counter, synchronous clear, preset and load in a counter, typical IC's for counters.
Synchronous (Clocked) sequential circuits: Moore and Mealey state machine circuits, Analysis & design of synchronous sequential circuits – State machine design with SM charts.

UNIT V-MEMORY AND PROGRAMMABLE LOGIC (7 hours)

RAM, memory decoding, ROM, PROMs, PAL & PLA, Sequential Programmable Devices (discuss three major devices without going into their detailed construction).

TEXT BOOKS

1. Morris Mano M, Michael D. Ciletti, *"Digital Design",* Pearson Education, 4th Edition, 2007.
2. Charles H Roth (Jr), Larry L. Kinney*, "Fundamentals of Logic Design",* Cengage Learning India Edition, 5th Edition, 2010.

REFERENCES

1. Floyd and Jain, *"Digital Fundamentals",* Pearson Education, 8th Edition, 2007.
2. Ronald J. Tocci, *"Digital Systems: Principles and Applications",* Pearson Education, 10th Edition, 2009.
3. Donald P Leach, Albert Paul Malvino, Goutam Saha, *"Digital Principles and Applications",* Tata McGraw Hill, 6th Edition, 2008.

EC1007 DIGITAL SYSTEMS												
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	1,2,3		4							1,2, 3,4
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)					Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing		Electronics			VLSI		Embedded	
						X						
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1008	SIGNALS AND SYSTEMS	L	T	P	C
	Total Contact Hours – 60	3	1	0	4
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to introduce students to the fundamentals of signals and systems which are basic to Digital Signal Processing. The main objective of this subject is to help the students to mathematically analyze different types of signals and their associated systems

INSTRUCTIONAL OBJECTIVES

At the end of this course, the students will be able to understand the

1. Various classifications of both Continuous time and Discrete time Signals and Systems.
2. Spectral analysis of Periodic and Aperiodic Signals using Fourier series.

3.	Analysis and characterization of the CT system through Laplace transform.
4.	Analysis and characterization of the DT system through Difference equation.
5.	Analysis and characterization of the DT system through Z transform.

UNIT I-CLASSIFICATION OF SIGNALS AND SYSTEMS (9 hours)

Classification of Signals: Continuous time signals - Discrete time signals – Periodic and Aperiodic signals – Even and odd signals – Energy and power signals –Deterministic and random signals –Complex exponential and Sinusoidal signals .Unit step, Unit ramp, Unit impulse – Representation of signals in terms of unit impulse .

Classification of Systems: Continuous time systems- Discrete time systems - Linear system – Time Invariant system – causal system – BIBO system – Systems with and without memory – LTI system.

UNIT II-ANALYSIS OF CONTINUOUS TIME SIGNALS (9 hours)

Fourier series: Representation of Continuous time Periodic signals – Trigonometric and exponential-Symmetry conditions- Properties of Continuous time Fourier series – Parseval's relation for power signals –Frequency spectrum.

Fourier transform: Representation of Continuous time signals- Properties of Continuous time Fourier transform – Parseval's relation for energy signals – Frequency spectrum –Analysis of LTI system using Fourier methods.

UNIT III-LTI CONTINUOUS TIME SYSTEM (9 hours)

System modeling: Solution of Differential equation with initial conditions-Zero state response and Zero input response– impulse response – Frequency response – Convolution – Analysis and characterization of LTI system using Laplace transform.

UNIT IV-ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS (9 hours)

Representation of sequences – Discrete Time Fourier Transform (DTFT) - Discrete Fourier Transform (DFT) and its properties – Solution of linear constant coefficient difference equations with initial conditions-Zero state response and Zero input response–- impulse response – Convolution sum -Frequency response.

UNIT V-LTI DT SYSTEM CHARACTERIZATION AND REALIZATION (9 hours)

Unilateral and Bilateral Z transforms and its properties - Inverse Z transform: Power series expansion and Partial fraction methods - Analysis and characterization of DT system using Z transform-Realization of structures for DT systems -Direct form-I- Direct form II--Parallel-Cascade forms

Tutorial - (15 hours)

TEXT BOOKS

1. Alan V Oppenheim, Ronald W. Schafer *"Discreate Time Signal Processing"* Pearson education , 2nd edition, 2007
2. Simon Haykin and Barry Van Veen, *"Signals and Systems",* John Wiley & Sons Inc, 2nd Edition, 2007.

REFERENCES

1. John G. Proakis and Manolakis, *"Digital Signal Processing, Principles, Algorithms and Applications",* Pearson Education, 4th Edition, 2007.
2. Lathi B.P, *"Linear Systems & Signals",* Oxford Press, Second Edition, 2009.
3. Rodger E Ziemer, William H. Tranter, D. Ronald Fannin, *"Signals and Systems – continuous and Discrete",* Pearson Education, 4th Edition, 2009.
4. Douglas K Linder, *"Introduction to Signals and Systems",* Mc-Graw Hill, 1st Edition, 1999.

EC1008 SIGNALS AND SYSTEMS												
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							X
2.	Mapping of instructional objectives with student outcome	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5							1,2,3,4,5
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences &Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad area	Communication			Signal Processing		Electronics			VLSI	Embedded	
					X							
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1009	ELECTRON DEVICES LAB	L	T	P	C
	Total Contact Hours – 45	0	0	3	2
	Prerequisite				
	EC1004				

PURPOSE

To reinforce learning in the accompanying EC1004 course through hands-on experience by examining the electrical characteristics of various semiconductor devices, such as diodes, BJTs and FETs. To provide the student with the

capability to use simulation tools for performing various analysis of semiconductor devices.	
INSTRUCTIONAL OBJECTIVES	
1.	To study experimentally the characteristics of diodes, BJT's and FET's.
2.	To verify practically the response of various special purpose electron devices.
3.	To construct and simulate various semiconductor devices using tools such as Pspice/multisim.

LIST OF RECOMMENDED EXPERIMENTS

1. Characteristics of PN junction and Zener diode.
2. Input, Output and Transfer characteristics of CE and CC Amplifier.
3. Characteristics of LDR, Photo-diode and Photo transistor.
4. Transfer characteristics of JFET.
5. Transfer characteristics of MOSFET (with depletion and enhancement mode)
6. Characteristics of LED with three different wavelengths.
7. Half wave rectifier.
8. Full wave rectifier with 2 diodes.
9. Full wave rectifier with 4 diodes (Bridge rectifier).
10. Series voltage Regulator.
11. Shunt voltage Regulator.
12. Characteristics of Thermistor.
13. Simulation experiments using PSPICE or Multisim.

REFERENCES

1. *"LAB MANUAL"*, Department of ECE, SRM University
2. Paul B Zbar and Alber P Malvino, Michael A Miller, *"Basic Electronics: A Text Lab Manual"*, 7th edition, Tata McGraw Hill, 2009.
3. David A Bell, *"Laboratory Manual for Electronic Devices and Circuits"*, 4th edition, PHI, 2001.
4. Muhammed H Rashid, *"SPICE for circuits and electronics using PSPICE"*, 2nd edition, PHI, 1995.
5. Mithal. G.K, *"Practicals in Basic Electronics"*, G K Publishers Private Limited, 1997.
6. Maheswari. L.K and Anand.M.M.S, *"Laboratory Manual for Introductory Electronic Experiments"*, New Age, 2010.
7. Poornachandra Rao.S and Sasikala.B, *"Handbook of Experiments in Electronics and Communication Engineering"*, Vikas publishers, 2003.

EC1009 ELECTRON DEVICES LAB												
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	1,2,3		1,2, 3				3	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
				X		
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1010	**DIGITAL SYSTEM LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**0**	**0**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

To reinforce learning in the accompanying EC0205 course through hands-on experience with digital electronic circuit analysis, design, construction, and testing. To provide the student with the capability to use simulation tools in digital electronic circuit analysis and design.

INSTRUCTIONAL OBJECTIVES

1.	To develop necessary skill in designing, analyzing and constructing digital electronic circuits.
2.	To design and simulate digital logic circuits using tools such as Logisim or PSPICE or Multisim.

LIST OF EXPERIMENTS **(45 hours)**

1. Study of Gates & Flip-flops.
2. Half Adder and Full Adder.
3. Magnitude Comparator (2-Bit).
4. Encoders and Decoders.
5. Multiplexer and Demultiplexer.
6. Code Converters.

7. Implementation of combinational logic functions using standard ICs
8. Synchronous Counters.
9. Ripple Counter.
10. Mod – N Counter.
11. Shift Registers and Shift Register Counters.
12. Implementation of sequential logic functions using standard ICs.
13. Simulation Experiments using Logisim/PSPICE/multisim

REFERENCES

1. *"LAB MANUAL"*, Department of ECE, SRM University.
2. Maheswari.L.K and Anand.M.M.S, *"Laboratory Manual for Introductory Electronic Experiments"*, New Age, 2010.
3. Poornachandra Rao.S and Sasikala.B, *"Handbook of Experiments in Electronics and Communication Engineering"*, Vikas publishers, 2003.
4. Website: http://ozark.hendrix.edu/~burch/logisim/

<table>
<tr><th colspan="14">EC1010 DIGITAL SYSTEMS LAB</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="12">Department of Electronics and Communication Engineering</td></tr>
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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/wollenwir”—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

<table>
<tr><th colspan="13">LE1008 GERMAN LANGUAGE PHASE II</th></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>1-4</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>
<tr><td colspan="3">x</td><td colspan="3">--</td><td colspan="3">--</td><td colspan="2">--</td></tr>
<tr><td>4.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

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)**

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.

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.

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

LE1009 FRENCH 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										

LE 1010	**JAPANESE LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**2**
	Total Contact Hours- 30				
	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ˆyouˇ 好ˆgood 'wellˇ

工作ˆwork 'jobˇ人员ˆpersonnel 'staff memberˇ 请问ˆMay I ask…ˇ 贵ˆexpensive 'valuableˇ 姓ˆone's family name isˇ

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

UNIT IV **(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

REFERENCES

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.

<table>
<tr><th colspan="13">PD1004 - APTITUDE-II</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="11">Career Development Centre</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></td><td></td><td></td><td>X</td><td></td><td></td><td></td><td></td></tr>
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</table>

	PROBABILITY AND RANDOM PROCESS	L	T	P	C
MA1024	Total Contact Hours – 60	4	0	0	4
	Prerequisite				
	Nil				
	Common to ECE, ITCE & NANO				

PURPOSE

To introduce the students to the idea of probability and random process, an important mathematical tool in signal processing.

INSTRUCTIONAL OBJECTIVES

1.	To acquire knowledge about Probability and Random variables.
2.	To gain knowledge on 2 - D Random variables.
3.	To expose to the concepts of Random process.
4.	To gain knowledge about the Correlation Functions.
5.	To learn about the applications of Fourier Transforms like Spectral Density and others.

UNIT I-PROBABILITY DISTRIBUTIONS (15 hours)

Random Variables - Moments - Moment generating function - Binomial, Poisson, Geometric, Exponential and Normal distributions - Functions of Random Variables.

UNIT II-TWO DIMENSIONAL RANDOM VARIABLES (12 hours)

Two dimensional Random Variables - Marginal and conditional distributions – Transformation of Random Variables - central limit theorem - simple problems.

UNIT III-RANDOM PROCESSES (12 hours)

Classification of Random processes - Stationarity - WSS and SSS processes - Poisson Random process - Renewal Process - Markov Chain and transition probabilities.

UNIT IV-CORRELATION FUNCTIONS (9 hours)

Autocorrelation function and its properties - Cross Correlation function and its properties - Linear System with Random inputs - Ergodicity.

UNIT V-SPECTRAL DENSITY **(12 hours)**

Power spectral Density Function - Properties - System in the form of convolution - Unit Impulse Response of the System - Einstein - Weiner-Khinchine Relationship - Cross Power Density Spectrum - Properties.

TEXT BOOKS

1. Veerarajan T, "*Probability, Statistics and Random Processes"*, Tata McGraw Hill,3rd edition, 2008.
2. Trivedi K S, "*Probability and Statistics with reliability, Queueing and Computer Science Applications*",Prentice Hall of India,New Delhi,2nd revised edition, 2002.

REFERENCES

1. Sivaramakrishna Das P. and Vijayakumari.C,A Textbook of Probability and Random Processes, Viji's academy,2010
2. Papoulis, Probability, Random variables and stochastic processes, 4th edition , Tata McGraw Hill Company,2002.

MA1024 - PROBABILITY AND RANDOM PROCESS												
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		X								
4.	Approval	23rd Meeting of Academic Council, May 2013										

EC1011	TRANSMISSION LINES AND NETWORKS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1005				

PURPOSE

To lay a strong foundation on the theory of transmission line and networks by highlighting their applications.

INSTRUCTIONAL OBJECTIVES

1.	To become familiar with propagation of signals through lines.

2.	Calculation of various line parameters by conventional and graphical methods.
3.	Need for impedance matching and different impedance matching techniques.
4.	Design of different types of filters, equalizer and attenuators.

UNIT I-TRANSMISSION LINE THEORY (9 hours)

General theory of Transmission lines - the transmission line – general solution – The infinite line – Wavelength, velocity of propagation – Waveform distortion – the distortionless line - Loading and different methods of loading – Line not terminated in Z0 – Reflection coefficient – calculation of current , voltage, power delivered and efficiency of transmission – Input and transfer impedance - Open and short circuited lines – reflection factor and reflection loss.

UNIT II-HIGH FREQUENCY TRANSMISSION LINES (8 hours)

Transmission line equations at radio frequencies – Line of Zero dissipation – Voltage and current on the dissipationless line, Standing Waves, Nodes , Standing Wave Ratio – Input impedance of the dissipationless line - Open and short circuited lines – Power and impedance measurement on lines – Reflection losses – Measurement of VSWR and wavelength.

UNIT III-IMPEDANCE MATCHING IN HIGH FREQUENCY LINES (9 hours)

Impedance matching: Quarter wave transformer – Impedance matching by stubs – Single stub and double stub matching – Smith chart – Solutions of problems using Smith chart – Single and double stub matching using Smith chart.

UNIT IV-PASSIVE FILTERS (9 hours)

Characteristic impedance of symmetrical networks – filter fundamentals. Design of filters: Constant K, Low Pass, High Pass, Band Pass, Band Elimination, m-derived sections and composite.

UNIT V-ATTENUATORS AND EQUALIZERS (10 hours)

Attenuators: T, π, Lattice Attenuators, Bridged – T attenuator, L-Type Attenuator. Equalizers: inverse network, series, full series, shunt, full shunt, constant resistance T, constant resistance π, constant resistance lattice and bridged T network.

TEXT BOOKS

1. John D.Ryder, *"Networks, Lines and Fields",* PHI, 2009.
2. Sudhakar. A, Shyammohan S Palli, *"Circuits and Networks – Analysis and Synthesis",* Tata McGraw Hill, 4th Edition, 2010.

REFERENCE

1. Umesh Sinha, *"Transmission Lines and Network",* Satya Prakashan Publishing Company, New Delhi, 2012

EC1011 TRANSMISSION LINES AND NETWORKS												
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				X	
2.	Mapping of instructional objectives with student outcome		1,2,3, 4	4	4		1,2,3, 4				2,3,4	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
		X				
5.	Approval	23rd meeting of academic council, May 2013				

EC1012	**ELECTRONIC CIRCUITS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1006				

PURPOSE

The purpose of this course is to introduce to the students the basics of biasing transistor circuits, feedback amplifiers, large signal amplifiers, tuned amplifiers, oscillators, wave shaping circuits, and to design and analyze various electronic circuits and systems

INSTRUCTIONAL OBJECTIVES

At the end of this course, the students will learn

1.	Operating point calculations, working and design of basic amplifiers, power amplifiers and tuned amplifiers.
2.	Working of different types of feedback amplifiers & oscillators.
3.	Frequency response and design of tuned amplifiers.
4.	Basic working & design of wave shaping circuits.

UNIT I-BIASING CIRCUITS AND SMALL SIGNAL MODELS (9 hours)

Biasing circuits : DC load line and bias point – BJT biasing circuits – FET biasing circuits.

Small-signal models : AC load line, BJT models and parameters – hybrid equivalent model – hybrid $\prod$ model, FET small-signal model and parameters.

UNIT II-SMALL-SIGNAL AMPLIFIERS - ANALYSIS AND FREQUENCY RESPONSE (9 hours)

BJT amplifiers : CE, CB and CC amplifiers – multistage amplifiers - differential amplifier – designing BJT amplifier networks.(analysis using hybrid $-\pi$ model)

FET amplifiers : CS, CG and CD amplifiers –designing FET amplifier networks

Frequency response : low frequency response of BJT and FET amplifiers – Miller effect capacitance – high frequency response of BJT and FET amplifiers.

UNIT III-FEEDBACK AND OSCILLATOR CIRCUITS (9 hours)

Feedback circuits : concept of feedback – effects of negative feedback – feedback connection types – practical feedback circuits – phase and frequency considerations – designing feedback amplifier circuits.

Oscillator circuits : oscillator principles – LC oscillators – RC oscillators – crystal oscillators – designing oscillator circuits.

UNIT IV-POWER AMPLIFIERS AND TUNED AMPLIFIERS (9 hours)

Power amplifiers : definitions and amplifier types – Q point placement – maximum dissipation hyperbola – Class A amplifier – Class B and Class AB push-pull amplifiers – Class C amplifiers – Amplifier distortions – heat sink – designing power amplifier circuits.

Tuned amplifiers : need for tuned circuits – single tuned – double tuned – synchronously tuned amplifiers – impedance matching to improve gain – design of basic tuned amplifier – video amplifier circuits (CA3040).

UNITV-SOLID STATE SWITCHING CIRCUITS (9 hours)

Types of waveforms – transistor switching times – multivibrators – astable multivibrator – monostable multivibrator – bistable multivibrator – schmitt trigger – design of multivibrators and Schmitt trigger.

