



# **SRI KRISHNA INSTITUTIONS**

**SRI KRISHNA COLLEGE OF ENGINEERING & TECHNOLOGY**

**DEPARTMENT OF  
ELECTRONICS & COMMUNICATION ENGINEERING**

**CURRICULUM  
DESIGNED FOR**

**REGULATION 2015**

**Applicable for students admitted from  
2015-2016**

<b>SEMESTER I</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
1	15UH101	Communication Skills – I	2/0/2	4	3	60/40	HS
2	15UH202	Engineering Physics	3/0/0	3	3	60/40	BS
3	15UH203	Engineering Chemistry	3/0/0	3	3	60/40	BS
4	15UH201	Mathematics – I	2/2/0	4	3	60/40	BS
5	15UC301	Fundamentals of Computing and C Programming	3/0/0	3	3	60/40	ES
6	15UF301	Basics of Electrical and Electronics Engineering	3/0/0	3	3	60/40	PC
7	15UA354	Engineering Graphics Lab	2/0/2	4	3	60/40	ES
8	15UC351	Fundamentals of Computing and C Programming Lab	0/0/3	3	2	60/40	ES
9	15UH251	Physical Sciences Lab	0/0/4	4	2	60/40	BS
<b>Total</b>				<b>31</b>	<b>25</b>	<b>900</b>	

<b>SEMESTER II</b>							
<b>S No</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
1	15UH102	Communication Skills – II	2/0/2	4	3	60/40	HS
2	15UH301	Material Science	3/0/0	3	3	60/40	BS
3	15UH302	Environmental Science	3/0/0	3	3	60/40	HS
4	15UH204	Mathematics – II	3/2/0	4	3	60/40	BS
5	15UC302	Advanced C Programming	3/0/0	3	3	60/40	ES
6	15UB301	Electric Circuits and Electron Devices	3/2/0	5	4	60/40	PC
7	15UA355	Engineering Practices Lab	0/0/3	3	2	60/40	ES
8	15UC352	Advanced C Programming Lab	0/0/3	3	2	60/40	ES
9	15UB351	Electric Circuits and Electron Devices Lab	0/0/3	3	2	60/40	PC
<b>Total</b>				<b>31</b>	<b>25</b>	<b>900</b>	

<b>SEMESTER III</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
1	15MA133	Partial Differential Equations and Transform Techniques	3/2/0	5	4	60/40	BS
2	15EC304	Digital System Design	3/0/0	3	3	60/40	PC
3	15EC305	Electromagnetic Fields	4/0/0	4	4	60/40	PC
4	15EC306	Linear Integrated Circuits	3/0/0	3	3	60/40	PC
5	15EC401	Measurement & Instrumentation	3/0/0	3	3	60/40	PC
6	15CS205	Data Structures and algorithms	3/0/3	6	5	40/60	ES
7	15EC307	Digital System Design Laboratory	0/0/3	3	2	40/60	PC
8	15EC308	Linear Circuits Laboratory	0/0/3	3	2	40/60	PC
9	15EC701	Mandatory Course-I	2/0/0	2	1	-	MC
<b>Total</b>				<b>32</b>	<b>27</b>	<b>800</b>	

<b>SEMESTER IV</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credits</b>	<b>Ext/Int</b>	<b>Category</b>
1.	15MA143	Probability and Random Process	3/2/0	5	4	60/40	BS
2.	15EC309	Electronic Circuits	4/0/0	4	4	60/40	PC
3.	15EC310	Analog and Pulse Communication	3/0/0	3	3	60/40	PC
4.	15EC311	Signals and Systems	3/0/2	5	4	40/60	PC
5.	15EC312	Transmission Lines and Waveguides	3/0/0	3	3	60/40	PC
6.	15EC313	Electronic Circuits Laboratory	0/0/3	3	2	40/60	PC
7.	15EC314	Analog Communication Laboratory	0/0/3	3	2	40/60	PC
8.	15EC601	Mini Project-I	-	-	2	40/60	PW
9.	15EC702	Mandatory Course-II	-	3	1	0/100	MC
				<b>29</b>	<b>25</b>	<b>900</b>	

<b>SEMESTER V</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credits</b>	<b>Ext/Int</b>	<b>Category</b>
1.	15EC315	Microcontrollers & Interfacing	3/0/0	3	3	60/40	PC
2.	15EC316	Digital Signal Processing	3/0/2	5	4	40/60	PC
3.	15EC317	Digital Communication	3/0/0	3	3	60/40	PC
4.	15EC318	Computer Networks & Interfacing	3/0/0	3	3	60/40	PC
5.	15EC208	Electrical Machines & Control Systems	3/0/0	3	3	60/40	ES
6.	15EC4XX	Common Elective	3/0/0	3	3	60/40	PE
7.	15EC319	Microcontrollers Laboratory	0/0/3	3	2	40/60	PC
8.	15EC320	Digital Communication and Networks Laboratory	0/0/3	3	2	40/60	PC
9.	15EC703	Mandatory Course-III	-	3	1	0/100	MC
<b>Total</b>				<b>29</b>	<b>24</b>	<b>900</b>	