TEXT BOOKS

1. Robert L. Boylestad and Louis Nashelsky, *"Electronic Devices and Circuit Theory",* Pearson Education, 9th Edition, 2009.
2. David A Bell, *"Fundamentals of Electronic Devices and Circuits",* Oxford University Press, 2009.
3. David A. Bell, *"Solid State Pulse Circuits",* Oxford University Press, 2007.

REFERENCES

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, *"Electron Devices and Circuits",* Tata McGraw Hill, 2010.
2. Thomas L. Floyd, *"Electronic Devices",* 9th edition, Pearson Education, 2011.
3. Albert P. Malvino, David J. Bates, *"Electronic Principles", 7*th edition, Tata McGraw Hill, 2007.

EC1012 ELECTRONIC CIRCUITS												
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		X				X	X
2.	Mapping of instructional objectives with student outcome	1,2,3	1,2, 3	1,2, 3	4		1,2,3				3	1,2,3, 4
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences &Technical Arts (E)				Professional Subjects (P)		
										X		
4.	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
						X						
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1013	LINEAR INTEGRATED CIRCUITS	L	T	P	C
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1006				

PURPOSE

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

INSTRUCTIONAL OBJECTIVES

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

UNIT I-OPERATIONAL AMPLIFIER CHARACTERISTICS (9 hours)

Op-amp symbol, terminals, packages and specifications - Block diagram Representation of op-amp- Ideal op-amp & practical op-amp - Open loop & closed loop configurations – DC & AC performance characteristics of op-amp – Frequency compensation - Noise – Differential amplifiers – General Description, Manufacturer's Specification, Electrical Characteristics and internal schematic of 741 op-amps.

UNIT II-OP–AMP APPLICATIONS (9 hours)

Basic op-amp circuits: Inverting & Non-inverting voltage amplifiers - Voltage follower - Summing, scaling & averaging amplifiers - AC amplifiers.

Linear Applications: Instrumentation Amplifiers-V-to-I and I-to-V converters-Differentiators and Integrators.

Non-linear Applications: Precision Rectifiers – Wave Shaping Circuits (Clipper and Clampers) – Log and Antilog Amplifiers – Analog voltage multiplier circuit and its applications – Operational Trans-Conductance Amplifier (OTA) - Comparators and its applications – Sample and Hold circuit.

UNIT III-WAVEFORM GENERATORS AND PLL (9 hours)

Waveform Generators: Sine-wave Generators – Square / Triangle / Saw-tooth Wave generators.

IC 555 Timer: Monostable operation and its applications – Astable operation and its applications.

PLL: Operation of the Basic PLL-Closed loop analysis of PLL-Voltage Controlled Oscillator-PLL applications.

UNIT IV-ACTIVE FILTERS & VOLTAGE REGULATOR (9 hours)

Filters: Comparison between Passive and Active Networks**-**Active Network Design – Filter Approximations**-**Design of LPF, HPF, BPF and Band Reject Filters – State Variable Filters – All Pass Filters – Switched Capacitor Filters.

Voltage Regulators: Basics of Voltage Regulator – Linear Voltage Regulators using Op-amp – IC Regulators (78xx, 79xx, LM 317, LM 337, 723)-Switching Regulators.

UNIT V-DATA CONVERSION DEVICES (9 hours)

Digital to Analog Conversion: DAC Specifications – DAC circuits – Weighted Resistor DAC-R-2R Ladder DAC-Inverted R-2R Ladder DAC-Monolithic DAC

Analog to Digital conversion: ADC specifications-ADC circuits-Ramp Type ADC-Successive Approximation ADC-Dual Slope ADC-Flash Type ADC- Monolithic ADC.

TEXT BOOKS

1. Roy Choudhury and Shail Jain, *"Linear Integrated Circuits",* 2nd Edition, New Age International Publishers, 2003.
2. Salivahanan.S. and Kanchana. V.S, Bhaaskaran, *"Linear Integrated Circuits",* 6th Edition, Tata McGraw-Hill, 2011.
3. Ramakant A.Gayakwad, *"Op-Amps and Linear Integrated Circuits",* 4th Edition, Prentice Hall, 2000.

REFERENCES

1. Robert F. Coughlin, Frederick F. Driscoll, *"Operational-Amplifiers and Linear Integrated Circuits",* 6th Edition, Prentice Hall, 2001.
2. Sergio Franco, "Design with operational amplifier and analog integrated circuits", McGraw Hill, 1997.

EC1013 LINEAR INTEGRATED CIRCUITS												
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	1,2,3	1,2,3								2,4
3	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
										X		
4	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
						X						
5	Approval	23rd Meeting of Academic Council, May 2013										

EC1014	ELECTRONIC CIRCUITS LAB	L	T	P	C
	Total Contact Hours – 45	0	0	3	2
	Prerequisite				
	Nil				

PURPOSE

The purpose of the lab is to train the students to design and analyze the operation of discrete amplifier and oscillator circuits and understand their functionality. This Laboratory can also support many experiments and new ideas which are evolved in the mind of students.

INSTRUCTIONAL OBJECTIVES	
1.	To provide hands-on experience to the students so that they are able to put theoretical concepts to practice
2.	To use computer simulation tolls such as PSPICE, or Multisim to carry out design experiments as it is a key analysis tool of engineering design
3.	To give a specific design problem to the students, which after completion they will verify using the simulation software or hardwired implementation

LIST OF EXPERIMENTS

1. Biasing networks for BJT & FET.
2. Transient analysis and frequency response of single-stage BJT & FET amplifiers.
3. Transient analysis and frequency response of multi-stage BJT & FET amplifiers.
4. Frequency response of BJT & FET feedback amplifiers.
5. Transistor Oscillators.
6. Frequency response of Single Tuned Amplifier.
7. Transistor Multivibrators & Schmitt Trigger.
8. Simulation experiments using PSPICE or Multisim.

REFERENCES

1. *"LAB MANUAL"*, Department of ECE, SRM University
2. Paul B Zbar and Albert P Malvino, Michael A Miller, *"Basic Electronics: A Text Lab Manual"*, 7th edition, Tata McGraw Hill, 2009.
3. David A Bell, *"Laboratory Manual for Electronic Devices and Circuits"*, 4th edition, PHI, 2001.
4. David A Bell, *"Laboratory Manual for Operational Amplifiers & Linear ICs"*, 2nd edition, PHI
5. Muhammed H Rashid, *"SPICE for circuits and electronics using PSPICE"*, 2nd edition, PHI, 1995.
6. Maheswari.L.K and Anand.M.M.S, *"Laboratory Manual for Introductory Electronic Experiments"*, New Age, 2010.

EC1014 ELECTRONIC CIRCUITS LAB												
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	1,2,3		1,2,3				3	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)		Professional Subjects (P)
						X
4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
				X		
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1015	**LINEAR INTEGRATED CIRCUITS LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**0**	**0**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

The purpose of the lab is to train the students to design and analyze the operation of operational amplifier and oscillator circuits and understand their functionality. This Laboratory can also support many experiments and new ideas which are evolved in the mind of students.

INSTRUCTIONAL OBJECTIVES

1.	To provide hands-on experience to the students so that they are able to put theoretical concepts to practice.
2.	To use computer simulation tolls such as PSPICE, or Multisim to carry out design experiments as it is a key analysis tool of engineering design.
3.	To give a specific design problem to the students, which after completion they will verify using the simulation software or hardwired implementation.

LIST OF EXPERIMENTS

1. Basic op-amp circuits such as inverting & non-inverting amplifiers, adders and subtractors.
2. Linear applications of op-amp such as Integrator and Differentiator.
3. Non-linear application of op-amp such as precision rectifiers and comparators.
4. op-amp oscillators such as Wein Bridge and RC Phase Shift oscillator.
5. 555 Timer – Astable and Monostable operation.
6. Active Filters such as LPF, HPF, BPF and Notch filter.
7. Digital to Analog converter and Analog to Digital converter (any one method).
8. Simulation experiments using PSPICE or Multisim.

REFERENCES

1. LAB MANUAL, Department of ECE, SRM University
2. David A Bell, *"Laboratory Manual for Operational Amplifiers & Linear ICs"*, 2nd edition, PHI.
3. Muhammed H Rashid, *"SPICE for circuits and electronics using PSPICE"*, 2nd edition, PHI, 1995.
4. Maheswari.L.K and Anand.M.M.S, *"Laboratory Manual for Introductory Electronic Experiments"*, New Age, 2010.

<table>
<tr><th colspan="13">EC1015 LINEAR INTEGRATED CIRCUITS LAB</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="11">Department of Electronics and Communication 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>X</td><td>X</td><td></td><td>X</td><td></td><td></td><td></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>1,2, 3</td><td>1,2, 3</td><td></td><td>1,2, 3</td><td></td><td></td><td></td><td>3</td><td></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">Communication</td><td colspan="2">Signal Processing</td><td colspan="2">Electronics</td><td>VLSI</td><td colspan="3">Embedded</td></tr>
<tr><td colspan="3"></td><td colspan="2"></td><td colspan="2">X</td><td></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>

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

UNIT IV **(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										

MA1015	**DISCRETE MATHEMATICS**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**
	Total Contact Hours - 60				
	(Common to CSE, SWE, ECE,TCE & EEE)				

PURPOSE

To impart analytical ability to describe, analyze and solving mathematical problems as applied to the respective branches of Engineering in a logical and systematic fashion.

INSTRUCTIONAL OBJECTIVES

1.	To understand Logic and mathematical reasoning and to count /enumerate objects in a systematic way. To understand Mathematical induction and recursion.
2.	To understand Set theory, relations and functions and to Read, understand and construct mathematical arguments.
3.	To understand Recurrence Relation, Generating functions and Algebraic Systems and their applications in coding theory - Group codes.
4.	To understand to apply graph theory to solve real-world problems like traveling salesman problem and networks and the maximum flow problem
5.	To understand Boolean algebra and its application to switching theory. To understand grammars, finite state machines and Turing Machines

UNIT I - MATHEMATICAL LOGIC (**12 hours)**

Propositions and Logical operators - Truth tables and propositions generated by a set - Equivalence and Implication - Tautologies - Laws of logic - Proofs in Propositional calculus - Direct proofs - Conditional conclusions - Indirect proofs - Mathematical Induction - The existential and universal quantifiers - Predicate calculus including theory of inference.

UNIT II - SET THEORY (**12 hours)**

Laws of Set theory - Partition of a set - The duality principle - Relations – Properties - Equivalence relation and partial order relation-poset-Graphs of relations - Hasse diagram - Matrices of relations - Closure operations on relations - Warshall's algorithm - Functions – Combinatorics - Pigeonhole Principle – Generalized Pigeon hole principle

UNIT III - RECURRENCE RELATION & ALGEBRAIC SYSTEMS (**12 hours)**

Recurrence relations - Solving a recurrence relation – Homogeneous and Non-homogeneous Recurrence relations - Formation of Recurrence relations obtained from solutions - Generating functions - Solution of a recurrence relation using generating functions - Groups – Properties - Cyclic groups and subgroups – Properties – Cosets – Lagrange's Theorem - Normal subgroups – Group Homomorphism.

UNIT IV - GRAPH THEORY (**12 hours)**

Basic concepts - Basic Definitions – Some Special Graphs – Matrix Representation of Graphs -–- Paths and circuits - Eulerian and Hamiltonian Graphs – connected graphs - Trees - Spanning Trees - Rooted trees - Binary Trees - Kruskal's algorithm - Traversals of Binary trees.

UNIT V - BOOLEAN ALGEBRA & FORMAL LANGUAGES (**12 hours)**

Boolean algebra - Application of Boolean Algebra to switching theory. Languages - Recognition and generation - Phase structure grammars and languages – Finite state Machine - Recognition in regular languages.

TEXT BOOKS

1. Alan Doerr and Kenneth Levasseur, "*Applied Discrete Structures for Computer Science*", Galgotia Publications (P) Ltd, 1992.
2. Tremblay J. P. and Manohar R., "*Discrete Mathematical Structures with applications to Computer Science*", Tata Mc Graw Hill Publishing Co., 35th edition, 2008.

REFERENCES

1. Sundaresan V, Ganapathy Subramanian K.S and Ganesan K, "*Discrete Mathematics*", New Revised Edition, A. R. Publications, 2001.
2. Kolman and Busby, "*Discrete Mathematical Structures for Computer Science*", Prentice Hall, 3rd edition, 1997.
3. Kenneth H.Rosen, "*Discrete Mathematics and its Application*", Fifth edition, Tata McGraw-Hill Publishing company PVT .Ltd., New Delhi, 2003.
4. Lipschutz Seymour, Marc Lars Lipson, "*Discrete Mathematics*", Mc Graw Hill Inc., 1992.
5. Liu C.L, "*Elements of Discrete Mathematics*", 2nd Edition, McGraw Hill Publications, 1985.

MA 1015 - DISCRETE MATHEMATICS												
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										

EC1016	**MICROPROCESSORS AND MICROCONTROLLERS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1012				

PURPOSE

The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/microcontroller implementation.

INSTRUCTIONAL OBJECTIVES

Through the use of assembly language, by the end of the course students will become thoroughly familiar with the elements of microprocessor software and hardware. They will be able to:

1. Understand fundamental operating concepts behind microprocessors and microcontrollers.

2.	Appreciate the advantages in using microprocessors / microcontrollers in engineering applications.
3.	Design microprocessor based solutions to problems.
4.	Understand low-level programming.
5.	Apply this knowledge to more advanced structures.

UNIT I-MICROPROCESSOR- 8086 (9 hours)

Register Organization -Architecture-Signals-Memory Organization-Bus Operation-I/O Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts - Service Routines – I/O and Memory Interfacing concepts.

UNIT II-PROGRAMMING OF 8086 (12 hours)

Addressing Modes-Instruction format-Instruction set-Assembly language programs in 8086. RISC architecture – introduction to ARM Programming-register configuration and instruction set – sample program.

UNIT III-INTERFACING DEVICES (8 hours)

Programmable Peripheral Interface (8255) - Programmable Interval Timer (8254) - Programmable Interrupt Controller (8259A) - Programmable DMA Controller (8257) - Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

UNIT IV-MICROCONTROLLER-8051 (8 hours)

Register Set-Architecture of 8051 microcontroller- I/O and memory addressing-Interrupts-Instruction set- Addressing modes. .

UNIT V-PROGRAMMING AND INTERFACING OF 8051 (8 hours)

Timer-Serial Communication-Interrupts Programming-Interfacing to External Memory-Interfacing to ADC, LCD, DAC, Keyboard and stepper motor.

TEXT BOOKS.

1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "*The 8051 - Microcontroller and Embedded systems*", 7th Edition, Pearson Education, 2004.
2. Doughlas.V.Hall, "*Microprocessor and Interfacing : Programming and Hardware*", Revised 2nd edition, McGraw Hill, 1992
3. Steve Furber, "*ARM System On Chip Architecture*", Second Edition, Pearson Education, 2000.

4. Ray.K and Bhurchandi.K.M, "*Advanced Microprocessors and Peripherals – Architectures, Programming and Interfacing*", Tata McGraw Hill, 2002 Reprint

REFERENCES

1. Kenneth.J.Ayala, "*8051 Microcontroller Architecture, Programming and Applications*", 3rd edition, Thomson, 2007.

EC1016 MICROPROCESSORS AND MICROCONTROLLERS												
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		X			X	X	X
2.	Mapping of instructional objectives with student outcome	1,3,4	1,3,4	1,2,3 ,4	1,2,3 ,4		4,5			5	5	5
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
										X		
4.	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
										X		
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1017	**DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	**3**	**1**	**0**	**4**
	Prerequisite				
	EC1008				

PURPOSE

The purpose of this course is to introduce the concepts of Digital signal processing and DSP Processor. The mathematical analysis of FIR and IIR filter design and simulation using MATLAB are dealt with in detail

INSTRUCTIONAL OBJECTIVES

At the end of this course, the students will be able to understand the

1.	Structures of Discrete time signals and systems.
2.	Fast Fourier Transform Implementations, Frequency response and design of FIR and IIR filters.
3.	Finite word length effect.
4.	DSP Processor- TMS320C5X.

UNIT I-REVIEW OF DISCRETE TIME SIGNALS AND SYSTEMS (9 hours)

Overview of signals and systems – DFT–FFT using DIT and DIF algorithms – Inverse DFT-FFT using DIT and DIF algorithms – Applications – Circular convolution – MATLAB programs for DFT and FFT.

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

Design of analog filters using Butterworth and Chebyshev approximations – IIR digital filter design from analog filter using impulse invariance technique and bilinear transformations – Matlab programs for IIR filters.

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

Linear phase response – Design techniques for FIR filters – Fourier series method and frequency sampling method –Design of Linear phase FIR filters using windows: Rectangular, Hanning and Hamming windows – Matlab programs for FIR filters.

UNIT IV-FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS (9 hours)

Fixed point arithmetic – effect of quantization of the input data due to Finite word length. Product round off – need for scaling – Zero input limit cycle oscillations - Limit cycle oscillations due to overflow of adders – Table look up implementation to avoid multiplications.

UNIT V-PROCESSOR FUNDAMENTALS (9 hours)

Features of DSP processors – 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).

Tutorial : (15 hours)

TEXT BOOKS

1. John G. Proakis and Dimitris C. Manolakis, *"Digital Signal Processing Principles, Algorithms and Applications",* Pearson Education, Fourth edition, 2007.
2. Venkataramani.B, Bhaskar.M, *"Digital Signal Processors, Architecture, Programming and Application",* Tata McGraw Hill, New Delhi, 2003.