<b>SEMESTER VI</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credits</b>	<b>Ext/Int</b>	<b>Category</b>
1.	15EC321	Embedded Systems	3/0/0	3	3	60/40	PC
2.	15EC322	VLSI Circuits	3/0/0	3	3	60/40	PC
3.	15EC323	Antennas & Wave Propagation	3/0/0	3	3	60/40	PC
4.	15EC5XX	Open Elective-I	3/0/0	3	3	60/40	OE
5.	15EC4XX	Program Elective-I	3/0/0	3	3	60/40	PE
6.	15EC4XX	Program Elective-II	3/0/0	3	3	60/40	PE
7.	15EC324	VLSI Circuits Laboratory	0/0/3	3	2	40/60	PC
8.	15EC325	Embedded Systems Laboratory	0/0/3	3	2	40/60	PC
9.	15EN003	Business Communication Skills Laboratory	0/0/3	3	2	40/60	HS
10.	15EC602	Mini Project-II	-	-	2	40/60	PW
11.	15EC704	Mandatory Course-IV	-	3	1	0/100	MC
<b>Total</b>				<b>30</b>	<b>27</b>	<b>1100</b>	

<b>SEMESTER VII</b>							
S No.	Course Code	Course	L/T/P	Contact hrs/week	Credits	Ext/Int	Category
1.	15MG003	Principles of Management	2/0/0	2	2	60/40	HS
2.	15EC326	Microwave and Optical Communication	4/0/0	4	4	60/40	PC
3.	15EC4XX	Program Elective-III	3/0/0	3	3	60/40	PE
4.	15EC4XX	Program Elective-IV	3/0/0	3	3	60/40	PE
5.	15EC4XX	Program Elective-V	3/0/0	3	3	60/40	PE
6.	15EC327	Wireless Communication & Networks	3/0/0	3	3	60/40	PC
7.	15EC328	Microwave and Optical Communication Laboratory	0/0/3	3	2	40/60	PC
<b>Total</b>					<b>21</b>	<b>20</b>	<b>700</b>

<b>SEMESTER VIII</b>							
S No.	Course Code	Course	L/T/P	Contact hrs/week	Credits	Ext/Int	Category
1.	15EC603	Project Work	0/0/24	24	12	40/60	PW
<b>Total</b>					<b>24</b>	<b>12</b>	<b>100</b>

#### **HUMANITIES SCIENCES (13 credits)**

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	15UH101	Communication Skills – I	2/0/2	4	3	HS
2.	15UH102	Communication Skills – II	2/0/2	4	3	HS
3.	15UH302	Environmental Science	3/0/0	3	3	HS
4.	15EN003	Business Communication skills Laboratory	0/0/3	3	2	HS
5.	15MG003	Principles of Management	2/0/0	2	2	HS

#### **BASIC SCIENCES (25 Credits)**

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	15UH202	Engineering Physics	3/0/0	3	3	BS
2.	15UH203	Engineering Chemistry	3/0/0	3	3	BS
3.	15UH201	Mathematics – I	3/2/0	4	3	BS
4.	15UH251	Physical Sciences Lab	0/0/4	4	2	BS
5.	15UH301	Material Science	3/0/0	3	3	BS
6.	15UH204	Mathematics – II	3/2/0	4	3	BS
7.	15MA133	Partial Differential Equations and Transform Techniques	3/2/0	5	4	BS
8.	15MA143	Probability and Random Process	3/2/0	5	4	BS

#### **ENGINEERING SCIENCES (23 Credits)**

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	15UC301	Fundamentals of Computing and C Programming	3/0/0	3	3	ES
2.	15UA354	Engineering Graphics Lab	2/0/2	4	3	ES
3.	15UC351	Fundamentals of Computing and C Programming Lab	0/0/3	3	2	ES
4.	15UC302	Advanced C Programming	3/0/0	3	3	ES
5.	15UA355	Engineering Practices Lab	0/0/3	3	2	ES
6.	15UC352	Advanced C Programming Lab	0/0/3	3	2	ES

7.	15CS205	Data Structures and algorithms	3/0/3	6	5	ES
8	15EC208	Electrical machines &Control Systems	3/0/0	3	3	ES

**PROGRAM CORE (83 credits)**

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	15UF301	Basics of Electrical and Electronics Engineering	3/0/0	3	3	PC
2.	15UB301	Electric Circuits and Electron Devices	2/2/0	4	4	PC
3.	15UB351	Electric Circuits and Electron Devices Lab	0/0/3	3	2	PC
4.	15EC304	Digital System Design	3/0/0	3	3	PC
5.	15EC305	Electromagnetic Fields	4/0/0	4	4	PC
6.	15EC306	Linear Integrated Circuits	3/0/0	3	3	PC
7.	15EC401	Measurement & Instrumentation	3/0/0	3	3	PC
8.	15EC307	Digital System Design Laboratory	0/0/3	3	2	PC
9.	15EC308	Linear Circuits Laboratory	0/0/3	3	2	PC
10.	15EC309	Electronic Circuits	4/0/0	4	4	PC
11.	15EC310	Analog and Pulse Communication	3/0/0	3	3	PC
12.	15EC311	Signals and Systems	3/0/2	5	4	PC
13.	15EC312	Transmission Lines and Waveguides	3/0/0	3	3	PC
14.	15EC313	Electronic Circuits Laboratory	0/0/3	3	2	PC
15.	15EC314	Analog Communication Laboratory	0/0/3	3	2	PC
16.	15EC315	Microcontrollers & Interfacing	3/0/0	3	3	PC
17.	15EC316	Digital Signal Processing	3/0/2	5	4	PC
18.	15EC317	Digital Communication	3/0/0	3	3	PC
19.	15EC318	Computer Networks & Interfacing	3/0/0	3	3	PC
20.	15EC319	Microcontrollers Laboratory	0/0/3	3	2	PC
21.	15EC320	Digital Communication & Networks Laboratory	0/0/3	3	2	PC
22.	15EC321	Embedded Systems	3/0/0	3	3	PC
23.	15EC322	VLSI Circuits	3/0/0	3	3	PC
24.	15EC323	Antennas & Wave Propagation	3/0/0	3	3	PC
25.	15EC324	VLSI Circuits Laboratory	3/0/0	3	2	PC
26.	15EC325	Embedded Systems Laboratory	0/0/3	3	2	PC
27.	15EC326	Microwave and Optical Communication	4/0/0	4	4	PC
28.	15EC327	Wireless Communication & Networks	3/0/0	3	3	PC
29.	15EC328	Microwave and Optical Communication Laboratory	0/0/3	3	2	PC

**PROGRAM ELECTIVE COURSES (18 Credits)**

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
<b>PROGRAM ELECTIVES</b>						
<b>COMMON ELECTIVES</b>						
1	15EC429	Digital Image Processing	3/0/0	3	3	PE
2	15EC402	Internet of Everything	3/0/0	3	3	PE
3	15EC403	Television and Video Engineering	3/0/0	3	3	PE
4	15EC404	Nano Electronics	3/0/0	3	3	PE
5	15EC405	Robotics	3/0/0	3	3	PE
6	15EC406	Information Theory and Coding Techniques	3/0/0	3	3	PE
7	15EC407	Soft Computing	3/0/0	3	3	PE
<b>Elective Stream I-VLSI Design</b>						
1.	15EC408	Hardware Description Languages	3/0/0	3	3	PE

2.	15EC409	ASIC and FPGA Design	3/0/0	3	3	PE
3.	15EC410	Testing and Verification of VLSI circuits	3/0/0	3	3	PE
4.	15EC411	Digital Low Power VLSI Design	3/0/0	3	3	PE
5.	15EC412	Analog CMOS Circuit Design	3/0/0	3	3	PE
6.	15EC413	CAD for VLSI Circuits	3/0/0	3	3	PE
7.	15EC414	SOC Design	3/0/0	3	3	PE
<b>Elective Stream II – Embedded Systems</b>						
1.	15EC415	Computer Architecture	3/0/0	3	3	PE
2.	15EC416	ARM Processor Architecture & Programming	3/0/0	3	3	PE
3.	15EC417	Sensors for Industrial Applications	3/0/0	3	3	PE
4.	15EC418	Automotive Electronics	3/0/0	3	3	PE
5.	15EC419	Real-Time Operating Systems	3/0/0	3	3	PE
6.	15EC420	Advanced Microprocessor and Microcontroller	3/0/0	3	3	PE
7.	15EC421	Embedded Linux	3/0/0	3	3	PE
<b>Elective Stream III – Communication &amp; Networking</b>						
1.	15EC422	Next Generation Networks	3/0/0	3	3	PE
2.	15EC423	Wireless Sensor Networks	3/0/0	3	3	PE
3.	15EC424	Body Area Networks	3/0/0	3	3	PE
4.	15EC425	Smart Antenna	3/0/0	3	3	PE
5.	15EC426	RF System Design and MEMS	3/0/0	3	3	PE
6.	15EC427	High Speed Networks	3/0/0	3	3	PE
7.	15EC428	Cognitive Radio Communication	3/0/0	3	3	PE
<b>Open Elective Courses offered by ECE</b>						
1.	15EC501	Introduction to VLSI & Embedded Systems	3/0/0	3	3	OE
2.	15EC502	Microcontrollers for Industrial applications	3/0/0	3	3	OE
3.	15EC503	Computer Communication and Networks	3/0/0	3	3	OE

#### MANDATORY COURSES (4 Credits)

S.No	Course Code	Course Title	Category
1.	15EC701	C Programming	MC
2.	15EC702	Embedded C	MC
3.	15EC703	Java	MC
4.	15EC704	PHP	MC
5.	15EC705	BEC Preliminary	MC
6.	15EC706	BEC Vantage	MC
7.	15EC707	Foreign Language/Spoken Hindi	MC
8.	15EC708	Life Skills/Professional Ethics/Industrial Psychology	MC
9.	15EC709	Environmental Awareness	MC
10.	15EC710	Domain Specific certification/MOOC certification	MC

#### ONE CREDIT COURSES

S. No	Course Code	Course Title	Credits
1.	15EC901	Simulation Program with Integrated Circuit Emphasis	1
2.	15EC902	PCB design	1
3.	15EC903	PLC and SCADA	1
4.	15EC904	CCNA/ CCSP Networking	1

5.	15EC905	4G Core Network Operations, Administration & Maintenance	1
6.	15EC906	IPv6 Fundamental & Deployment	1
7.	15EC907	Advance Mobile communication Technologies	1
8.	15EC908	Timing issues in Digital Circuits	1
9.	15EC909	Embedded RTOS design	1
10.	15EC910	Embedded LINUX/ C	1
11.	15EC911	System Design	1
12.	15EC912	Measurement System Analysis	1

**SCHEME OF CREDIT DISTRIBUTION - SUMMARY**

S. No	Stream	Credits/Semester								Credits	%	AICTE %
		I	II	III	IV	V	VI	VII	VIII			
1.	Humanities (HS)	3	6				2	2		13	<b>6.9</b>	5-10
2.	Basic Sciences(BS)	11	6	4	4					25	<b>13.3</b>	15-20
3.	Engineering Sciences(ES)	8	7	5		3				23	<b>12.29</b>	15-20
4.	Program Core(PC)	3	6	17	18	17	16	6		83	<b>44.38</b>	30-40
5.	Program Electives(PE)					3	6	9		18	<b>9.6</b>	10-15
6.	Open Electives(OE)							3		3	<b>1.6</b>	5-10
7.	Project Work(PW)				2		2		12	16	<b>8.5</b>	10-15
8.	Mandatory Course			1	1	1	1			4	<b>2.1</b>	-
9.	Employability Skills									2	<b>1.0</b>	-
<b>Total</b>		<b>25</b>	<b>25</b>	<b>27</b>	<b>25</b>	<b>24</b>	<b>27</b>	<b>20</b>	<b>12</b>	<b>187</b>	<b>100</b>	