REFERENCES

1. Sanjit Mitra, *"Digital Signal Processing – A Computer based approach",* Tata McGraw Hill, New Delhi, 2011.

2. Hayes.M.H, *"Digital Signal Processing",* Tata McGraw Hill, New Delhi, Edition, 2009.

EC1017 DIGITAL SIGNAL PROCESSING												
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			X			X
2.	Mapping of instructional objectives with student outcome	1	2,4	2		1,2			3			2
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences &Technical Arts (E)				Professional Subjects (P)		
										x		
4.	Broad Area	Communication		Signal Processing		Electronics			VLSI	Embedded		
				x								
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1018	**COMMUNICATION THEORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The course considers analog communication systems and techniques. In this course we will introduce some of the basic mathematical concepts that will allow us to think in the two "domains" of communications, the time domain and the frequency domain. We will cover the basic types of analog modulation (AM, FM, and PM) from both a mathematical description and from a block-diagram system approach.

INSTRUCTIONAL OBJECTIVES

The scope of this course is to provide the complete analysis of Analog communications. This knowledge helps them to acquire better application of these principles in Digital communications. The overall objective is to introduce the student to the basics of communication theory. This course emphasizes:

1.	Analog modulation and demodulation techniques.
2.	Acquiring mathematical understanding of Analog Communication Systems.
3.	Understanding the trade-offs (in terms of bandwidth, power, and complexity requirements)
4.	Performance evaluation of communication systems in the presence of noise.
5.	Design of practical communication system at the block diagram level under certain constraints and requirements.

UNIT I-AMPLITUDE MODULATION SYSTEMS (10 hours)

Need for modulation, Amplitude Modulation System, Single Tone & Multiple Tone Amplitude Modulation, Power Relation, Generation of Amplitude Modulation – Linear Modulation – Collector Modulation method Non-linear Modulation – Square law Modulator, Product Modulator, Switching Modulator - Demodulation of Amplitude Modulation – Envelope Detector, Coherent Detector, VSB, Performance comparison of various Amplitude Modulation System.

UNIT II-ANGLE MODULATION SYSTEMS (10 hours)

Frequency Modulation, Types of Frequency Modulation, Generation of NBFM, WBFM, Transmission BW of FM Signal, Phase Modulation. Relationship between PM & FM, Comparison, Generation of FM Direct Method, Indirect method, Demodulation of FM - FM Discriminators.

UNIT III-RADIO RECEIVERS (6 hours)

Introduction – Functions & Classification of Radio Receivers, Tuned Radio Frequency (TRF) Receiver, Superheterodyne Receiver – Basic Elements, Receiver Characteristics, Frequency Mixers, AGC Characteristics.

UNIT IV-NOISE THEORY (9 hours)

Noise, Types of noise, White Noise, Addition of Noise due to several sources in series and parallel, Generalized Nyquist Theorem for Thermal Noise, Calculation of Thermal Noise for a Single Noise Source, RC Circuits & Multiple Noise sources. Equivalent Noise Bandwidth, Signal to Noise Ratio, Noise-Figure, Noise Temperature, Calculation of Noise Figure, Noise Figure Determination for Cascaded Stages of Amplifiers.

UNIT V-PERFORMANCE OF COMMUNICATION SYSTEM (10 hours)

Receiver Model, Noise in DSB-SC Receivers, Noise in SSB-SC Receivers, Noise in AM receiver (Using Envelope Detection), Noise in FM Receivers, FM Threshold Effect, Threshold Improvement through Pre-Emphasis and De-Emphasis, Noise in PM system – Comparison of Noise performance in PM and FM, Link budget analysis for radio channels.

TEXT BOOKS

1. John G. Proakis & Masoud Salehi, *"Communication System Engineering",* 2nd Edition, 2002.
2. Singh.R.P. & Sapre. S.D, *"Communication Systems: Analog & Digital",* 3rd Edition, Tata McGraw-Hill, 2012.

REFERENCES

1. Sanjay Sharma, "*Communication Systems, Analog & Digital*", S.K. Kataria & Sons, 5th Edition, 2009.
2. Dennis Reddy & John Coolen, *"Electronic Communications",* 4th Edition, Prentice Hall, 2008.

EC1018 COMMUNICATION THEORY												
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	X	X			X		X
2.	Mapping of instructional objectives with student outcome	1,2	1,2, 4	4	5	1,2, 5	5			5		1,2 ,3
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences & Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad area	Communication			Signal Processing		Electronics		VLSI	Embedded		
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1019	**PROCESSOR LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**0**	**0**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

This laboratory will provide the students a perfect introduction to the world of Microprocessors and to provide hands-on experience essential to the real understanding of microprocessors architecture and it's interfacing to the peripheral devices. The experiments are designed to provide the students with the design principles of microprocessor systems and real time programming. The course accomplishes this by using microprocessor kits, simulators and software development systems.

INSTRUCTIONAL OBJECTIVES

1.	To demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.
2.	To apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.
3.	To interface the processor to external devices.

LIST OF EXPERIMENTS

PART-A: GENERAL PURPOSE PROGRAMMING EXERCISES

Minimum six experiments to be conducted.

1. Introduction of Microprocessor and Microcontroller Kit.
2. Addition, Subtraction, Multiplication and Division.
3. Finding the maximum value in an array.
4. Sorting of data.
5. Finding number of positive / negative elements in a block of data.
6. BCD-to-Hex conversion and Hex-to-BCD conversion.
7. Binary-to-ASCII and ASCII-to-Binary conversion.
8. Square Root of a given data.
9. LCM and GCD.

PART-B: INTERFACING WITH APPLICATION BOARDS

Minimum six experiments to be conducted

1. 8255 PPI.
2. Transfer data serially between two kits (Study of 8253/8251).
3. 8279 Keyboard & display
4. Seven segment display
5. LCD Display
6. Traffic light.
7. 8259 programmable interrupt controller.
8. 8257/8237 DMA controller.
9. 8 bit ADC and 8 bit DAC.
10. Stepper motor control.
11. DC motor speed measurement and control module.
12. Real Time Clock.
13. Logic Controller.

REFERENCES

1. LAB MANUAL, Department of ECE, SRM University
2. Ray.A.K and Bhurchandi.K.M, "*Advanced Microprocessors and Peripherals*", Tata McGraw-Hill, 2006.
3. Muhammad Ali Mazidi and Janice Gillispie Mazidi, Rolin D. McKinlay, "*The 8051 – Microcontroller and Embedded Systems: Using Assembly and C*", 2nd Edition, Pearson Education, 2011.

EC1019 PROCESSOR LAB												
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				X	
2.	Mapping of instructional objectives with student outcome			1,2, 3	1,2, 3	3	1,2, 3				3	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences &Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
				X		X
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1020	COMMUNICATION ENGINEERING LAB	L	T	P	C
	Total Contact Hours – 45	0	0	3	2
	Prerequisite				

PURPOSE

The experiments in this laboratory enable the students to gather basic knowledge on communication systems. Different experiments are performed which forms the fundamental blocks of any communication system used now-a-days. Experiments are performed using electronic instrument, such as oscilloscopes, signal generators, spectrum analyzers, and network analyzers. Certain experiments are simulated using MATLAB and P-SPICE simulation software.

INSTRUCTIONAL OBJECTIVES

1.	To practice the basic theories of analog communication system.
2.	To provide hands-on experience to the students, so that they are able to apply theoretical concepts in practice.
3.	To use computer simulation tools such as P-SPICE, or Matlab to carry out design experiments as it is a key analysis tool of engineering design.
4.	To give a specific design problem to the students, which after completion they will verify using the simulation software or hardware implementation.

LIST OF EXPERIMENTS

1. AM modulator and Demodulator.
2. DSB-SC modulator and Demodulator.
3. SSB modulator and Demodulator.
4. FM modulator and Demodulator.

5. PAM modulator and Demodulator.
6. TDM Multiplexer and Demultiplexer.
7. FDM Multiplexer and Demultiplexer.
8. Pre emphasis and De-emphasis in FM.
9. Simulation experiments using P-SPICE and Matlab.

a) AM modulator with AWGN noise in Matlab.
b) Pre-emphasis and De-emphasis in FM using P-SPICE.

REFERENCES

1. John O. Attia, *"PSPICE and MATLAB for Electronics: An integrated approach",* CRC press, 2002.
2. LAB MANUAL, Department of ECE, SRM University.

EC1020 COMMUNICATION ENGINEERING LAB												
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	X	
2.	Mapping of instructional objectives with student outcome			1,2, 3,4	1,2, 3,4		1,2, 3			4	3	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
		X				

5.	Approval	23rd Meeting of Academic Council, May 2013

EC1047	**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 Electronics and Communication 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 Electronics and Communication 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><th colspan="14">EC1047 INDUSTRIAL TRAINING I</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="12">Department of Physics and Nanotechnology</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="2">Basic Sciences (B)</td><td colspan="3">Engineering Sciences & 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">Communication</td><td colspan="2">Signal Processing</td><td>Electronics</td><td>VLSI</td><td colspan="3">Embedded</td></tr>
<tr><td colspan="3"></td><td colspan="2"></td><td></td><td></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 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										

EC1021	ANTENNA AND WAVE PROPAGATION	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1005, EC1011				

PURPOSE

The purpose of this course is to enable the students to understand the basics of antennas and various types of antenna arrays and its radiation patterns. The main objective of this subject is to help students to identify the different latest antennas available for specific communication.

INSTRUCTIONAL OBJECTIVES

1.	To study various antennas, arrays and radiation patterns of antennas.
2.	To learn the basic working of antennas.
3.	To understand various techniques involved in various antenna parameter measurements.
4.	To understand the propagation of radio waves in the atmosphere.

UNIT I-ANTENNA FUNDAMENTALS AND RADIATION (9 hours)

Definition and function of antennas – Antenna theorems-Antenna parameters – Radiation Mechanism – Antenna field zones – Radiation from a small current element – Power radiated by a small current element and its radiation resistance – Hertzian dipole – Half wave dipole – Monopole – Current distributions.

UNIT II-ANTENNA ARRAYS AND SYNTHESIS (9 hours)

Linear arrays – Analysis of linear arrays – Phased arrays – Binomial arrays – Pattern multiplication – Method of excitation of antennas – Impedance matching techniques.

Synthesis methods: Schelkunoff polynomial – Fourier transform – Wooden Lawson method.

UNIT III-SPECIAL PURPOSE ANTENNAS (9 hours)

Travelling wave – Loop – small loop – Dipole and Folded dipole antennas – Horn antenna – Reflector antenna – Yagi – Uda antenna – Log periodic antenna – Helical and Micro strip antennas. Introduction to CAD tools used for antenna modeling.

UNIT IV-ANTENNA MEASUREMENTS (9 hours)

Drawbacks in measurements of antenna parameters – Methods to overcome drawbacks in measurements –Measurement ranges – Impedance – Gain – Radiation pattern – Beam width – Radiation resistance – Antenna efficiency-Directivity-Polarization and Phase Measurements.

UNITV-RADIO WAVE PROPAGATION (9 hours)

Basics of propagation-Ground wave propagation – Space wave propagation-Considerations in space wave propagation – Super refraction – Ionospheric wave propagation – Structure of ionosphere – Mechanism of ionospheric propagation – Effect of earth's Magnetic field on Radio wave propagation – Virtual height – MUF – Skip distance – OWF – Ionosphere abnormalities.

TEXT BOOKS

1. John D Kraus, Ronald J Marhefka, Ahmad S Khan, *"Antenna and Wave Propagation",* Tata McGraw Hill, 4th Edition, 2010.
2. Yadava.R.L, *"Antennas and Wave Propagation",* PHI, 2011.

REFERENCES

1. Constantine Balanis.A, *"Antenna Theory: Analysis and Design",* Third Edition, John Wiley and Sons, 2012.
2. Raju.G.S.N, *"Antennas and wave propagation",* 1st Edition Pearson Education, 2012.
3. Robert S. Elliott, *"Antenna Theory and Design",* John Wiley and Sons, Revised Edition, 2007.

EC1021 ANTENNA AND WAVE PROPAGATION												
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						X
2.	Mapping of instructional objectives with student outcome	1,2,3	1,2, 4	2,4		1,2, 3						2,3
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
										X		
4.	Broad area	Communication		Signal Processing		Electronics			VLSI	Embedded		
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1022	MICROWAVE AND OPTICAL COMMUNICATIONS	L	T	P	C
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1005 , EC1006				

PURPOSE

To expose basics of Microwave and Optical devices and components. To introduce the students to a few microwave measurements. To expose various optical fiber modes configurations and various signal degradation factors associated with optical fiber and to the design simple optical communication system.

INSTRUCTIONAL OBJECTIVES

1.	To understand all basic Microwave and Optical devices and components.
2.	To learn few microwave measurements and analyze parameters.
3.	To understand the principles of fiber-optic communications and the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
4.	To design the optical communication system.

UNIT I-MICROWAVE AMPLIFIERS AND OSCILLATORS (9 hours)

Introduction to microwave transmission – Application and limitation – Klystron amplifier – Reflex Klystron Oscillator – TWT amplifiers – Magnetron Oscillator – Gunn oscillator.

UNIT II-MICROWAVE COMPONENTS (9 hours)

Directional coupler – E plane Tee, H- plane Tee – Magic Tee – Circulators – Isolators – Attenuators – Phase Shifters – Avalanche breakdown devices, PIN diode and TUNNEL diode.

Power, VSWR, Impedance Measurement.

UNIT III-INTRODUCTION TO OPTICAL FIBERS AND TRANSMISSION CHARACTERISTICS (9 hours)

The propagation of light in optical waveguides – Classification of optical fibers – Numerical aperture, Step index and Graded index fiber – Modes in cylindrical fiber – Linearly polarized modes,

Attenuation: Absorption, Scattering, Bending losses. Modal dispersion and chromatic dispersion – Single mode fiber - waveguide dispersion– MFD – PMD.

UNIT IV-OPTICAL TRANSMITTERS AND RECEIVERS (9 hours)

Optical Sources: - Light source materials – LED homo and hetero structures – surface and edge emitters – Quantum efficiency – Injection Laser Diode – Modes and threshold condition – Structures and Radiation Pattern.

Optical detectors: – Physical principles – PIN and APD diodes – Photo detector noise

UNIT V-OPTICAL COMMUNICATION SYSTEMS AND DESIGN (9 hours)

Transmitter module: Signal formats – Electronic driving circuit – Modulation circuit – external modulators.

Amplifier: EDFA, Semiconductor Optical Amplifier.

Receiver Module: Optical front end – Quantizer – Decision circuit.

Optical Link Design: Point- to- point links – System considerations – Link Power budget – Rise time budget.

TEXT BOOKS

1. Samuel Y. Liao, "*Microwave Devices and Circuits",* 3rd edition, Pearson education, 2011 reprint.
2. Keiser G, "*Optical Fiber Communication Systems",* 4th edition, Tata McGraw Hill. Edition, 2010.

REFERENCES

1. Collin.R.E, *"Foundations for Microwave Engineering",* 2nd edition, Tata McGraw Hill, 2006.
2. Djafar.K. Mynbaev Lowell and Scheiner, *"Fiber Optic Communication Technology",* Pearson Education Asia, 9th impression, 2011.

3. John Powers, *"An Introduction to Fiber optic Systems",* 2nd edition, Tata-McGraw Hill, 2010.

EC1022 MICROWAVE AND OPTICAL COMMUNICATION												
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	1,3	1,2,4	1,3,4								2,4
3	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)				Professional Subjects (P)	
											X	
4	Broad area	Communication		Signal Processing			Electronics		VLSI		Embedded	
		X										
5	Approval	23rd Meeting of Academic Council, May 2013										

EC1023	**DIGITAL COMMUNICATION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1018 , EC1020				

PURPOSE

To provide a comprehensive coverage of digital communication systems. The key feature of digital communication systems is that it deals with discrete messages and to add organization and structure to this field

INSTRUCTIONAL OBJECTIVES

To learn and understand

1. The process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals and digital modulation systems.
2. Baseband and passband transmission systems.
3. M-ary signaling and spread spectrum Techniques.

UNIT I-SAMPLING AND QUANTIZATION (9 hours)

Sampling Process – Aliasing – Instantaneous sampling – Natural Sampling –Flat Sampling – Quantization of signals – sampling and quantizing effects –channel effects – SNR for quantization pulses – data formatting techniques –Time division multiplexing.

UNIT II-DIGITAL MODULATION SYSTEMS (9 hours)

PCM Systems – Noise Considerations in PCM system – Overall Signal-to-noise ratio for PCM system – Threshold effect – Channel Capacity – Virtues, Limitations & Modification of PCM system – PCM Signal Multiplexing – Differential PCM – Delta Modulation – Noise Considerations in Delta Modulation – SNR Calculations – Comparison of PCM, DPCM & DM.

UNIT III-BASE BAND PULSE TRANSMISSION (9 hours)

Maximum likelihood receiver structure – Matched filter receiver – Probability error of the Matched filter – Intersymbol interference – Nyquist criterion for distortionless baseband transmission – Correlative coding – Eye pattern.

UNIT IV-PASS BAND DATA TRANSMISSION (9 hours)

Pass Band Transmission Model – Generation, Detection, Signal Space Diagram, Probability of Error for BFSK, BPSK, QPSK, DPSK, and Schemes – Comparison.

EC1023 DIGITAL COMMUNICATION												
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		X
2.	Mapping of instructional objectives with student outcome	1,2,3	1,2	2						1,2,3		2,3
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences &Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication			Signal Processing		Electronics		VLSI		Embedded	
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

UNITV-M-ARY SIGNALING AND INTRODUCTION TO SPREAD SPECTRUM TECHNIQUES (9 hours)

M-ary signaling, vectoral view of MPSK and MFSK signaling, symbol error performance of M-ary systems –Introduction – Discrete Sequence Spread Spectrum technique – Use of Spread Spectrum with CDMA-Ranging Using Discrete Sequence Spread Spectrum – Frequency Hopping Spread Spectrum – Generation & Characteristics of PN Sequence.