**COURSE PRE-REQUISITES** : Nil

**COURSE OBJECTIVES:**

1. To emphasis and develop language skills to satisfy the needs of work environment
2. To inculcate reading and listening habits and thereby improvising speaking and writing skills.
3. To familiarize students with business terms through BEC Preliminary examination

**COURSE OUTCOME**

1. Understand and intensely focus on improving and increasing LSRW Skills.
2. Apply a good command over basic writing and reading skills.
3. Remember language skills for business related situations.
4. Analyze and use vocabulary in corporate work environment

**UNIT I**

**8**

Getting to know people- Introduction- Talking about job ( Present simple)- Talking about working conditions(Adverb of frequency)- Talking about company history and structure (Past simple, Prepositions of time)- Talking about company activities (Connectors of addition and contrast, Present Continuous)- Focus on language -Parts of Speech- Gerunds and Infinitives- Instructions

**UNIT II**

**10**

Vocabulary practice- Telephoning Leaving and taking messages)- Requests and obligation- Describing trends (Adjectives and adverbs)- Talking about company performance (Present perfect and past simple, Reasons and consequences)- Reading Test Practice- Describing products Dimensions, (Comparatives and superlatives, Question formation)- Talking about product development (Sequencing words, Present continuous and going to)- Articles- Prepositions- Synonyms-Antonyms- Recommendations

**UNIT III**

**8**

Talking about business equipment (Giving Instruction)- Letter Phrases- Writing Test Practice- Talking about hotel facilities (Asking for and giving direction)- Talking about traffic and transport (making predictions)- Tenses- Present-Past-Future-Forms of verbs- Word techniques-Formation-Prefixes-Suffixes.

**UNIT IV**

**7**

Talking about conference arrangement (Checking and confirming)- Talking about a conference before, after, when, until, etc.- Listening Test Practice- Talking about production processes- passive- Talking about quality control Conditional 1 (real) (Making suggestions)- Itinerary- Jumbled Sentences.

**UNIT V**

**11**

Talking about call centers, insurance and changes in working practices(Future possibility/ Probability- Talking about banking- Speaking Test Practice- Talking about delivery services (prepositions of time)- Talking about trading (Tense review)- Talking about recruitment Conditional 2 ( hypothetical)-Talking about job applications (Indirect questions)- Reading, Writing and Listening Test- Job Application Letter and Resume Writing-Permission Letters.

**TOTAL HOURS: 45**

**TEXT BOOKS**

1. Wood, Ian, Anne Williams with Anna Cowper Pass Cambridge BEC Preliminary, Cengage learning. Second Edition. 2013
2. DrSumanth S, English for Engineers, Vijay Nicole Imprints Private Limited, 2005

**REFERENCE BOOKS:**

1. Whitby, Norman. Cambridge University Press- Students Book. 2013.
2. Jawahar, Jewelcy, Rathna P, English Work book, VRB Publications Pvt Ltd, 2006.  
E. Gunasekaran S, 'A Text and Workbook of Technical English I', United Global Publishers, June 2010

**PREREQUISITES:** Nil

**COURSE OBJECTIVES**

1. To impart the fundamental knowledge on acoustics
2. To understand the advanced technology of laser and optical fiber in the field of Engineering and medicine
3. To exposure the behavior of heat

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Present a technical overview of architectural acoustics
2. Understand modern device and technology based on laser and optical fiber
3. Design the heat engine having greater efficiency

**UNIT I: ACOUSTICS**

9

Characteristics of musical sound – Loudness - Weber-Fechner law – decibel – absorption coefficient – reverberation time – Sabine’s formula – Acoustics of buildings – Ultrasonics: Production of ultrasonics using piezoelectric method, magnetostriction method – Applications of ultrasonics: Sonogram, SONAR

**UNIT II: LASER**

9

Introduction, Principle – Spontaneous emission, Stimulated emission, Population Inversion, Pumping - Types of Laser –Nd-YAG, CO<sub>2</sub> Laser, Semiconductor Laser. Applications – Lasers in Microelectronics: Thermal Effect Drilling, Welding, Cutting, Medical Field and Holography.

**UNIT III: FIBER OPTICS**

9

Principle, Modes of Propagation, Numerical aperture, Acceptance angle and Fractional Index change of an optical fiber - Classification based on Materials, Refractive Index Profile and Modes - Fabrication Techniques: Rod & Tube method, Crucible-Crucible Technique - Splicing, Losses in Optical fiber. Light Sources for fiber Optics – Detectors: PIN, Avalanche Photo diode – Application: Fiber Optical Communication links and endoscope.

**UNIT IV: HEAT AND THERMODYNAMICS**

9

Thermal conductivity – Forbe’s and Lees disc methods - Radial flow of heat: Thermal conductivity of rubber and glass - Laws of thermodynamics - Concepts of entropy - Carnot cycle as heat engine and refrigerator, Carnot theorem, ideal Otto and diesel engines.

**UNIT V: QUANTUM PHYSICS**

9

Inadequacy of classical mechanics, Black body radiation, photoelectric effect – Dual nature, de-Broglie concept of matter waves – Electron diffraction, Davisson–Germer experiment – Heisenberg’s uncertainty principle, applications – Schrodinger wave equation, time dependent and time independent, applications (particle in one dimensional box). Electron microscopy- SEM and TEM

**TOTAL HOURS: 45**

**REFERENCE BOOKS:**

1. R.K. Gaur and SL Gupta “Engineering Physics” DhanpatRai Publications 2014
2. Rajendran “Engineering Physics” Tata McGraw-Hill Education, New Delhi – 2011

3. Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2010
4. M.N. Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company Ltd., New Delhi 2005
5. Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2013

**WEB REFERENCES:**

1. <http://nptel.ac.in>
2. [www.wikipedia.com](http://www.wikipedia.com)
3. [www.hyperphysics.com](http://www.hyperphysics.com)

**PREREQUISITES:** Nil

**COURSE OBJECTIVES**

1. To impart knowledge on the role of chemistry in everyday life along with the basic nature, types, preparation and uses of polymers.
2. To demonstrate the principle and working of electrochemistry, corrosion science and to impart knowledge on various analytical techniques used in the field of basic sciences.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Understand and remember the concept of ecology and environment and importance of Natural resources.
2. To understand the various environmental issues prevailing.
3. Executing the gained knowledge to prevent pollution.
4. Applying the knowledge gained about the interrelation between human and Environment.

**UNIT I CHEMISTRY IN EVERYDAY LIFE**

**9**

Chemicals in medicines-analgesics, antiseptics, antacids, disinfectants-chemicals in food preservatives-artificial sweetening agents Characteristics of water-hardness-types and estimation by EDTA method. Problems based on EDTA method Domestic water treatment-disinfection methods (chlorination,ozonation,UV treatment)-demineralisation process-desalination-reverse osmosis

**UNIT IICHEMISTRY FOR ENGINEERING PLASTICS**

**9**

Introduction-monomers and polymers-classification of polymers Polymerisation--mechanism of addition polymerization(free radical mechanism) Plastics- classification -preparation, properties and uses of PVC,Teflon, Nylon 6,6, moulding methods Rubber-vulcanisation of rubber-synthetic rubber (Butyl rubber and SBR)

**UNIT IIINON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES**

**9**

Nuclear energy-fission and fusion reaction Light water nuclear reactor for power generation (block diagram only)- breeder reactor Solar energy conversion-solar cells-wind energy Fuel cells-hydrogen oxygen fuel cells Batteries-alkaline batteries-lead acid,nickel cadmium and lithium batteries.

**UNIT IVELECTROCHEMISTRY AND CORROSION SCIENCES**

**9**

Electrochemical cells-single electrode potential-measurement of emf Reference electrode-SHE-calomel electrode-glass electrode and measurement of pH. Ion selective electrode Corrosion-chemical corrosion-electrochemical corrosion-galvanic corrosion-differential corrosion Protective coatings-electroplating of gold-electroless plating of Nickel.

**UNIT VANALYTICAL TECHNIQUES**

**9**

Laws of absorption-Principles Colorimetry-Estimation of Iron by colorimetry Instrumentation and applications-UV-Visible spectroscopy-IR spectroscopy Flame photometry-Estimation of sodium by flame photometry Atomic absorption spectroscopy-Estimation of Nickel by atomic absorption spectroscopy.

**TOTAL HOURS: 45**

**TEXT BOOKS**

1. Jain and Jain, Engineering Chemistry, DhanpatRai Publishing Company, New Delhi, 2011
2. Ravikrishnan, A., Engineering Chemistry – I Sri Krishna Hitech Publishing Company, 2012.
3. Ravikrishnan, A., Engineering Chemistry – II, Sri Krishna Hitech Publishing Company, 2012.

**REFERENCE BOOKS**

1. Sunita Rattan, A Text Book of Engineering Chemistry,SKKataria Publishers, 2010
2. Uppal& Bhatia, Engineering Chemistry, Khanna Publishers, 2010.

**WEB REFERENCES:**

1. [nptel.ac.in/courses/105104102/hardness.htm](http://nptel.ac.in/courses/105104102/hardness.htm)
2. [nptel.ac.in/courses/105104102/Lecture%204.htm](http://nptel.ac.in/courses/105104102/Lecture%204.htm)
3. [en.wikipedia.org/wiki/Colorimetry](http://en.wikipedia.org/wiki/Colorimetry)
4. [nptel.ac.in/courses/105106112/1\\_introduction/5\\_corrosion.pdf](http://nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf)

**PREREQUISITES:** Basic concepts on Matrices, Differential and Integral Calculus.

**COURSE OBJECTIVES:**

1. To have a well founded knowledge on Eigen values and Eigen vectors to handle problems that arises in Engineering and Scientific fields.
2. To emphasize the applications of Differential and Integral calculus for solving different kinds of Mathematical modeling problems.
3. To give adequate exposure in applying numerical methods in predicting missing data.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Apply the concepts of Eigen values and vectors in the field of theory of vibration, Robotic Engineering, Image Processing etc.
2. To apply differentiation and integration techniques to solve engineering problems.
3. To apply numerical methods to evaluate single and double integrals, interpolation of numerical data.

**UNIT I - MATRICES**

12

9

Characteristic Equation – Eigen values and Eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic forms.