TEXT BOOKS

1. Bernard Sklar, *"Digital Communication, Fundamentals and Application",* Pearson Education Asia, 2nd Edition, 2001.
2. Simon Haykin, *"Communication Systems"*, John Wiley & Sons, 4th Edition, 2000.
3. Taub & Schilling, *"Principle of Communication Systems",* 2nd Edition, 2003.

REFERENCES

1. John G. Proakis, *"Digital Communication",* McGraw Hill Inc, 5th Edition, 2008.
2. Singh, R.P. & Sapre, S.D, *"Communication Systems: Analog & Digital",* Tata McGraw-Hill, 5th reprint, 2000.

	MICROWAVE AND OPTICAL COMMUNICATION LAB	**L**	**T**	**P**	**C**
EC1024	Total Contact Hours – 45	**0**	**0**	**3**	**2**
	Prerequisite				
	EC1006 , EC1009				

PURPOSE

Microwave communication deals with the study of operation and characteristics of microwave sources and microwave components. It also deals with the measurement of load impedance VSWR, antenna gain and radiation pattern. Optical communication deals with the study of the characteristics of the optical fiber, sources and detectors and setting up of analog and digital fiber links using LED and LASER sources.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize the students with microwave and optical communication techniques/technologies.
2.	To understand the fundamentals of microwave circuit design using ORCAD PSPICE tool, and become familiar with basic microwave measurements.
3.	To analyze optical signals and devices in optical communication systems, and learn how to measure and interpret optical signals.

LIST OF EXPERIMENTS

MICROWAVE EXPERIMENTS

1. Mode Characteristics of Reflex Klystron.
2. Study of power distribution in Directional coupler, E & H plane and Magic tee.
3. Wavelength and Frequency measurement.

4. Impedance measurement by slotted line method.
5. Gain and Radiation pattern of Horn antenna.
6. Study of Micro strip components.

OPTICAL COMMUNICATION EXPERIMENTS

1. D. C. Characteristics of LED and Laser diode.
2. D. C. Characteristics of PIN and APD photo diode.
3. Measurement of Numerical aperture, Propagation and Bending Loss in fiber.
4. Fiber Optic Analog and Digital Link.

PSPICE SIMULATION

1. Operating characteristics of Microwave semiconductor devices (bipolar transistors, GaAs FETs, varactor diodes, PIN diodes).
2. Microwave transistor amplifier and oscillator design.
3. Operating characteristics of optical devices (LED and photodiode).

REFERENCE

1. LAB MANUAL, Department of ECE, SRM University.

<table>
<tr><th colspan="13">EC1024 MICROWAVE AND OPTICAL COMMUNICATION LAB</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="11">Department of Electronics and Communication 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></td><td></td><td>X</td><td>X</td><td></td><td>X</td><td></td><td></td><td></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>1,2,3</td><td>1,2,3</td><td></td><td>1,2,3</td><td></td><td></td><td></td><td>3</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>
<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">Communication</td><td colspan="3">Signal Processing</td><td colspan="2">Electronics</td><td>VLSI</td><td colspan="3">Embedded</td></tr>
<tr><td colspan="3">X</td><td colspan="3"></td><td colspan="2"></td><td></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>

EC1025	DIGITAL COMMUNICATION LAB	L	T	P	C
	Total Contact Hours – 45	0	0	3	2
	Prerequisite				
	EC1018 , EC1020				

PURPOSE

This lab helps the students to understand the basic principles of digital communication systems by practical module systems. The experiments are designed in such a way that the theoretical concepts introduced in lectures are re-discussed and implemented practically.

INSTRUCTIONAL OBJECTIVES

1.	To demonstrate digital communication concepts using hands-on experience and using simulation environments such as PSPICE / Multisim, or Matlab/Simulink, or LabVIEW.
2.	To use commercial, modular systems which have some distinct advantages over breadboarding to examine more complex communication topics and to deliver a hands-on laboratory experience.
3.	To use LabVIEW in conjunction with data acquisition cards and interconnected instruments, and to present communication concepts using real-world signals so that the students can investigate and manipulate.

LIST OF EXPERIMENTS

1. FSK Modulation and Demodulation.
2. PSK Modulation and Demodulation.
3. QPSK Modulation and Demodulation.
4. DPSK Modulation and Demodulation.
5. PAM Modulation and Demodulation.
6. PWM Modulation and Demodulation.
7. PPM Modulation and Demodulation.
8. Pulse Code Modulation and Demodulation.
9. Delta Modulation and Demodulation.
10. Differential Pulse Code Modulation and Demodulation.
11. Data formatting.
12. BER comparison of different modulation schemes in AWGN channel in MATLAB Simulink.
13. Performance analysis of different channels with error correcting codes.

REFERENCE

1. LAB MANUAL, Department of ECE, SRM University.

EC1025 DIGITAL COMMUNICATION LAB												
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	1,2,3		1,2,3				3	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences &Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
		X				
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1049	**MINOR PROJECT**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

To carry out a design project in one of the specializations of Electronics and communication engineering 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 following Electronics and communication engineering areas but with substantial multidisciplinary component involving Electrical Engineering, Computer Science Engineering, Information Technology, Mechanical Engineering, BioMedical Engineering.

Communication
Signal Processing
Electronics
VLSI
Embedded

Student groups will be formed (6 in a group) and a faculty member will be allocated to guide them. There will be three reviews. First review will not carry any marks but the project topic will be finalized in it. Of remaining 2 reviews one will be carried out in the mid-semester and the last one by the end of semester.

Assessment:

MARKS	AWARDED BY	CRITERIA
30	Guide	For regularity, systematic progress, extent of work and quality of work
20	Review committee during II review	Presentation, contents and viva
20	Review committee during III review	Quality of project report
10	Review committee during III review	Multidisciplinary component
20	Review committee during III review	Presentation, contents and viva

EC1049 MINOR PROJECT												
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	X	X	X	X	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	Communication		Signal Processing		Electronics		VLSI		Embedded		
		X		X		X		X		X		
5.	Approval	23rd Meeting of Academic Council, May 2013										

SEMESTER VII

EC1026	WIRELESS COMMUNICATION	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1023				

PURPOSE

To introduce the students to the concepts of wireless systems, mobile systems.

INSTRUCTIONAL OBJECTIVES

To understand and gain complete knowledge about.

1.	Basic wireless, cellular concepts.
2.	Radio wave propagation and Mobile Channel models.
3.	Various performance analysis of mobile communication system
4.	Standards 1G, 2G Basic system available.

UNIT I-INTRODUCTION TO WIRELESS COMMUNICATION (9 hours)

Evolution of Mobile Radio Communication – Examples of Wireless Communication System – Cellular concept – Frequency Reuse – Channel assignment – Hand off – Interference & System capacity – Trunking and Erlang – capacity calculation – Improving coverage and capacity.

UNIT II-MOBILE RADIO WAVE PROPAGATION (LARGE SCALE FADING)(9 hours)

Radio wave Propagation – Transmit and receive Signal Models – Free Space path loss – Ray Tracing – Empirical Path loss models – Simplified path loss model – Shadow fading – Combine path loss and Shadowing – Outage Probability under path loss & shadowing – Cell coverage area.

UNIT III-MOBILE RADIO WAVE PROPAGATION (SMALL SCALE FADING & MULTIPATH) (9 hours)

Small Scale Multipath Propagation – Impulse response model of a Multipath Channel – Small Scale Multipath Measurements – Parameters of Mobile Multipath Channels – Types of fading (fading effects due to Multipath Time Delay Spread & Doppler spread) – Rayleigh and Ricean Distribution.

UNIT IV-CAPACITY, DIVERSITY AND EQUALIZATION IN WIRELESS SYSTEM(9 hours)

Capacity in AWGN – Capacity of Flat Fading Channels – Channel and System Model – Channel Distribution Information known – CSI at Receiver

Diversity Technique – Selection combining – EGC – MRC – Feedback – Time – Frequency – Rake Receiver – Interleaving.

Equalization – Linear Equalization – Non linear (DFE & MLSE) – Algorithm of Adaptive Equalization – Zero Frequency algorithm – LMS algorithm – Recursive Least Square algorithm.

UNIT V-WIRELESS SYSTEMS AND STANDARDS (9 hours)

AMPS & ETACS System overview – Call handling – GSM System – Services and features – Architecture – Radio Subsystem – GSM Call – Frame Structure – Signal Processing – CDMA Digital Cellular Standard (IS-95) – Frequency & Channel Specification – Forward CDMA channel – Reverse CDMA channel.
Introduction to OFDM system – Cyclic prefix – Matrix representation case study : IEEE 802.11a wireless LAN.

TEXT BOOKS

1. Rappaport T.S, *"Wireless Communications: Principles and Practice",* Pearson education, 2nd edition, 2009.
2. William Stallings, *"Wireless Communication & Networking",* Pearson Education Asia, 2009.
3. Feher K. *"Wireless Digital Communications",* Prentice Hall 1995.
4. Schiller, *"Mobile Communication",* Pearson Education Asia Ltd., 2008.

REFERENCES

1. Andrea Goldsmith, *"Wireless Communications",* Cambridge University Press, Aug 2005.
2. Lee W.C.Y., *"Mobile Communications Engineering: Theory & Applications",* McGraw Hill, New York 2nd Edition, 1998

EC1026 WIRELESS COMMUNICATION												
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
2.	Mapping of instructional objectives with student outcome	1,2,3				1,2,3						1,2,3, 4
3.	Category	General (G)			Basic Sciences (B)			Engineering Sciences &Technical Arts (E)			Professional Subjects (P)	
											X	
4.	Broad Area	Communication			Signal Processing			Electronics		VLSI	Embedded	
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1027	COMPUTER COMMUNICATION	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	NIL				

PURPOSE

It is very much required for an ECE graduate to know use of computers in communication as well as in network formation. The syllabus focuses on mode of data transfer, layer and protocols related to networks.

INSTRUCTIONAL OBJECTIVES

1.	Understand about the functions and services of all 7 layers of OSI model.
2.	Get an idea of various network standards.

UNIT I-DATA COMMUNICATION & NETWORKING BASICS (9 hours)

Data transfer modes Telephone system – Protocols & standards – Multiplexing – Circuit switching – Message & packet switching – Introduction to LAN, MAN & WAN – IEEE standards for LAN – Network topologies.

UNIT II-OSI LOWER LAYERS (9 hours)

Network models – OSI layer architecture – Issues in data traffic over network – Physical layer standards – Data link control & protocol – ARQ schemes – HDLC protocol.

UNIT III-NETWORK LAYER (9 hours)

Need for Internetworking – Addressing – Routing Issues – Internet protocol (IPV4/V6) – Congestion & flow control mechanism – TCP/IP model.

UNIT IV-OSI HIGHER LAYERS (9 hours)

Transport layer – TCP & UDP – Session layer issues – Presentation layer – Application layer.

UNIT V-APPLICATION & INTRODUCTION TO ISDN (9 hours)

Application layer: Email – FTP – HTTP – Compression Techniques. Introduction to ISDN – Broadband ISDN Features – ATM Concept.

TEXT BOOKS

1. Behrouz A.Fehrouzan, *"Data communication & Networking",* Mc-Graw Hill, 4th Edition, 2007.
2. Andrew S.Tanenbaum, *"Computer Networks",* Pearson Education India, 3rd Edition, 2010.

REFERENCES

1. William Stallings, *"Data & Computer Communication",* Pearson Education India, 8th Edition, 2007.
2. Rarnier Handel, N.Huber, Schroder, *"ATM Networks Concepts, Protocols Applications",* Addison Welsey, 3rd Edition, 2009.

EC1027 COMPUTER COMMUNICATION												
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
2.	Mapping of instructional objectives with student outcome		1							1,2		1,2
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
										X		
4.	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
		X										
5	Approval	23rd Meeting of Academic Council, May 2013										

EC1028	**ELEMENTS OF INFORMATION THEORY AND CODING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	MA1024				

PURPOSE

To learn the basic principles of encoding, error detection, and error correction, decoding, mutual information, and channel capacity, which will be extremely useful in understanding the working of a digital communication system.

INSTRUCTIONAL OBJECTIVES

1.	To analyze the process of coding for analog and discrete sources and the mathematical model for information sources.
2.	To solve problems on error detection and error correction for various types of codes.
3.	To understand the principles of Huffman codes and to solve problems therein.
4.	To study the properties of Entropy and the principles of Shannon-Fano coding.
5.	To learn the concepts of mutual information, channel capacity, and Shannon's Main Theorem.

UNIT I-SOURCE CODING (**9 hours)**

Model of signaling system - Mathematical models for information sources – Encoding a source alphabet – ASCII code – Radix r code – Miscellaneous codes - A Logarithmic measure of information – Coding for Discrete sources – Coding for analog sources (Optimum quantization) – Coding techniques for analog sources.

UNIT II-ERROR DETECTING AND ERROR CORRECTING CODES (10 hours)

Simple parity checks – CRC codes – Hamming weight – Hamming distance – Minimum distance decoding – Single / Double parity checks – Hamming codes – Linear block codes – Cyclic codes – Syndrome calculation – Block encoders and Decoders.

UNIT III-VARIABLE-LENGTH CODES – HUFFMAN CODES (10 hours)

Unique decoding – Instantaneous codes and its construction – The Kraft's inequality – Shortened block codes – The McMillan's Inequality – Huffman codes and its special cases – Extensions of a code – Huffman codes Radix r – Noise in Huffman coding probabilities – Use of Huffman codes – Hamming Huffman coding

UNIT IV-ENTROPY AND SHANNON'S FIRST THEOREM (5 hours)

Entropy and its Mathematical properties – Entropy and coding – Shannon-Fano coding – Entropy of a Markov process – The Adjoint system – Robustness of Entropy.

UNIT V-MUTUAL INFORMATION, CHANNEL CAPACITY & SHANNON'S MAIN THEOREM (11 hours)

Information channel – Capacity of a Binary symmetric channel – System entropies – Mutual information – Definition of channel capacity – Uniform channel – Conditional mutual information – Random encoding - Average random code – Fano bound – Converse of Shannon's theorem.

REFERENCES

1. Hamming, Richard W, *"Coding and Information Theory",* Prentice Hall Inc., NJ, 1986.
2. Proakis J. G., *"Digital Communications",* McGraw Hill Inc., 4th Edition, NY, 2001.

EC1028 ELEMENTS OF INFORMATION THEORY AND CODING												
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
2.	Mapping of instructional objectives with student outcome	2,5				1,2, 4,5						1,2, 3,4, 5
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences &Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication			Signal Processing		Electronics			VLSI	Embedded	
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1029	VLSI DESIGN	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1007				

PURPOSE

To introduce the technology, design concepts, electrical properties and modeling of Very Large Scale Integrated Circuits.

INSTRUCTIONAL OBJECTIVES

1.	To learn the basic MOS Technology.
2.	To learn the MOS Process Technology and its second order effect.
3.	To learn the concepts of modeling a digital system using Hardware Description Language.
4.	To learn the basic concept of VLSI implementation strategies based on CMOS and FPGA.

UNIT I-MOS TECHNOLOGY (**9 hours)**

Chip Design Hierarchy – IC Layers – Photolithography and Pattern Transfers – Basic MOS Transistors – CMOS Fabrication: n-well – p-well – twin tub – Latch up and prevention (SOI) – Submicron CMOS Process – Masks and Layout – CMOS Design Rules: Lambda based layout – Types of rules – SCMOS Design Rule set II.

UNIT II-MOS CIRCUIT DESIGN PROCESS **(9 hours)**

Introduction of MOSFET: Symbols, Enhancement mode-Depletion mode transistor operation – Threshold voltage derivation – body effect – Drain current Vs voltage derivation – channel length modulation. NMOS and CMOS inverter – Determination of pull up to pull down ratio –Stick diagrams – VLSI Circuit Design Flow.

UNIT III-CMOS LOGIC GATES & OTHER COMPLEX GATES **(9 hours)**

Gate delays – Logical Effort - CMOS Static Logic – Transmission Gate Logic – Tri-State Logic – Pass Transistor Logic – Dynamic CMOS Logic – Domino CMOS Logic, NORA CMOS Logic, Differential Cascade Voltage Switch (DCVS) Logic, True Single Phase Clock (TSPC) Dynamic Logic.

UNIT IV-VERILOG HDL (**9 hours)**

Hierarchical modeling concepts – Basic concepts: Lexical conventions – Data types – Modules and ports. Gate level modeling – Dataflow modeling – Behavioral modeling – Design examples of Combinational and Sequential circuits – Switch level modeling – Functions – UDP concepts.

UNIT V-VLSI IMPLEMENTATION STRATEGIES (**9 hours)**

Introduction – Design of Adders: carry look ahead-carry select-carry save. Design of multipliers: Array – Braun array – Baugh-Wooley Array. Introduction to FPGA – Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures.

TEXT BOOKS

1. Douglas A. Pucknell, *"Basic VLSI Systems and Circuits",* Prentice Hall of India, 3rd Edition, reprint 2008.
2. John P. Uyemura, *"Introduction to VLSI Circuits and Systems"*, John Wiley & Sons, Reprint 2009.
3. Samir Palnitkar, *"Verilog HDL – Guide to Digital Design and Synthesis",* Pearson Education, 3rd Edition, 2003.

REFERENCES

1. Smith.M.J.S, *"Application Specific Integrated Circuits",* Addison -Wesley Longman Inc., 1997.
2. Weste & Eshraghian, *"Principles of CMOS VLSI Design",* Addison Wesley, 2nd Edition, 2008.
3. John P Uyemura, *"Chip Design for Submicron VLSI: CMOS layout and simulation"*, Thomson India Edition, 2010.