**UNIT II – INTERPOLATION AND APPROXIMATION**

12

9

Difference Operators: Forward and Backward difference operators – Interpolation with equal intervals of arguments : Newton's forward and backward interpolation – central interpolation using Bessel formula – Divided differences – Newton's divided difference formula – Lagrangian Polynomials

**UNIT III - APPLICATIONS OF DIFFERENTIAL CALCULUS**

12

Limits and Continuity – Differentiation of standard functions (concepts only) - Curvature in Cartesian co-ordinates – Centre of curvature – Radius of curvature – Circle of curvature - Evolutes of standard curves – Envelopes of curves in one and two parameters.

**UNIT IV – DEFINITE INTEGRALS**

12

9

Definite Integrals – Even and Odd functions – Properties of the definite integrals – simple problems – Integration by parts and Extension **Numerical Integration** : Trapezoidal rule – Simpson's  $1/3$  and  $3/8$  rules - Two and Three point Gaussian Quadrature formulae (derivations not included) .

**UNIT V MULTIPLE INTEGRALS**

12

9

Double integration – Cartesian and Polar coordinates – Change the order of integration – Triple integration in Cartesian coordinates – Area as double integral – Volume as triple integral (cartesian co-ordinates) – Double integrals using Trapezoidal and Simpson's rules.

**TOTAL HOURS: 60**

**TEXT BOOKS**

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2011.
2. Jain, M.K., Iyengar, S.R.K and Jain R.K., 'Numerical Methods for Scientific and Engineering Computation', New Age international Publishers, New Delhi, 2012.

## **REFERENCE BOOKS**

1. Grewal, B. S., Higher Engineering Mathematics, 42<sup>nd</sup> Edition, Khanna Publishers, New Delhi, 2014.
2. Veerarajan, T., Engineering Mathematics, Tata Mc. Graw Hill Publishing Company, New Delhi, 2011.
3. Bali.N.P and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, New Delhi, 2011.

**PREREQUISITES: Nil****COURSE OBJECTIVES:**

1. Extrapolate the basics about Computer and Computational Thinking.
2. Applying Systematic approach for problem solving with emphasis for Design skills
3. Understand the basics and features of Structured Programming
4. Understand the Syntax and Usage of Arrays, Strings, Functions, Pointers, Structures and unions in C.
5. Write C programs using the concepts Arrays, Strings, Functions, Pointers Structures and Unions

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Apply the knowledge and skills acquired in computing Environment.
2. Demonstrate problem solving and design skills including the ability to formulate Problems and their solutions.
3. Select appropriate data types and control structures for solving a given problem.
4. Illustrate the representation of arrays, strings and usage of string operations.
5. Illustrate the representation of Pointers, Functions and Structure.

**UNIT-I COMPUTATIONAL THINKING AND PROBLEM SOLVING****9**

**Computational Thinking:** Introduction to Computational Thinking - History of Computation and Computational Thinking – Computer Systems – Computing Environments. How Real World Information Becomes Computational Data: Information and data Converting Information into Data - Data Capacity – Data Types and Data Encoding. Solving Problems: Problem Definition – Logical Reasoning. System /Software Development Life Cycle: Program Development – Analysis – Design: (Algorithm - Flow Chart - Pseudo Code) – Coding – Testing – Documentation. Case Study: Raptor and Scratch Tools – Installation – Programming Environment.

**UNIT-II INTRODUCTION TO C PROGRAMMING****9**

Computer Languages – Overview of C – Creating and Running Programs. Character Set – C Tokens: (Keywords -Identifiers – Constants – Strings - Operators – Special Symbols) – Data Types. Expression – Precedence and Associativity– Evaluating Expression – Type Conversion. Input and Output: Unformatted Input and Output – Formatted Input and Output.

**UNIT – III CONTROL FLOW CONSTRUCTIONS****9**

Decision Making and Branching: Simple if – if else – Nested if – if else if – Conditional Expression – Switch case - Programming Examples. Decision Making and Looping: for – while – do while – Nested Loop - Programming Examples. Jumps in Loops: goto – Continue – break - Programming Examples.

**UNIT – IV ARRAYS AND STRINGS****9**

Arrays: Introduction – Declaration and Initialization of Single Dimensional Arrays – Array Application - Declaration and Initialization of Two Dimensional Arrays – Multidimensional Arrays - Programming Examples - Character Arrays and Strings: Declaring and Initialing Strings – Reading and Writing Strings – String Manipulation Functions – Array of Strings - Programming Examples.

## **UNIT – V POINTERS AND FUNCTIONS**

**9**

Pointers – Introduction – Pointer Constants – Pointer Values – Pointer Variables – Accessing Variables through Pointers – Pointer Declaration and Definition – Declaration Versus Redirection – Initialization of Pointer Variables. Functions – Introduction – Needs of Function – Elements of Function – Category of Function – Recursion. Structures – Introduction – Declaring and Defining Structure Variables – Accessing Structure Members – Structure Initialization – Array of structure – Unions.

**TOTAL : 45**

### **TEXT BOOKS**

1. David Riley and Kenny Hunt, “Computational Thinking for the Modern Problem Solver”, Chapman & Hall/CRC, 2014.
2. E Balagurusamy, “Programming in ANSI C”, 6E, TMH, 2012.

### **REFERENCE BOOKS**

1. Behrouz A. Forouzan & Richard F. Gilberg, “A Structured Programming Approach Using C”, 3E, Cengage Learning, 2008.
2. Ashok N. Kamthane, “Programming in C”, 2E, Pearson Education, 2012.
3. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

### **WEB REFERENCES**

1. <http://raptor.martincarlisle.com/>
2. <https://scratch.mit.edu/>

**PREREQUISITES:** Engineering Physics

### **COURSE OBJECTIVES**

1. To expose the rudiments of electric circuits
2. To know various types and working of measuring equipments and transducers
3. To familiarize with the constructional details of different types of electrical machines, working principle and their performances.
4. To learn the construction and characteristics of semi conductor and opto electronic devices.