EC1029 VLSI DESIGN												
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						X
2.	Mapping of instructional objectives with student outcome	1,2		1,3	4	3,4						2,3
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing			Electronics		VLSI		Embedded	
									X			
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1030	NETWORK SIMULATION LAB	L	T	P	C
	Total Contact Hours – 45	**0**	**0**	**3**	**2**
	Pr requisite				
	Nil				

PURPOSE

Network Simulation is a cost-effective method to design, analyze and evaluate network protocols and is an important tool in networking research.

To know and understand communication networks using NETSIM Software and LAN Trainer kit.

INSTRUCTIONAL OBJECTIVES

1.	To understand the basics of network simulation.
2.	To introduce simulations and use simulation tools in networking.
3.	To design and analyze different networks, and protocols.
4.	To simulate and evaluate networks using network simulator (ns-2).
5.	To study the communication network's characteristics and to analyze various MAC and routing layer Protocols.

LIST OF EXPERIMENTS **(45 hours)**

1. Ethernet LAN protocol. To create Scenario and study the performance of CSMA/CD protocol through simulation.
2. Token bus and Token Ring protocols. To create scenario and study the performance of token bus and token ring protocols through simulation.
3. Wireless LAN protocols. To create scenario and study the performance of network with CSMA/CA protocol and compare with CSMA/CD protocols.
4. Implementation and study of stop and wait protocol.
5. Implementation and study of Go back N and selective repeat protocols.

6. Implementation of distance vector routing algorithm.
7. Implementation of Link state routing algorithm.
8. Implementation of data encryption and decryption.
9. Transfer of files from PC to PC using windows/ UNIX socket processing.

REFERENCE:

1. LAB MANUAL, Department of ECE, SRM University.

EC1030 NETWORK SIMULATION LAB												
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	1,2,3		1,2,3,4				3,5	
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)					Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing		Electronics			VLSI		Embedded	
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1031	**VLSI DESIGN LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**0**	**0**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

The laboratory consists of hands-on assignments which accompany the lectures of EC1029. The goal is to illustrate concepts discussed in the class and to give the students the opportunity to build and test real systems. The lab exercises will make use of the Xilinx Foundation™ System which is a a powerful state-of-the-art CAD tool for designing and implementing digital systems on Field Programmable devices (FGPAs or CPLDs).

INSTRUCTIONAL OBJECTIVES

To gain expertise in design and development and simulation of digital circuits with Verilog HDL

1.	To apply concepts and methods of digital system design techniques as discussed in the class (EC1029) through hands-on experiments.
2.	Learn to design combinational and sequential digital systems starting from

	a word description that performs a set of specified tasks and functions.
3.	To analyze the results of logic and timing simulations and to use these simulation results to debug digital systems.
4.	Develop skills, techniques and learn state-of-the-art engineering tools (such as HDL, Xilinx / Altera tools) to design, implement and test digital systems on FPGAs / CPLDs.

LIST OF EXPERIMENTS **(45 hours)**

1. Combinational logic circuit design.
2. Sequential logic circuit design.
3. Design of VLSI multipliers.
4. Multiply-Accumulate circuits.
5. Digital Filters.
6. State Machines.
7. Design of microprocessor parts.

REFERENCES

1. LAB MANUAL, Department of ECE, SRM University.
2. Michael D. Ciletti, *"Advanced Digital Design with the Verilog HDL",* Prentice Hall Higher Education, 2010, Edition 2.
3. Bhaskar J, *"A VHDL Primier",* Prentice Hall, 3rd Edition, 1999.
4. Douglas L.Perry**,** *"VHDL:Prigramming by Example",* McGraw-Hill, 2002.
5. Charles H.Roth, Lizy Kurian John, *"Digital systems design using VHDL",* Thomson, 2008.

EC1031 VLSI DESIGN LAB												
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, 3,5	1,2, 3		1,2, 3,4				3	
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences &Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing			Electronics			VLSI	Embedded	
										X		
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1048	INDUSTRIAL TRAINING II (Training to be undergone after VI 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 three – week practical training in Electronics and Communication 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 Electronics and Communication 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.

EC1048 INDUSTRIAL TRAINING II												
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	X	
2.	Mapping of instructional objectives with student outcome				1	1	1	1	1	1	1	
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)				Professional Subjects (P)	
											X	
		--		--			--				--	
4.	Broad Area	Communication			Signal Processing		Electronics			VLSI	Embedded	
		X			X		X			X	X	
4.	Approval	23rd Meeting of Academic Council, May 2013										

EC1050	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 Electronics and Communication Engineering 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) like investigation, designing, coding detailing ,implementation of a Electronics and Communication circuits / systems in which the aspects like performance analysis, application of relevant standards etc., will find a place. Alternately, a few research problems also may be identified for investigation and the use of laboratory facilities to the fullest extent may be taken as a project work. 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 Electronics and Communication companies 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.

EC1050 MAJOR PROJECT												
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	X	X	X	X	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	Communication			Signal Processing		Electronics		VLSI	Embedded		
		X			X		X		X	X		
5.	Approval	23rd Meeting of Academic Council, May 2013										

DEPARTMENTAL ELECTIVE COURSES

	ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY	L	T	P	C
EC1101	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to expose the students to the basics and fundamentals of Electromagnetic Interference and Compatibility and application in System Design.

INSTRUCTIONAL OBJECTIVES

1.	To study EMI Fundamentals and EMI sources.
2.	To learn EMI Measuring Instruments and their usage.
3.	To study EMI standards and controlling methods.

UNIT I-EMI ENVIRONMENT (9 hours)

Concepts of EMI and EMC and Definitions, Sources of EMI – Celestial Electromagnetic noise- Lightning Discharge-Electrostatic Discharge-Electromagnetic Pulse-Electromagnetic emissions-Noise from relays and Switches-Nonlinearities in Circuits.

UNIT II-EMI COUPLING PRINCIPLES (9 hours)

Capacitive coupling - Inductive coupling- Common Impedance Ground Coupling-Ground Loop coupling-Transients in power supply lines- Radiation coupling-Conduction coupling-Common – mode and Differential-mode interferences-Conducted EM noise on power supply lines.

UNIT III-EMI MEASUREMENTS (9 hours)

Open Area test site measurements-Measurement precautions – Anechoic Chamber – TEM - Reverberating TEM-GTEM cell – Comparisons.

UNIT IV-EMI CONTROL TECHNIQUES (9 hours)

EMC Technology- Grounding-Shielding-Electrical Bonding-Power line filter-CM filter – DM filter- EMI suppression Cables- EMC Connectors -Isolation transformer.

UNIT V-EMI / EMC STANDARDS **(9 hours)**

Introducti1on- Standards for EMI/EMC- MIL-STD-461/462-IEEE/ANSI standard-CISPR/IEC standard- FCC regulations-British standards-VDE standards-Euro norms-Performance standards-some comparisons.

TEXT BOOK

1. Prasad Kodali, *"Engineering Electromagnetic Compatibility–Principles, Measurements, and Technologies",* IEEE press, 2001.

REFERENCES

1. Henry W. Ott, *"Noise Reduction Techniques in Electronic Systems",* John Wiley & Sons, 2nd Edition, 1988.
2. Bernharo Q'Keiser, *"Principles of Electromagnetic Compatibility",* Artech house, 3rd Edition, 1986.

EC1101 ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY												
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	X	
2.	Mapping of instructional objectives with student outcome		1,2,3			1,2, 3			1,2	1	1	
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing			Electronics		VLSI		Embedded	
				X			X					
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1102	**FUNDAMENTALS OF MEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

This course is offered to students to gain basic knowledge on MEMS (Micro Electro Mechanical System) and various fabrication techniques. This enables them to design, analyze, fabricate and test the MEMS based components.

INSTRUCTIONAL OBJECTIVES	
1.	To introduce MEMS and micro fabrication.
2.	To study the essential electrical and mechanical concepts of MEMS.
3.	To study various sensing and actuating technique.
4.	To know about the polymer and optical MEMS.

UNIT I-INTRODUCTION TO MEMS AND MICRO FABRICATION (9 hours)

History of MEMS Development, Characteristics of MEMS-Miniaturization - Micro electronics integration - Mass fabrication with precision. Sensors and Actuators-Energy domain. Sensors, actuators

Micro fabrication - microelectronics fabrication process- Silicon based MEMS processes- New material and fabrication processing- Points of consideration for processing. Anisotropic wet etching, Isotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), and Surface micromachining process-structural and sacrificial material.

UNIT II-ELECTRICAL AND MECHANICAL CONCEPTS OF MEMS (9 hours)

Conductivity of semiconductors, crystal plane and orientation, stress and strain - definition - Relationship between tensile stress and strain- mechanical properties of Silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- longitudinal strain under pure bending -deflection of beam- Spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

UNIT III-ELECTROSTATIC AND THERMAL PRINCIPLE SENSING AND ACTUATION (9 hours)

Electrostatic sensing and actuation-Parallel plate capacitor - Application-Inertial, pressure and tactile sensor parallel plate actuator- comb drive. Thermal sensing and Actuations-Thermal sensors-Actuators- Applications Inertial, flow and infrared sensors.

UNIT IV-PIEZORESISTIVE, PIEZOELECTRIC AND MAGNETIC PRINCIPLE SENSORS AND ACTUATOR (9 hours)

Piezoresistive sensors- piezoresistive sensor material- stress in flexural cantilever and membrane- Application-Inertial, pressure, flow and tactile sensor.

Piezoelectric sensing and actuation- piezoelectric material properties-quartz-PZT-PVDF -ZnO- Application-Inertial, Acoustic, tactile, flow-surface elastic waves

Magnetic actuation- Micro magnetic actuation principle- Deposition of magnetic materials-Design and fabrication of magnetic coil.

UNIT V-POLYMER AND OPTICAL MEMS **(9 hours)**

Polymers in MEMS- polymide-SU-8 Liquid crystal polymer(LCP)- PDMS – PMMA – Parylene - Flurocorbon, Application-Acceleration, pressure, flow and tactile sensors.

Optical MEMS-passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.

TEXT BOOK

1. Chang Liu, *"Foundations of MEMS",* Pearson Indian Print, 1st Edition, 2012.

REFERENCES

1. Gaberiel M. Rebiz, *"RF MEMS Theory,Design and Technology",* John Wiley & Sons, 2003.
2. Charles P. Poole and Frank J. Owens, *"Introduction to Nanotechnology"*, John Wiley & Sons, 2003.
3. Julian W.Gardner and Vijay K Varadhan, *"Microsensors, MEMS and Smart Devices",* John Wiley & sons, 2001.

EC1102 FUNDAMENTALS OF MEMS												
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	X		X	X	X
2.	Mapping of instructional objectives with student outcome	1,2,3, 4	2,3		1,2, 3,4		1,4	1,2,3 ,4		1,4	1	1
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences & Technical Arts (E)			Professional Subjects (P)		
										X		
4.	Broad area	Communication			Signal Processing		Electronics		VLSI	Embedded		
					X		X		X			
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1103	**FUNDAMENTALS OF NANOTECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1006				
PURPOSE					
To introduce to the students, the various opportunities in the emerging field of					

nano electronics and nano technologies.	
INSTRUCTIONAL OBJECTIVES	
1.	The objective of this course is to make students familiar with the important concepts applicable to small electronic devices, their fabrication, characterization and application.

UNIT I-LIMITATIONS OF CMOS (9 hours)

Fundamentals of MOSFET devices - Scaling of CMOS – Limitations – Alternative concepts in materials – **Structures of MOS devices:** SOI MOSFET, FINFETS, Dual Gate MOSFET, Ferro electric FETs.

UNIT II-MICRO AND NANO FABRICATION (9 hours)

Optical Lithography – Electron beam Lithography – Atomic Lithography – Molecular beam epitaxy - Nano lithography.

UNIT III-CHARACTERIZATION EQUIPMENTS (9 hours)

Principles of Electron Microscopes – Scanning Electron Microscope – Transmission Electron Microscope - Atomic Force Microscope – Scanning Tunneling Microscope.

UNIT IV-NANO DEVICES – I (9 hours)

Resonant tunneling diodes – Single electron devices – Josephson junction – Single Flux Quantum logic – Molecular electronics.

UNIT V-NANO DEVICES – II (9 hours)

Quantum computing: principles – Qbits – Carbon nanotubes (CNT): Characteristics, CNTFET, Application of CNT - Spintronics: Principle, Spin valves, Magnetic Tunnel Junctions, SpinFETs, MRAM.

TEXT BOOK

1. Rainer Waser (Ed.), *"Nano electronics and information technology",* Wiley-VCH. 3rd Edition, 2012.

REFERENCES

1. Thomas Heinzel, *"A Microscopic Electronics in Solid State Nanostructure",* Wiley- VCH, 2008.
2. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, *"Nanotechnology – (Basic Science and Emerging Technologies)",* Overseas Press, 2002.

3. Mark Ratner, Daniel Ratner, *"Nanotechnology: A Gentle introduction to the Next Big idea",* Pearson education, 2003.

EC1103 FUNDAMENTALS OF NANOTECHNOLOGY												
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									
2.	Mapping of instructional objectives with student outcome	1	1									
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)					Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing		Electronics			VLSI		Embedded	
						X						
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1104	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1013				

PURPOSE

The Purpose of this course is to introduce students to the various types of measurements made in electronics and the instruments used for measuring them. The main objective of this subject is to help students identify the different latest measurement techniques available for specific engineering applications.

INSTRUCTIONAL OBJECTIVES

1.	Understand the various measurement techniques available.
2.	Understand the basic working of instruments used for measurement.
3.	Understand the errors in measurements and their rectification.

UNIT I-MEASUREMENTS AND ERRORS (9 hours)

Accuracy-Precision-Significant Figures-Types of Errors-Statistical Analysis-Limiting Errors-Bridge Measurements (AC and DC bridges) - Analysis of Linear Systems-Static and Dynamic characteristics-Time Domain Response-I Order

response for Step Input-Ramp Input-Impulse Input- Bourdon Tube-Pressure Gauges - Measurement of Flow (Magnetic).

UNIT II-ELECROMECHANICAL & DIGITAL INDICATING INSTRUMENTS (9 hours)

PMMC Mechanism-DC Ammeters and Voltmeters-Series and Shunt Type Ohmmeter-Alternating Current Indicating Instruments (Moving Iron instruments, electrodynamometer instrument)- Digital Voltmeters-Vector Voltmeter-Guarding Techniques-Automation in Voltmeter.

UNIT III–SIGNAL GENERATION AND ANALYSIS (9 hours)

Sine Wave Generator-Sweep Frequency Generator-Pulse and Square wave Generator-Function Generator-Analyzer-Wave Analyzer-Distortion Analyzer-Harmonic Distortion Analyzer-Spectrum Analyzer - Logic Analyzer.

UNIT IV–OSCILLOSCOPES AND RECORDERS (9 hours)

Simple CRO - Dual Beam-Dual Trace-Sampling Oscilloscope-Analog and Digital Storage Oscilloscope-Recorders-Analog and Digital Recorders

UNIT V–ADVANCED MEASUREMENT AND COMPUTER CONTROLLED TEST SYSTEMS (9 hours)

Scanning Probe Microscope-Atomic Force Microscope-Magnetic Force Microscope-Scanning Tunneling Microscope-Testing an Audio Amplifier-Testing a Radio Receiver-Instruments used in Computer Controlled Instrumentation-Case Studies in Instrumentation-Electronic Weighing System-Digital Transducer.

TEXT BOOKS

1. Albert.D. Helfrick and William. D. Cooper, "*Modern Electronic Instrumentation and Measurement Techniques*", PHI Learning Private Limited, 2010
2. Kalsi.S, "*Electronic Instrumentation*", Tata McGraw Hill Publishing Company Ltd., 3rd edition, 2010.

REFERENCES

1. Sawhney.A.K, "*A Course in Electrical and Electronic Measurements and Instrumentation*", Dhanapat Rai & Sons, 2012.
2. Earnest.O Doeblin, "*Measurement Systems Application and Design*", McGraw Hill International editions, 4th edition, 1990.
3. A.J.Bouwens, "*Digital Instrumentation*", McGraw Hill, 1986.

EC1104 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION												
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	1,2	1,2,3					1,2,3
3	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)			Professional Subjects (P)		
										X		
4	Broad area	Communication		Signal Processing			Electronics		VLSI	Embedded		
							X					
5	Approval	23rd Meeting of Academic Council, May 2013										

EC1105	SENSORS AND TRANSDUCERS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1001				

PURPOSE

To impart knowledge on various types of sensors and transducers for Automation in science, Engineering and medicine.

INSTRUCTIONAL OBJECTIVES

1.	To study basic concepts of various sensors and transducers.
2.	To develop knowledge in selection of suitable sensor based on requirement and applilcation.

UNIT I-NTRODUCTION (9 hours)

Definition, classification, static and dynamic parameters, Characterization – Electrical, mechanical, thermal, optical, biological and chemical, Classification of errors – Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors.

UNIT II-MECHANICAL AND ELECTROMECHANICAL SENSORS (9 hours)

Resistive Potentiometer, strain gauge, Inductive sensors and transducer, capacitive sensors, ultrasonic sensors.

UNIT III-THERMAL AND RADIATION SENSOR (9 hours)

Thermal Sensors: Gas thermometric sensors, acoustic temperature sensors, magnetic thermometer, resistance change -type thermometric sensors, thermo emf sensors, junction semiconductor types, Thermal radiation sensors, spectroscopic thermometry

Radiation Sensors: Photo detectors, photovoltaic and photo junction cells, photo sensitive cell, photo FETs and other devices.

UNIT IV-MAGNETIC AND ELECTROANALYTICAL SENSOR (9 hours)

Magnetic Sensors: Force and displacement measurement, magneto resistive sensors, Hall Effect sensor, Inductance and eddy current sensors, Angular/rotary movement transducer, Electro magnetic flow meter, squid sensor.

Electroanalytical Sensors: Electro chemical cell, cell potential, sensor electrodes, electro ceramics in gas media, chemFET.

UNIT V-SENSORS AND THEIR APPLICATIONS (9 hours)

Automobile sensor, Home appliance sensor, Aerospace sensors, sensors for manufacturing, medical diagnostic sensors, environmental monitoring.

TEXT BOOK

1. Patranabis D, "*Sensor and Actuators"*, Prentice Hall of India (Pvt) Ltd., 2006.

REFERENCES

1. Ian Sinclair, *"Sensor and Transducers"*, Elsevier India Pvt Ltd, 3rd Edtion, 2011.
2. Sawhney.A.K, Puneeth sawhney, *"A Course in Electrical and Electronic Measurements and Instrumentation"*, Dhanpat Rai Publications, 2012.
3. Ernest O. Doeblin, *"Measurement System, Application and Design"*, Tata McGraw Hill Publishing Company Ltd., 5th Edition, 2008.

EC1105 SENSORS AND TRANSDUCERS												
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	1,2		1,2					1,2		
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
										X		

4.	Broad Area	Communication	Signal Processing	Electronics	VLSI	Embedded
				X		
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1106	**BIOMEDICAL INSTRUMENTATION**	**L**	**T**	**P**	**C**
	Total Contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1001				

PURPOSE

The purpose of this course is to introduce the students to the basics of Electro-physiology and its measurements, non-electrical parameters related to various systems of human body and their measurements, Electrodes and Transducers used in bio signal acquisition. This course will enable the students to learn the basic principles of different instruments/equipment used in the health care industry. Also student will get to know about various Medical Imaging techniques used for diagnosis along with other diagnostic and therapeutic devices.

INSTRUCTIONAL OBJECTIVES

1.	To understand the Origin of Bioelectric potential and their measurements using appropriate electrodes and Transducers.
2.	To understand how to measure various biochemical and nonelectrical parameters of human system.
3.	To understand the Electro-physiology of various systems and recording of the bioelectric signals.
4.	To understand the working principles of various Imaging techniques.
5.	To understand the design aspects of various Assist and Therapeutic Devices.

UNIT I-BIOPOTENTIAL ELECTRODES AND TRANSDUCERS (9 hours)

Electrode theory- Electrode electrolyte interface, half-cell potential, Hydrogen, Calomel, Ag-AgCl electrode, needle and wire electrode, surface electrodes, microelectrode-metal micropipete.

Physiological Transducers: Resistive transducers - Thermistor, Inductive Transducers - Capacitive Transducers - Photoelectric Transducers -Piezoelectric Transducers -, Biochemical Transducers- pH, pCo2 and pO2 electrodes.

UNIT II-BIO ELECTRIC POTENTIALS AND ELECTRO PHYSIOLOGICAL MEASUREMENTS (9 hours)

Sources of Bioelectric potentials - Resting and Action potential - Propagation of Action potential

Electrophysiology of Heart, Nervous System and Muscle Activity

Bio-signals: ECG - EEG, Evoked potential – EMG- ERG- Electrodes and Lead System, Typical waveforms and Signal characteristics

Signal Conditioning circuits: Design of low Noise Medical Amplifier, Isolation Amplifier, Protection Circuits and Electrical Safety.

UNIT III-NON-ELECTRICAL PARAMETER MEASUREMENTS (9 hours)

Measurement of Blood Pressure, Blood Flow, Plethysmography, Cardiac Output, Heart Sounds- Lung Volumes and their measurements- Auto analyzer –Blood cell counters, Oxygen saturation of Blood.

UNIT IV-MEDICAL IMAGING TECHNIQUES (9 hours)

X-ray machine – Computer Tomography – Angiography – Ultrasonography – Magnetic Resonance Imaging System – Nuclear Imaging Techniques – Thermography – Lasers in Medicine – Endoscopy.

UNIT V-TELEMETRY, ASSIST AND THERAPEUTIC DEVICES (9 hours)

Bio telemetry – Elements and Design of Bio telemetry system. Assist and Therapeutic devices: Cardiac Pacemakers – Defibrillators – Artificial Heart Valves – Artificial Heart Lung machine – Artificial Kidney – Orthopadeic Prosthetics – Respiratory therapy equipment – Patient Monitoring System.

TEXTBOOKS

1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeifer, *"Biomedical Instrumentation and Measurements"*, 2nd Edition, PHI, 2006
2. Khandpur.R.S, *"Handbook of Biomedical Instrumentation"*, 2nd edition, 12th reprint, Tata McGraw Hill, 2008.

REFERENCES

1. Joseph J. Carr and John M. Brown, *"Introduction to Biiomedical Equipment Technology"*, 4th edition, Pearson Education, 2008.
2. John G. Webster, *"Medical Instrumentation Application and Design"*, 3rd edition, Wiley India, 2008.

EC1106 BIOMEDICAL INSTRUMENTATION												
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		X			X
2.	Mapping of instructional objectives with student outcome	1,2		1,2,5	3,4		3,5		5			1,2,4, 5
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing			Electronics		VLSI		Embedded	
							X					
5.	Approval	23rd meeting of Academic Council, May 2013										

EC1107	**CONTROL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To understand the fundamental need for control system and to derive its transfer function.

INSTRUCTIONAL OBJECTIVES

1.	To understand the methods of representation of systems and deriving their transfer function model.
2.	To give basic knowledge is obtaining the open loop and closed loop frequency responses of systems.
3.	Applications of control systems.

UNIT I-SYSTEMS AND THEIR REPRESENTATION (9 hours)

Control systems- Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function –Block diagram reduction techniques – Signal flow graphs.

UNIT II-TIME RESPONSE (9 hours)

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feedback control.

UNIT III-FREQUENCY RESPONSE **(9 hours)**

Frequency response of the system – Correlation between time and frequency response – Gain and Phase margin – Bode plot - Polar plot.

UNIT IV-STABILITY OF CONTROL SYSTEM **(9 hours)**

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition.

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

Transfer functions of Synchros – AC and DC servomotors – Potentiometers – Encoders- Gear trains-Single stage and two stage amplifiers transfer functions-case studies.

TEXT BOOK

1. Gopal, *"Control Systems, Principles & Design",* Tata McGraw Hill, New Delhi, 2002.

REFERENCES

1. Ogata.K, "*Modern Control Engineering*", 5th Edition, Pearson Education India, New Delhi, 2010.
2. Nagrath.I.J. & Gopal.M, *"Control Systems Engineering",* New Age International Publishers, 2006.
3. Bandyopadhyay.M.N*, "Control Engineering Theory and Practice",* Prentice Hall of India, 2003.

EC1107 CONTROL 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		X	X	X						X
2.	Mapping of instructional objectives with student outcome	1		1	2	2						3
3.	Category	General (G)			Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)	
											X	
4.	Broad area	Communication			Signal Processing			Electronics		VLSI	Embedded	
		X			X							
5.	Approval	23rd meeting of academic council held on May 2013										

	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	C
EC1108	Total Contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite:				
	Nil				

PURPOSE

To study the basic structure of a digital computer and to discuss in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

INSTRUCTIONAL OBJECTIVES

1.	To have a thorough understanding of the basic structure and operation of a digital computer.
2.	To discuss in detail the operation of the arithmetic unit including the algorithms &implementation of fixed-point and floating-point addition, subtraction, multiplication &division.
3.	To study in detail the different types of control and the concept of pipelining.
4.	To study the hierarchical memory system including cache memories and virtual memory.
5.	To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I-INTRODUCTION (9 hours)

Evolution of Computers, VLSI Era, System Design- Register Level, Processor Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

UNIT II-DATA PATH DESIGN (9 hours)

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson Algorithm, Booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Modified booth's Algorithm

UNIT III-CONTROL DESIGN (9 hours)

Hardwired Control, Micro programmed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV-MEMORY ORGANIZATION **(9 hours)**

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT V-SYSTEM ORGANIZATION **(9 hours)**

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, multiprocessors, RISC and CISC processors, Superscalar and vector processor.

TEXT BOOKS

1. John P.Hayes, *"Computer architecture and Organisation"*, Tata McGraw-Hill, Third dition, 2012.
2. Carl.V. Hamacher, Zvonko Varanesic.G. and Safat G.Zaky, *"Computer Organisation",* V Edition, Reprint 2012,Tata McGraw-Hill Inc.

REFERENCES

1. Morris Mano, *"Computer System Architecture",* Third Edition,Prentice-Hall of India, 2000.
2. Paraami, *"Computer Architecture",* Eighth impression, 2011, Oxford Press.
3. Pal Chaudhuri. P, *"Computer organization and design",* 2nd Edition., Prentice Hall of India, 2007.

EC1108 COMPUTER ARCHITECTURE AND ORGANIZATION												
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							X
2.	Mapping of instructional objectives with student outcome	1,2	2		2,3,4							2,4
3.	Category	General (G)			Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication			Signal Processing		Electronics		VLSI		Embedded	
							X		X			
5.	Approval	23rd meeting of Academic Council, May 2013										

EC1109	EMBEDDED SYSTEMS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1007, 1016				

PURPOSE

To provide sufficient Knowledge to understand the embedded systems design, embedded programming and their operating system.

INSTRUCTIONAL OBJECTIVES

1.	To provide in-depth knowledge about embedded processor, its hardware and software.
2.	To explain programming concepts and embedded programming in C and assembly language.
3.	To explain real time operating systems, inter-task communication and an embedded software development tool.

UNIT I-INTRODUCTION TO EMBEDDED SYSTEM AND ARM ARCHITECT (9 hours

Challenges of Embedded Systems – Embedded system design process. Embedded processors – ARM processor – Architecture, ARM and Thumb Instruction sets.

UNIT II-EMBEDDED C PROGRAMMING (9 hours)

C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

UNIT III-OPTIMIZING ASSEMBLY CODE (9 hours)

Profiling and cycle counting – instruction scheduling – Register allocation – conditional execution – looping constructs – bit manipulation – efficient switches – optimized primitives.

UNIT IV-RTOS PRINCIPLE (9 hours)

Operating systems and its internals - Multitasking and Real time Operating Systems – Task Swapping Methods – Scheduler Algorithms – Priority Inversion – Task , Thread and Process – Choosing Operating System – Commercial Operating Systems – Linux.

UNIT V-EMBEDDED SOFTWARE DEVELOPMENT PROCESS (9 hours)

Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Design

methodologies – Case studies – Complete design of example embedded systems.

TEXT BOOKS

1. Andrew N Sloss, D. Symes and C. Wright, "*ARM system developers guide",* Morgan Kauffman/ Elsevier, 2006.
2. Michael J. Pont, *"Embedded C",* Pearson Education, 2007.

REFERENCES

1. Wayne Wolf, *"Computers as Components: Principles of Embedded Computer System Design",* Elsevier, 2006.
2. Steve Heath, *"Embedded System Design",* Elsevier, 2005.

EC1109 EMBEDDED SYSTEMS												
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				X
2.	Mapping of instructional objectives with student outcome		1,2	2,3	1,3			3				2,3
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)					Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing		Electronics		VLSI			Embedded	
											X	
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1110	**VIRTUAL INSTRUMENTATION USING LABVIEW**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite: 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 BASICS (9 hours)

Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses.ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation, Simple applications using NI MyDAQ and NI ELVIS.

UNIT IV-LabVIEW IN SIGNAL PROCESSING (9 hours)

Waveform Generation, Sampling, Quantization, Aliasing, Signal Reconstruction. Fourier transforms, Power spectrum, Correlation methods, windowing & flittering. Degital Filter Design, IIR/FIR Filtering system Design, Adaptive Filter design.

UNIT V-FREQUENCY DOMAIN PROCESSING (9 hours)

Discrete Fourier Transform and Fast Fourier Transform, STFT, Wavelet Transform, Signal Processing applications.

TEXT BOOKS

1. Sumathi & P.Surekha, " *LabVIEW based Advanced Instrumentation*" Springer, 2007.
2. Jovitha Jerome, "*Virtual Instrumentation Using LabVIEW*", PHI Learning Pvt. Ltd, 2010.

REFERENCES

1. Cory L.Clark, "*Labview Digital Signal Processing and Digital Communication*".
2. Herbert. A. J. "*The structure of Technical English"*, Orient Longman, 1995

3. Sanjay Gupta, Joseph John, "*Virtual Instrumentation using LabVIEW*", 2nd Edition, Tata McGraw Hill Education Private Limited, 2010.
4. Gary W. Johnson, Richard Jennings , "*LabVIEW Graphical Programming*", Fourth Edition, McGraw-Hill publications, 2006
5. Technical Manuals for DAS Modules of Advantech and National Instruments.

EC1110 VIRTUAL 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		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	Communication		Signal Processing		Electronics		VLSI		Embedded		
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1111	**DIGITAL TELEVISION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1012				

PURPOSE

Television technology has now become a vital tool to the information revolution that is sweeping across the countries of the world. This syllabus aims at a comprehensive coverage of Digital Television systems with the emphasis on television evolution.

INSTRUCTIONAL OBJECTIVES

1.	To study the evolution of television systems
2.	To apply digitization principles on composite television signal
3.	To study types of compression standards
4.	To know the television display, storage devices

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

Raster images – Quantization – Image structure – Brightness and contrast – Raster scanning – Resolution – Introduction to luma and chroma.

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

Image digitization – Perception and visual acuity – Luminance and lightness – CIE system of colorimetry – Color science – Video signal processing – Gamma – Luma and color differences.

UNIT III-DIGITAL TELEVISION **(9 hours)**

Digital Television types – JPEG – Video compression – MPEG2, MPEG4, H264, Motion – JPEG (M-JPEG) compression.

UNIT IV-HIGH DEFINITION TV **(9 hours)**

HDTV evolution and role of Grand Alliance – HDTV compressed video and audio streams – Packetized transport – Transmission – HDTV receiver – HDTV standards – Metadata broadcasting.

UNIT V-DTV FUTURE AND ACCESSORIES **(9 hours)**

3D TV – Plasma, LCD, Digital Light Processing – HDMI – Digital Video Disk (DVD), Blue Ray Disk, Super hi-vision.

TEXT BOOKS

1. Philip J. Cianci, *"HDTV and the Transition to Digital Broadcasting: Understanding New Television Technologies"*, Focal Press, 2007.
2. Iain E. G. Richardson, *"H.264 and MPEG-4 and Video compression video coding for Next-generation Multimedia"*, John Wiley & Sons Ltd., 2003.

REFERENCES

1. Ibrahim.K.F, *"Newnes Guide to Television and Video Technology"*, Newnes Publishers, 2007.
2. Charles poynton, *"Digital Video and HDTV Algorithms and Interfaces"*, Morgan Kaufman publishers, 2007.

EC1111 DIGITAL TELEVISION												
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		1,2							1,2, 3,4	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
		X				
5.	Approval	23rd meeting of Academic Council, May 2013				

EC1112	**DIGITAL IMAGE PROCESSING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1017				

PURPOSE

The purpose of this course is to introduce the basic concept and methodologies for digital image processing.

INSTRUCTIONAL OBJECTIVES

The students undergoing this course will be able to know.

1.	Fundamentals of image processing.
2.	Various transforms used in image processing.
3.	Image processing techniques like image enhancement, reconstruction, compression and segmentation.

UNIT I-DIGITAL IMAGE FUNDAMENTALS (9 hours)

Introduction-Elements of Digital Image Processing system- elements of visual perception – image sensing and acquisition – Image sampling and quantization - image representation -Some basic relationship between pixels.

UNIT II-IMAGE TRANSFORMS (9 hours)

Introduction - 2D Discrete Fourier Transform – Properties- Importance of Phase -Walsh – Hadamard – Discrete Cosine Transform, Haar, –KL transforms – Singular Value Decomposition.

UNIT III-IMAGE ENHANCEMENT (9 hours)

Enhancement through point operation- Histogram manipulation – Gray level transformation- Neighbourhood operation – Median filter - Image Sharpening- Bit plane slicing - Homomorphic Filtering – Zooming operation.

UNIT IV-IMAGE RESTORATION (9 hours)

Model of Image Degradation/restoration process –Inverse filtering -Least mean square (Wiener) filtering – Constrained least mean square restoration – Singular value decomposition-Recursive filtering.

UNIT V-IMAGE COMPRESSION AND SEGMENTATION (9 hours)

Image compression schemes – Information theory – Run length, Huffman and arithmetic coding –Vector quantization - JPEG. Image Segmentation – Classification – Thresholding – edge based segmentation – Hough transform – Active contour.

TEXT BOOKS

1. Rafael C Gonzalez and Richard E Woods, *"Digital Image Processing",* Pearson Education, 3rd Edition, 2003.
2. Jayarman.S, Esakkirajan.S and Veerakumar.T, *"Digital Image Processing",* Tata McGraw Hill, 2010.
3. Jain.A.K, *"Fundamentals of Digital Image Processing",* Pearson Education, 1989.

REFERENCES

1. William K Pratt, *"Digital Image Processing",* John Willey, 2001.
2. Millman Sonka, Vaclav Hlavac, Roger Boyle, and Broos Colic, *"Image Processing Analysis and Machine Vision",* Thompson learning, 1999.

EC1112 DIGITAL IMAGE PROCESSING												
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						X
2.	Mapping of instructional objectives with student outcome	1,2,3	2		3	1,2,3						2,3
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences & Technical Arts (E)				Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing			Electronics			VLSI	Embedde	

						d
			X			
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1113	RADAR AND NAVIGATIONAL AIDS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1018				

PURPOSE

Main objective of this course is to make the students understand the basic concept in the field of Radar and Navigational aids. Students are taught about different types of Radar Systems.