### **COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Gain knowledge on electrical circuit analysis
2. Understand the working of measuring instruments and transducers.
3. Analyze and understand the working of electrical machines.
4. Understand the semiconductor and optoelectronic devices.

#### **UNIT 1 BASICS OF CIRCUIT ANALYSIS 9**

Ohm's Law - Kirchoff's laws – Source transformation - Resistors in series and parallel – Voltage and current division-- Star/delta conversion- Introduction to AC Circuits – RMS value – Average value- Power and Power factor.

#### **UNIT 2 MEASURING INSTRUMENTS AND TRANSDUCERS 9**

Basic principles of indicating instruments- Classification- Operating Principle-Ammeter and Voltmeter- Dynamometer type Watt meters and Energy meters – Megger –Transducers- Thermistor – Thermocouple – Piezo and photo electric transducer.

#### **UNIT 3 ELECTRICAL MACHINES 9**

Construction -Principle of Operation- Basic equations and applications of DC machines- Single phase transformer- Three phase and single phase induction motors.

#### **UNIT 4 SEMICONDUCTOR DEVICES 9**

PN junction diode – Zener Diode - Characteristics – Half wave and Full wave rectifiers- Bipolar Junction Transistor – CB, CE and CC configurations-Characteristics - JFET configuration and characteristics.

#### **UNIT 5 OPTO ELECTRONIC DEVICES 9**

Photo conductive, Photo voltaic, Photo emissive sensors- LED-LCD-LDR-Laser diodes – Opto couplers.

**TOTAL:45**

**TEXT BOOKS:**

1. R. Muthusubramnian, S. Salivahanan, 'Basic Electrical and Electronics Engineering' McGraw Hill education (India) Private limited, 2010.
2. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, "Electronic Devices and Circuits", 2nd Edition, Tata McGraw Hill. Ninth reprint 2010.

**REFERENCE BOOKS:**

1. A.E.Fitzgerald, Charles Kingsley and Stephan.D.Umans, " Electric Machinery", McGraw Hill, Seventh Edition, 2013
2. Thomas.L.Floyd, "Electronic Devices", Prentice Hall, Ninth Edition, 2012
3. Sudhakar.A and Shyammohan.SPalli "Circuits and Networks: Analysis & Synthesis" 4th Edition, Tata McGraw Hill. 2010
4. Ravish Singh, "Electrical Networks", Tata McGraw Hill, New Delhi, 2008.

**WEB REFERENCES:**

1. [www.allaboutcircuits.com](http://www.allaboutcircuits.com)
2. [www.circuitstoday.com](http://www.circuitstoday.com)
3. [www.electrcal4u.com](http://www.electrcal4u.com)

**PREREQUISITES:** Basic Knowledge in drawing and computer

**COURSE OBJECTIVES:**

1. To know the method to construct the conic curves used in Engineering Applications.
2. To develop an understanding of Isometric to Orthographic Views and vice versa.
3. To learn the basic projection of straight lines and plane surfaces.
4. To develop the imagination of solids inclined to one reference planes.
5. To know the sectioning of solids and development of surfaces used in various fields.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Understand the basic drawing concepts.
2. Student will be able to visual all in the form of technical views of drawing.
3. Student will be familiar with the software drawings
4. Student will be familiarizing with new design of Engineering Products.

**LIST OF EXPERIMENTS:**

**CURVES USED IN ENGINEERING GRAPHICS**

Introduction of Basic Concepts and Conventions

Conic Section – Ellipse

Conic Section – Parabola

Cycloids

Involutes

Introduction to 2D Software – Sketching, Mirroring, Scaling, Copying and Dimensioning

**ISOMETRIC TO ORTHOGRAPHIC AND ORTHOGRAPHIC TO ISOMETRIC VIEWS  
[FREE HAND SKETCHING AND 2D SOFTWARE]**

General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – Free hand sketching of multiple views from pictorial views of 3D objects.

Orthographic Projection - 2D Software

Isometric View - Manual (Free Hand Sketching)

Isometric View Using 2D Software

**PROJECTION OF LINES AND PLANE SURFACES [2D SOFTWARE]**

Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations of lines.

Projection of Straight Lines - Inclined to Both Planes

Projection of Polygonal Surface and circular lamina inclined to any one reference plane - Inclined to HP

Projection of Polygonal Surface and circular lamina - Inclined to VP

**PROJECTION OF SOLIDS [2D SOFTWARE]**

Projection of Solids when the axis is inclined to one reference plane by change of position method – Prisms

Projection of Solids - Pyramids

Projection of Solids - Cylinder

Projection of Solids - Cone

### **SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES [2D SOFTWARE]**

Sectioning of solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Prism and Pyramid

Section of Solids - Cylinder and Cone

Development of lateral surfaces - Prism and Pyramid

Development of lateral surfaces - Cylinder and Cone

### **REFERENCES:**

- 1.DhananjayA.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, 2012.
- 2.BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.
- 3.K.V.Natarajan , "Engineering Graphics" Dhanalakshmi Publications, 2012.