INSTRUCTIONAL OBJECTIVES

1.	To study RADAR theory.
2.	To study and learn different types of RADAR and their working principle.
3.	To study RADAR signal detection methods.
4.	To study an overview of RADAR Navigation.
5.	To learn about RADAR systems and components.

UNIT I-RADAR EQUATIONS (7 hours)

RADAR Block Diagram & operation – RADAR Frequencies – RADAR Equation – Detection of signals in Noise – RADAR cross section of targets – RADAR cross section fluctuations – transmitter power – pulse repetition frequency – system losses and propagation effects.

UNIT II-MTI AND PULSE DOPPLER RADAR (11 hours)

Introduction to Doppler & MTI RADAR – Delay Line canceller – Moving Target Detector – Pulse Doppler RADAR – Non-Coherent MTI – CW RADAR – FMCW RADAR – Tracking RADAR – Monopulse Tracking – Conical Scan and Sequential Lobing.

UNIT III-RADAR SIGNAL DETECTION AND PROPAGATION ON WAVES (9 hours)

Detection criteria – automatic detection – constant false alarm rate receiver – Ambiguity diagram – pulse compression – introduction to clutter – surface clutter RADAR equation – anomalous propagation and diffraction.

UNIT IV-RADIO NAVIGATION **(9 hours)**

Adcock directional finder – automatic directional finder – Decca Navigation System – Tactical Air Navigation – Instrument Landing System – Ground Controlled Approach.

UNIT V-RADAR TRANSMITTER AND RECEIVER **(9 hours)**

Linear beam power tubes – Solid state RF power sources – solid state devices used in RADAR – Magnetron- crossed field amplifiers – other aspects of radar transmitter – RADAR Receiver – Receiver noise figure – super heterodyne receiver – dynamic range – RADAR Displays.

TEXT BOOKS

1. Skolnik.M.I, *"Introduction to RADAR systems",* Mc-Graw Hill, 3rd Edition, 1981.
2. Nagaraja.N.S. *"Elements of Electronic Navigation",* Tata Mc-Graw Hill, 2nd Edition, 1993.

REFERENCES

1. Nadav Levanon, *"RADAR Principles",* John Wiley and Sons, 1989.
2. Brookner, *"RADAR Technology",* Artech House, 1986.
3. Mark, Richards.A, "*Fundamentals of radar signal processing*", Mc-Graw Hill, Electronic Engineering, 1st Edition, 2005.
4. Bagad.V.S, "*Radar Systems",* Technical publications, 1st edition,2008.

EC1113 RADAR AND NAVIGATIONAL AIDS												
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			1, 5						3, 4, 5
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)			Professional Subjects (P)			
									X			
4.	Broad area	Communication		Signal Processing		Electronics		VLSI	Embedded			
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1114	COMMUNICATION SWITCHING TECHNIQUES	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1018				

PURPOSE

To learn the basic principles of switching, signaling, and traffic in the context of telecommunication networks.

INSTRUCTIONAL OBJECTIVES

1.	To study the concepts of message switching, circuit switching, strowger switching, crossbar switching, electronic switching, and digital switching.
2.	To understand the problems of congestion, queuing, and to study methods like Grade of Service, and Blocking Probability to provide an estimate of the amount of traffic present in various systems.
3.	To solve problems in single-stage networks, strict-sense non-blocking networks, and sectionalized switching networks.
4.	To study concepts like Reliability, Availability, and Security in various types of switching systems.
5.	To learn the different kinds of signaling, circuit and packet switching techniques.

UNIT I-BASIC SWITCHING SYSTEMS FOR TELECOMMUNICATION (9 hours)

Crossbar switching – Electronic space division switching – Time division switching – Time multiplexed switching – n-stage combination switching - hybrid time and space division multiplexes.

UNIT II-TRAFFIC ENGINEERING (9 hours)

Congestion – Network traffic load and Parameters – Traffic measurement – Lost-call system – Grade of Service and Blocking probability – Modeling switching systems – Incoming traffic and service time characterization – Blocking models and loss estimates – Queuing systems – Simulation models.

UNIT III-SWITCHING NETWORKS (9 hours)

Single-stage networks – Gradings – Link systems – Grades of service of link systems – Application of graph theory to link systems – Use of expansion – Call packing – Rearrangeable networks – Strict-sense non-blocking networks – Sectionalized switching networks.

UNIT IV-TIME-DIVISION SWITCHING AND CONTROL OF SWITCHING SYSTEMS (9 hours)

Space and time switching – Time-division switching networks – Grades of service of time-division switching networks – Non-blocking networks – Synchronization – Call-processing functions – Common control – Reliability, availability and security – Stored program control.

UNIT V-SIGNALING AND PACKET SWITCHING (9 hours)

Customer line signaling – FDM carrier systems – PCM signaling – Inter-register signaling – Common-channel signaling principles – CCITT signaling – Digital customer line signaling – Statistical multiplexing – Local area and wide area networks – Large scale and Broadband networks.

TEXT BOOK

1. Flood.J.E, *"Telecommunications Switching, Traffic and Networks",* Pearson Education Ltd., 1999.

REFERENCE

1. Thiagarajan Viswanathan, "*Telecommunication Switching Systems and Network"s*, Prentice Hall of India Pvt. Ltd, 1992.

EC1114 COMMUNICATION SWITCHING TECHNIQUES												
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	1,4,5		4		2,3,4 ,5						1,2,3
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)					Professional Subjects (P)	
											X	
4.	Broad area	Communication		Signal Processing		Electronics			VLSI		Embedded	
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1115	ASIC DESIGN	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1012				

PURPOSE

The purpose of this course is to introduce the students the basics of designing and using ASIC's. The operation of tools used in the design is also explained.

INSTRUCTIONAL OBJECTIVES

1.	To give basic knowledge of ASIC internals.
2.	To impart knowledge on ASIC types and tools used in the design.
3.	To give basic understanding of tools used.

UNIT I-INTRODUCTION TO ASICS (9 hours)

Introduction to ASICs : Full-custom and Semi -custom ASIC – CMOS logic – ASIC library design.

UNIT II-PROGRAMMABLE ASICS (9 hours)

Programmable ASICs – Anti fuse – static RAM – EPROM and technology – Actel ACT – Xilinx LCA – Altera flex – Altera MAX Logic cells – I/O cells – Interconnects – Low level design entry: Schematic entry.

UNIT III-SIMULATION AND SYNTHESIS (9 hours)

Logic synthesis: A comparator MUX, Inside a logic synthesizer, VHDL and logic synthesis, FSM synthesis, memory synthesis – Simulation: Types of simulation – logic systems – how logic simulation works.

UNIT IV-ASIC TESTING (9 hours)

Boundary scan test – Faults – Fault simulation – Automatic test pattern generation algorithm: D-algorithm, PODEM – Built in self test.

UNIT V-ASIC CONSTURCTION (9 hours)

System partitioning – power dissipation – partitioning methods – floor planning and placement:– Routing: Global routing, detailed routing, special routing – Introduction to SOC.

TEXT BOOK

1. Smith.M.J.S, *"Application Specific Integrated Circuits",* Addison Wesley Longman Inc., 1996. (Pearson Education Reprint 2006).

REFERENCES

1. Sarafzadeh.M. and Wong.C.K, *"An Introduction to VLSI Physical Design",* McGraw Hill, 2nd Edition, 1996.
2. Wolf Wayne, *"FPGA based system design",* Pearson Education, 2005.
3. Design manuals of Altera, Xilinx and Actel.
4. Jan M. Rabaey. Anantha Chandrakasan, Borivoje Nikolic*, "Digital Integrated Circuits",* Prentice-Hall Publication, 2nd Edition, 2002.

EC1115 ASIC DESIGN												
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		X
2.	Mapping of instructional objectives with student outcome	1,2		2,3	1,3					2,3		1,2
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)			Professional Subjects (P)			
									X			
4.	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
								X				
5.	Approval	23rd Meeting of Academic Council, May 2013										

		L	T	P	C
EC1116	**EMBEDDED C AND MICROCONTROLLER**	**3**	**0**	**0**	**3**
	Total Contact Hours – 45				
	Prerequisite				
	EC1016				

PURPOSE

The objective of the course is to provide strong foundation in ARM SOC architecture, as well as programming of ARM Microcontroller using Embedded C language, which is a great demand in the today's core industry. This course content satisfies the thrust to bridge the gap between the academic course and core industry skill set requirement.

INSTRUCTIONAL OBJECTIVES	
1.	Understand fundamentals in ARM Architecture and its instruction set.
2.	Appreciate the advantages in using ARM microcontrollers & systems development using ARM target boards.
3.	Design systems applications using Embedded C programming
4.	Apply this knowledge to more real-time case study.

UNIT I-THE ARM PROCESSOR FUNDAMENTALS AND INSTRUCTION SET(9 hours)

ARM Register structure – Program Status register- Pipeline, Exception, Interrupts on vector table- core extension- ARM Processor families. Data processing instructions-Branch Instructions-Load-store instructions, software Interrupts-Program status resister instructions, loading instructions-ARMv5E Extensions, conditional execution.

UNIT II-THE THUMB INSTRUCTION SET AND ARM ARCHITECTURE (9 hours)

THUMB register usage, ARM-THUMB Interworking-other Branch instruction, Data Processing instruction-single register Load-store instructions- multiple register load store instruction-stack instruction-Software Interrupt instructions – ARM Processor Cores - ARM assembly language programming - writing and optimizing ARM assembly code - Instruction schedules.

UNIT III-ARCHITECTURAL SUPPORT FOR HIGH LEVEL LANGUAGE AND SYSTEM DEVELOPMENT (9 hours)

Conditional execution - looping constructs - Bit manipulation - Function and procedure - use of memory – ARM memory interface – AMBA bus architecture – Hardware system prototyping tools - the ARMulator - The JTAG BST architecture - The ARM Embedded trace - debug architecture.

UNIT IV-MEMORY HIERARCHY, EMBEDDED ARM CPU CORES AND ITS APPLICATIONS (9 hours)

Caches - Memory protection unit - Memory management unit - ARM CPU cores – The AMULET asynchronous ARM Processors. Embedded Operating Systems - Principle Components – Application case study – **VLSI Ruby II** Advanced communication processor – **nuvoTon Cortex M0 (Nu-LB-NUC140)** Microcontroller processor & its supporting tools.

UNITV-INTRODUCTION TO EMBEDDED C (9 hours)

C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues. Embedded Systems

programming in C – Binding & Running Embedded C program in Keil IDE – Dissecting the program -Building the hardware. Basic techniques for reading & writing from I/O port pins – switch bounce - LED Interfacing using Embedded C – Basics of SEOS

TEXT BOOKS

1. Andrew N Sloss, Symes.D, Wright.C, *" Arm system developers guide"*, Morgan Kauffman/ Elsevier, 2007.
2. Steve Furber, *"ARM Systems-on-Chip architecture"* Addison Wesley, Reprint, 2012.
3. Michael J. Pont, *"Embedded C"*, Addison Wesley, 2002.

REFERENCES

1. David Seal, *"ARM Architecture Reference Manual"*, Pearson Education, 2007.
2. Jivan S. Parab, Vinod Shelake.G, Rajanish Kamot.K, and Gourish Naik.M, *"Exploring C for Microcontrollers- A Hands on Approach"*, Springer, 2007.
3. www.nuvoton.com.

EC1116 EMBEDDED C AND MICROCONTROLER												
Course Designed by		**Department of Electronics and Communication Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
2.	Mapping of instructional objectives with student outcome	1,2,3,4	2,4									
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
4.	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
										X		
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1117	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE	
To study various aspects of Network Security Attacks, Services and Mechanisms.	
INSTRUCTIONAL OBJECTIVES	
1.	To understand the mathematical concepts of various Encryption, Authentication and Digital Signature Algorithms.
2.	To standby the design of different general purpose and application specific security Protocols and standards.

UNIT I-INTRODUCTION (9 hours)

Security Services, Mechanisms and Attacks – Network Security Model-Classical Encryption Techniques –Steganography – Data Encryption Standard (DES).

UNIT II-ADVANCED BLOCK CIPHERS AND PUBLIC KEY CRYPTOSYSTEMS (9 hours)

Block cipher modes operation – Overview of IDEA, Blowfish, RC5, CAST-128 – Characteristics of advanced symmetric Block ciphers – Key Distribution – Principle – RSA algorithm – Public Key Management – Diffie Hellmen Key Exchange – X.509 Public Key Certificate Format.

UNIT III-MESSAGE AUTHENTICATION AND DIGITAL SIGNATURE (9 hours)

Message Authentication codes – MAC – HASH function – Principle of MD5, SHA-1 and HMAC algorithms-Digital Signature algorithm.

UNIT IV-NETWORK SECURITY (9 hours)

Authentication Application – Kerbros – Email Security – PGP – Network Security – IPSec – Web Security – SSL –SET.

UNIT V- SYSTEM SECURITY (9 hours)

Intrusion Detection – Password management – Malicious software – Viruses and countermeasures – Firewall Types and Configurations – Trusted System.

TEXT BOOK

1. William Stallings, *"Cryptography and Network Security",* Pearson Education, 5th Edition, New Delhi, 2011.

REFERENCES

1. Forouzan.B.A. and Mukhopadhyay.D, *"Cryptography and Network Security",* Tata Mc-Graw Hill, 2nd Edition, 2010.
2. William Stallings, *"Cryptography and Network Security",* PHI, New Delhi, 2nd Edition, 1999.

EC1117 CRYPTOGRAPHY AND NETWORK SECURITY												
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	X	X					X
2.	Mapping of instructional objectives with student outcome	1	1,2	2	1,2	1	1,2					1,2
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
										X		
4.	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1118	SATELLITE COMMUNICATION AND BROADCASTING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	EC1018				

PURPOSE

The main objective of this course is to make the students understand the basic concept in the field of satellite communication. This subject gives the students an opportunity to know how to place a satellite in an orbit. The students are taught about the earth and space subsystems. The satellite services like broadcasting are dealt thoroughly. This will help the student to understand and appreciate the subject.

INSTRUCTIONAL OBJECTIVES

At the end of this course students will gain knowledge in topics such as

1.	Orbital aspects involved in satellite communication.
2.	Power budget calculation.
3.	Satellite system and services provided.

UNIT I-SATELLITE ORBIT **(9 hours)**

Satellite orbits: Kepler's laws – Earth satellite orbiting satellite terms-Orbital elements – Orbital perturbations –Inclined Orbits – Sun synchronous orbit. **Constellation:** Geo stationary satellites – Non geostationary constellation – Launching of Geostationary satellites.

UNIT II-INK DESIGN **(9 hours)**

EIRP – Transmission Losses – Power Budget equation – System Noise Carrier to noise ratio – Uplink – Downlink –Effects of rain – Inter modulation Noise.

UNIT III-SPACE AND EARTH SEGMENT **(9 hours)**

Space Segment: Power Supply – Altitude control – Station keeping – Thermal Control – TT&C – Subsystems – Antenna subsystem –Transponders – Wideband Receiver. **Earth Segment:** receive only home TV system – Community antenna TV system.

UNIT IV-SATELLITE ACCESS **(9 hours)**

Single Access- Pre assigned FDMA – Demand Assigned FDMA – SPADE system-TWT amplifier operation – Downlink analysis – TDMA – reference bursts – Preamble – Postamble – Carrier recovery – Network synchronization – Pre assigned TDMA – Assigned –CDMA introduction.

UNIT V-BROADCAST AND SERVICES **(9 hours)**

Broadcast: DBS – Orbital Spacings- Power ratings – Frequency and Polarization – Transponder Capacity – Bit rate – MPEG – Forward Error Correction. ODU-IDU – Downlink Analysis – Uplink – Satellite Mobile services: VSAT–GPS.

TEXT BOOK

1. Dennis Roddy, *"Satellite Communications",* Tata Mc-Graw Hill Publications, 4th Edition, 2008.

REFERENCES

1. Madhavendra Richharia, Leslie David, *"Satellite Systems for Personal Applications Concepts and Technology",* Wiley-Blackwell, 2010.
2. Wilbur L.Prichard, Henry G. Suyerhood, Ropert A. Nelson, *"Satellite Communication System Engineering",* 2nd Edition, Pearson Education, 1993.
3. Pratt, Timothy, Charles W. Bostian, *"Satellite Communication",* John Wiley and Sons, 2nd Edition, New York, 1986.

EC1118 SATELLITE COMMUNICATION AND BROADCASTING												
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					X	
2.	Mapping of instructional objectives with student outcome	1,2	1,3	1,3		1,2					1,3	

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
		X				
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1119	MOBILE COMPUTING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To understand the fundamentals and architectures of wireless communication standards and Mobile Adhoc networks.

INSTRUCTIONAL OBJECTIVES

1.	To study the introduction of wireless communication systems.
2.	To study the specifications and functionalities of wireless protocols / standards.
3.	To study the fundamentals of mobile Adhoc networks.

UNIT I-INTRODUCTION (9 hours)

Introduction to Mobile Computing – Wireless transmission: Signal Propagation – Multiplexing – Modulation – Spread Spectrum and Cellular Systems.

UNIT II-WIRELESS PROTOCOLS (9 hours)

Infrastructure and adhoc networks – IEEE 802.11: Protocol architecture – Physical and MAC layer; Hiperlan2: Reference model and configurations – Physical layer – Data link layer & Convergence layer; Bluetooth: Protocol stack – radio layer – Baseband layer – Link manager protocol – L2CAP layer and security.

UNIT III-WIRELESS NETWORKING (9 hours)

Satellite systems – Cellular networks – Cordless systems – Wireless Local Loop – IEEE 802.16: System reference model – Protocol architecture – MAC layer & Physical layer.

UNIT IV-PACKET RADIO NETWORKS **(9 hours)**

Packet Radio Networks: Architecture and components of PRNETs – Routing in PRNETs – Pacing techniques – Media access and flow acknowledgement in PRNETs.

UNIT V-AD-HOC MOBILE NETWORKS **(9 hours)**

Types of Ad-hoc mobile communications & Host movements – Challenges facing Ad-hoc mobile networks – Problems in Ad-hoc channel access – Existing Ad-hoc MAC protocols: MACA – MACABI – PAMAs – DBTMA.

TEXT BOOK

1. Jochen Schiller, *"Mobile Communications",* Pearson Education, 2nd Edition, 2002.

REFERENCES

1. Toh.C.K, *"Ad Hoc Mobile Wireless Networks: Protocols and Systems",* Pearson Education, 2002.
2. William Stallings, *"Wireless Communications and Networks",* Pearson Education, 2nd Edition, 2002

<table>
<tr><th colspan="13">EC1119 MOBILE COMPUTING</th></tr>
<tr><th colspan="2">Course Designed by</th><td colspan="11">Department of Electronics and Communication 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>5.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
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EC1120	BLUETOOTH TECHNOLOGY	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE	
To Study the concepts of Bluetooth Technology.	
INSTRUCTIONAL OBJECTIVES	
1.	To study the fundamental concepts of Bluetooth module.
2.	To analyze the protocol operation.
3.	To gain knowledge on various low power modes and Quality of Service parameters.
4.	To understand the testing methodology and the related standards.

UNIT I-THE BLUETOOTH MODULE (8 hours)

Introduction-overview - the Bluetooth module-antennas- base band - introduction-bluetooth device address –masters, slaves, and Pico nets-system timing-physical links-Bluetooth packet structure-logical channels-frequency hopping.

UNIT II-THE LINK CONTROLLER (10 hours)

The link controller-link control protocol-link controller operation-Pico net, scatter net operation-master/slave role switching-base band/link controller architectural overview -link manager-the host controller interface.

UNIT III-THE BLUETOOTH HOST (10 hours)

The bluetooth host-logical link control and adaptation protocol –RFCOMM- the service discovery protocol – the wireless access protocol-OBEX and IrDA-telephony control protocol.

UNIT IV-CROSS LAYER FUNCTIONS (8 hours)

Cross layer functions-Encryption and security-low power operations-controlling low power modes-hold mode-sniff mode-park mode-quality of service-managing Bluetooth devices.

UNITV-ZIGBEE NETOWRKS (9 hours)

Zigbee communication basics – Zigbee network layers and their functions – Zigbee MAC series, MAC frame format – Transceiver building block – Receiver sensitivity – 2.4 GHz and 868/915 MHz operation – FCC regulations – Applications – Home automation – Healthcare Industrial automation.

TEXT BOOKS

1. Jennifer Bray and Charles F Sturman, *"Bluetooth: Connect Without Cables",* Pearson Education, 2002.
2. Stahun Farahani, *"Zigbee Wireless Networks and Transceivers"*, Elsevier Ltd, 2003.

REFERENCES

1. Jennifer Bray, Brain Senese, Gordon McNutt and Bill Munday, *"Bluetooth Application Developer's Guide",* Syngress Media, 2001.
2. Micheal Mille, *"Discovering Bluetooth",* Sybex Incorporation, 2001.

EC1120 BLUETOOTH TECHNOLOGY												
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	4				3			
3	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)			Professional Subjects (P)			
									X			
4	Broad area	Communication		Signal Processing		Electronics		VLSI		Embedded		
		X										
5	Approval	23rd Meeting of Academic Council, May 2013										

EC1121	**COMMUNICATION NETWORK PROTOCOLS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The course introduces the students to the emerging areas in Internetworking. This will enable the students to acquire a solid understanding of the different components involved in the seamless working of the Internet.

INSTRUCTIONAL OBJECTIVES

1.	To learn the technology of Data Networking.
2.	To learn Internet addressing and routing methods.
3.	To study Client Server model and Internet Security.

UNIT I-REVIEW OF UNDERLYING NETWORK TECHNOLOGIES (6 hours)

Motivation for internetworking- Internet Services- Introduction to Wide Area and Local Area Networks- Ethernet Technology- FDDI- Internetworking concepts and Architecture model.

UNIT II-INTERNET ADDRESSES (10 hours)

Classful Internet Addresses- Subnetting and Supernetting- ARP- ARP Packet format, Encapsulation & operation- ARP over ATM- Proxy ARP- RARP-ICMP – ICMP message types.

UNIT III-ROUTING (11 hours)

Internet Protocol-Connectionless Datagram Delivery- Forwarding IP Datagrams-IPV4 data grams -Packet format – Routing Architecture –Core ,Peers and Algorithms-Routing between peers- Border Gateway Protocol(BGP)-Routing within Autonomous systems-Routing Information Protocol- RIP-OSPF.

UNIT IV-CLIENT SERVER MODEL AND SOCKET INTERFACE (9 hours)

The client server model- UDP echo server- Time and date service-Socket abstraction- Specifying local and destination addresses- Sending and Receiving data-Handling multiple services, Domain name system – Distribution of name space-DNS resolution – DNS messages and records.

UNIT V-INTERNET SECURITY AND IPV6 (9 hours)

Protecting resources - IPSec- Authentication Header-Encapsulating security payload – Secure sockets-Secure Socket Layer (SSL)- Firewalls and Internet access- Packet filter firewall- Proxy firewall- IPv6-Features and packet format-IPV6 Source routing types- Comparison between IPV4 and IPV6.

TEXT BOOK

1. Douglas E. Comer, *"Internetworking with TCP/IP", Principles, Protocols and Architectures", Pearson Education, Vol. I, 5th Edition, 2006.*

REFERENCES

1. Behrouz A. Forouzan, *"TCP/IP protocol suite",* Tata McGraw Hill, 4th Edition, 2010.
2. Peterson (David. M.)., *"TCP/IP Networking",* Tata McGraw Hill, 5th Edition, 2011.
3. Douglas E. Comer., *"Computer Networks and Internet",* Addison Wesley, 4th Edition, 2011.

EC1121 COMMUNICATION NETWORK PROTOCOL												
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
2.	Mapping of instructional objectives with student outcome			1,2						1,2 ,3		*2,3*

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences & Technical Arts (E)	Professional Subjects (P)
					X

4.	Broad area	Communication	Signal Processing	Electronics	VLSI	Embedded
		X				
5.	Approval	23rd Meeting of Academic Council, May 2013				

EC1122	**PHOTONICS AND OPTICAL NETWORKS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The course will provide students with the fundamental concepts in photonics, which have increasing applications in the area of information technology and communication, healthcare and life science, optical sensing, lightning, energy and manufacturing. The course will focus on the applications in optical communication and networks.

INSTRUCTIONAL OBJECTIVES

1.	To understand the interaction of photons and matter, the propagation of light in waveguides and optical fibers, the operation principles of light emitting diodes, semiconductor lasers, detectors amplifiers and network components.
2.	To understand the operating principles of optical communication systems including wavelength division multiplexing, Time division multiplexing and code division multiplexing.
3.	To design simple optical communication link.
4.	To describe the main types of architectures, protocols and standards governing modern optical networks.

UNIT I-INTRODUCTION TO PHOTONICS (6 hours)

Review of wave nature and particle nature of light, Interaction of light with matter-emission and absorption of radiation. Review of optics- Reflection and refraction of plane waves; Fresnel's formulas, Interference and interferometers, Diffraction, Optical coherence, Polarization of light.

UNIT II-OPTICAL FIBER WAVEGUIDES, SOURCES AND DETECTORS (12 hours)

The propagation of light in optical waveguides, Classification of optical fibers, Single mode fiber, Material and Waveguide Dispersion, Dispersion shifted fiber, Signal Attenuation. Introduction to Non linear fiber optics. Laser Fundamentals: Stimulated and spontaneous Emission, Einstein relations, Optical feedback, threshold condition, Injection Laser Diode (ILD), Laser Modes. Photodetection, PIN and Avalanche Photo diode (APD), Quantum Efficiency, Responsivity and Speed of Response , Noise mechanism in photo detectors.

UNIT III-OPTICAL COMPONENTS AND SYSTEM DESIGN (9 hours)

Principle and Operation of couplers/splitters, WDM MUX/DEMUX - AWG, Isolators, Circulators, Fabry Perot Filters, Mach-Zehnder Interferometer, optical switches, EDFA, Semiconductor Optical Amplifier.Optical Link Design: Power penalty -Point- to- point links – System considerations – Link Power budget – Rise time budget.

UNIT IV-OPTICAL NETWORKS ARCHITECTURE (9 hours)

Optical network concepts – Topology – Metropolitan – Area Networks - SONET/SDH: – Optical specifications – SONET frame structure –Optical transport network - Broadcast and Select networks.

UNIT V-WDM NETWORK DESIGN (9 hours)

WDM network elements, WDM network design - Cost tradeoffs, virtual Topology design, Routing and wavelength assignment, statistical dimensioning models.

TEXT BOOK

1. Rajiv Ramaswamy, Kumar N. Sivaranjan and Galen H. Sasaki, *"Optical Networks – A practical perspective",* 3rd edition, Elsevier, 2010.

REFERENCES

1. Keiser, *"Optical Fiber Communication Systems",* 4th edition, Tata McGrawHill. Edition, 2010.
2. Joseph C.Palais *"Fiber Optic Communications",* Fifth edition, Seventh impression, Pearson, 2012.

3. Djafar.K. Mynbaev Lowell and Scheiner, *"Fiber Optic Communication Technology",* Sixth impression, Pearson Education Asia, 9th impression, 2011.
4. John M. Senior, *"Optical Fiber Communications –Principles and Practice",* Pearson Education, 2009.
5. John Powers, *"An Introduction to Fiber optic Systems",* 2nd edition, Tata-McGraw Hill, 2010.

EC1122 PHOTONICS AND OPTICAL NETWORKS												
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								
2.	Mapping of instructional objectives with student outcome	1,2	3	3,4								
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)			Professional Subjects (P)			
									X			
4.	Broad area	Communication		Signal Processing		Electronics		VLSI	Embedded			
		X										
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1123	RF SYSTEM DESIGN FOR WIRELESS COMMUNICATIONS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To learn about the specifications, design and analysis of RF systems for wireless communication applications.

INSTRUCTIONAL OBJECTIVES

1.	RF circuits and system specifications and analysis.
2.	Transceiver architectures.
3.	Overall picture of Wireless Transceivers.

UNIT I-INTRODUCTION TO RF AND WIRELESS SYSTEMS (9 hours)

Characteristics of RF signals, Wireless communication systems, Wireless Standards, Introduction to Multiple Access Techniques FDMA, TDMA,CDMA and OFDMA.

UNIT II-RF COMPONENTS AND CIRCUITS (9 hours)

Components: Capacitors, Inductors, Tuning and Matching.

Circuits: Low Noise Amplifiers, Mixers, Oscillators, Frequency Synthesizers, Power Amplifiers.

UNIT III-RADIO ARCHITECTURES (9 hours)

Two step transmitter Architecture, Homodyne Receiver Architecture, Super heterodyne Architecture, Direct Conversion (Zero IF) Architecture, Low IF Architecture, Digital IF Receivers and Band Pass sampling Radio Architectures.

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UNIT IV-SYSTEM ANALYSIS AND DESIGN (9 hours)

Receiver: Sensitivity & Noise Figure of Receiver, Inter modulation Characteristics, Single Tone Desensitization, Adjacent/Alternate channel selectivity, Receiver Dynamic Range and AGC system, System design and performance evaluation.

Transmitter: Transmitter power and spectrum, Modulation accuracy, Adjacent and alternate channel power, Noise emission calculation.

UNIT V-APPLICATIONS AND CASE STUDIES (9 hours)

Multimode and Multiband Super heterodyne Transceiver, Direct Conversion Transceiver

Case studies: FM Receiver, Pager Receiver, DECT transceiver, GSM Transceiver, Wireless LAN RFIC, Four band GSM, GPRS, EDGE handset.

TEXT BOOKS

1. Allan W. Scott, Rex Frobenius, *"RF Measurements for Cellular Phones and Wireless Data Systems",* John Wiley & Sons Publications, 2008.
2. Qi Zheng Gu, *"RF System Design of Transceivers for Wireless Communications",* Nokia Mobile Phones,Inc. Springer, 2005.

REFERENCES

1. Joseph. J. Carr, *" RF Components and Circuits",* Newnes Publications, First edition, 2002.
2. Behzad Razavi*, "RF Microelectronics",* Prentice Hall PTR, 1998.

EC1123 RF SYSTEM DESIGN FOR WIRELESS COMMUNICATIONS												
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.	Broad area	Communication			Signal Processing			Electronics		VLSI	Embedded	
5.	Approval	23rd Meeting of Academic Council, May 2013										

EC1124	**NEURAL NETWORK AND FUZZY LOGIC**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

This course provides a way to study the Artificial Neural Networks and Fuzzy Logic concepts.

INSTRUCTIONAL OBJECTIVES

1.	To learn the various architectures of ANN.
2.	To learn the methods of representing information in ANN like self organizing networks, associative and competitive learning.
3.	To understand and apply concepts of Crisp sets, Fuzzy sets and Fuzzy Relations.

UNIT I-INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS (9 hours)

Neuro-physiology - General Processing Element - ADALINE - LMS learning rule – MADALINE – XOR Problem – MLP - Back Propagation Network - updation of output and hidden layer weights - application of BPN.

UNIT II-ASSOCIATIVE MEMORY & CPN (9 hours)

Associative memory - Bi-directional Associative Memory – Hopfield memory - traveling sales man problem Annealing, Boltzmann machine - learning – application - Counter Propagation network –architecture – training – Applications.

UNIT III-SELF ORGANIZING MAP & ART **(9 hours)**

Self-organizing map - learning algorithm - feature map classifier – applications - architecture of Adaptive Resonance Theory - pattern matching in ART network.

UNIT IV-CRISP SETS AND FUZZY SETS **(9 hours)**

Introduction – crisp sets an overview – the notion of fuzzy sets –Basic concepts of fuzzy sets – classical logic an overview – Fuzzy logic- Operations on fuzzy sets - fuzzy complement – fuzzy union – fuzzy intersection – combinations of operations – general aggregation operations.

UNIT V-FUZZY RELATIONS **(9 hours)**

Crisp and fuzzy relations – binary relations – binary relations on a single set– equivalence and similarity relations – Compatibility or tolerance relations– orderings – morphisms-fuzzy relation equations.

TEXT BOOKS

1. Freeman J.A. and Skapura B.M., "*Neural Networks, Algorithms Applications and Programming Techniques*", Addison-Wesely, 1991.
2. Martin T.Hagan, *"Neural network design"*, Cengage publications, 2010.
3. George J Klir and Tina A Folger, " *Fuzzy sets, uncertainty and information*", Prentice Hall of India, (reprint) 2012

REFERENCES

1. Laurene Fausett, "*Fundamentals of Neural Networks: Architecture, Algorithms and Applications*", Pearson Education, (reprint) 2006.
2. Zimmerman.H.J, "*Fuzzy set theory and its Applications*", Kluwer academic Publishers, 2001.

<table>
<tr><td colspan="14">EC1124 NEURAL NETWORK AND FUZZY LOGIC</td></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="12">Department of Electronics and Communication 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>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
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	DIGITAL LOGIC DESIGN WITH PLDS AND VHDL	L	T	P	C
EC1125	Total Contact Hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	EC1007				

PURPOSE

Learning design of digital circuits is a fundamental necessity for designing practical systems. To develop standard design practices for digital circuits at a higher level of abstraction a hardware description language is useful. This subject provides necessary instruments to achieve that goal.

INSTRUCTIONAL OBJECTIVES

1.	Apply advanced theorems to simplify the design aspects of various practical circuits.
2.	Design State Machines.
3.	Implement various digital circuits using Programmable Logic Devices.
4.	Implement combinational and sequential circuits using VHDL.

UNIT I-ADVANCED TOPICS IN BOOLEAN ALGEBRA (8 hours)

Shannon's Expansion theorem and its application ,Consensus theorem,Reed-Muller Expansion technique, Multiplexer logic as function generators, Implementation of Multiple output logic functions, Static and Dynamic hazards, Design of static hazard-free and dynamic hazard-free logic circuits.

UNIT II-Sequential Circuit Design (9 hours)

Mealy and Moore machines, clocked synchronous sequential circuit design procedure-state diagrams-state table-state reduction-state assignment, Incompletely Specified Sequential Machines.

UNIT III-Design with Programmable Logic Devices (9 hours)

Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Design of combinational and sequential circuits using PLD's, Complex PLD (CPLD), Introduction to Field Programmable Gate Arrays (FPGA), Xilinx FPGAs-Xilinx 3000 series and 4000 series FPGA.

UNIT IV-Introduction to VHDL (9 hours)

VHDL Description of combination circuits, VHDL Modules- entity and architecture description, Sequential statements and VHDL processes, VHDL Data types and Operators, Concurrent and Sequential Assignment Statements(All types), Different types of Modeling in VHDL – Behavioral, dataflow and structural modeling, Variables, Signals and Constants in VHDL, Package in VHDL.

UNIT V-Digital Design with VHDL **(10 hours)**

Combinational Circuit Design using Structural, behavioral and data flow modeling (Circuits like Arithmetic circuits, decoders, encoders, multiplexers, demultiplexers, code converters, 4-bit binary adders, BCD adder, comparator, ALU etc.,), Design of Sequential Elements, Registers, Counters and Synchronous Sequential Circuits using VHDL.

TEXT BOOKS

1. Charles. H. Roth, Jr, *"Digital Systems Design using VHDL"*, CENGAGE Learning, Third Indian Reprint, 2010.
2. Zwolinski, *"Digital System Design With VHDL"*, 2/E, Pearson Education India, 2004.
3. Ian Grout, *"Digital Systems Design with FPGAs and CPLDs"*, Newness, 2011.

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