**PREREQUISITES:** Nil

**COURSE OBJECTIVES:**

1. Be exposed to problem solving techniques and to generate flow charts using Raptor Tool.
2. Be exposed to Animation, gaming and application creation using Scratch Tool
3. Be Familiar with Programming in C
4. To apply the various features of C

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Demonstrate problem solving and design skills including the ability to formulate Problems and their solutions.
2. Select appropriate data types and control structures for solving a given problem.
3. Apply and practice logical ability to solve simple problems.
4. Demonstrate 'C' programs using arrays, strings.
5. Illustrate the representation of Pointers, Functions and Structure.

**LIST OF EXPERIMENTS:**

1. Draw Flowchart using Raptor Tool  
Simple Flow Chart  
Using Decision Making  
Using Pre Test Loop  
Using Post Test Loop
2. Create Animation / Gaming /Application using Scratch Tool
3. Program to process Data types, formatting inputs and outputs.
4. Program using Operators and Expression Evaluation
5. Program using Decision Making
6. Program using Looping Statements
7. Program using Single and Two Dimensional Arrays
8. Program for String manipulation
9. Program using Call by Value and Call by Reference.
10. Program using Recursive Function.
11. Program using Array of Structures

**TEXT BOOKS**

1. David Riley and Kenny Hunt, "Computational Thinking for the Modern Problem Solver", Chapman & Hall/CRC, 2014.
2. E Balagurusamy, "Programming in ANSI C", 6E, TMH, 2012.

**REFERENCE BOOKS**

1. Behrouz A. Forouzan& Richard F. Gilberg, "A Structured Programming Approach Using C", 3E, Cengage Learning, 2008.
2. Ashok N. Kamthane, "Programming in C", 2E, Pearson Education, 2012.
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

**WEB REFERENCES**

1. <http://raptor.martincarlisle.com/>
2. <https://scratch.mit.edu/>

**PREREQUISITES: NIL****COURSE OBJECTIVES:**

1. To provide exposure to the students with hands-on experience on scientific equipments.
2. Enhancement of student in developing analytical skills through instrumental analysis.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
2. handle physics instruments like spectrometer, travelling microscope and solar cell

**LIST OF EXPERIMENTS:**

- 1) Determination of laser parameters – Wavelength and angle of divergence Particle size determination using diode laser.
- 2) Determination of acceptance angle in an optical fiber
- 3) Determination of Band gap of a Semi conducting material.
- 4) Determination wavelength of mercury spectrum – spectrometer
- 5) Determination of thermal conductivity of a bad conductor – Lee’s disc method.
- 6) Determination of coefficient of viscosity of liquid – Poiseuille’s Method
- 7) Determination of Young’s modulus by cantilever method
- 8) Determination the specific resistance of the given coil – Carey Foster Bridge.
- 9) Determination of efficiency of a solar cell.
- 10) Determination of Young’s modulus of the materials – Uniform bending
- 11) Determination of lattice constant X-ray powder photograph.
- 12) Determination of Rigidity modulus of a wire - Torsion Pendulum
- 13) Determination the dispersive power of a prism – Spectrometer.

**REFERENCES:**

1. Dr. G. Senthilkumar “Physics Laboratory Manual I and II (2008 & 2013)” VRB publishers Pvt Ltd., 2013
2. Dr. V. Veeraiyan “Chemistry Laboratory manual I and II (2011) VRB publishers Pvt Ltd.,
3. Dr. Magudeswaran, PN Dr. R. Ramachandran “Engineering chemistry laboratory Manual” 2004
4. R.K. Shukla, AnchalSrivastava Practical Physics, New age international (2011)
5. C.L Arora, B.Sc. Practical Physics, S. Chand &Co. (2012)

**COURSE PRE-REQUISITES** : Nil

**COURSE OBJECTIVES:**

1. To develop the prominence of listening and reading practices using authentic business vocabulary.
2. To instill analytical thinking and logical reasoning to use LSRW skills in Business related situations.
3. To urge the need of effective communication in corporate sector with Business English.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Understand and gain proficiency with business vocabulary.
2. Apply Task- Based activity to enhance an effective communication.
3. Remember LSRW skills and employ cross-cultural communication in business relate situations.
4. Analyze and apply Business English in working environment.

**UNIT I**

**9**

Introduction- Talking about teamwork- Making Arrangements- Improving Communication in spoken Language- Taking and Leaving Voice mail messages (Present Tenses, Past Tense and Present Perfect)-Talking about Business Hotel ( Speaking Activity)- Talking about Corporate Hospitality – Formal and Informal Language- Making accepting and declining invitations (Auxiliary Verbs, Countable or Uncountable Nouns)- Focus on language –Definitions-Extended Definitions

**UNIT II**

**11**

Talking about orders – Clarity in Written Language- Phone and Letter Phrases- Talking about Company Finances- Conditional 1 and 2- Managing Cash Flow (Intention and arrangements Conditional 1 and 2)- Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event- Describing Duties and Responsibilities ( Future Tense and Articles)- Reported speech-Modal verbs- Active and Passive, impersonal passive voice

**UNIT III**

**9**

Talking about relocation- Report Phrases- Talking about Similarity and Difference- Giving Directions – Asking for Information and Making Suggestions- Talking about Location(Comparatives and Superlatives, Participles)- Talking about Company Performance- Describing Trends- Describing Cause and Effect- Talking about Environmental Impact- Discussing Green Issues- Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones- Homonyms- Acronyms- Abbreviations- British and American words-

**UNIT IV**

**8**

Talking About Health and Safety- Expressing Obligation- Discussing Regulations- Talking about personnel Problems- Passives- Talking about Problem at Work ( Modal Verbs , Passives)-Talking about Expenses Claims- Talking about Air Travel (Relative Pronouns , Indirect Questions)- Transcoding

**UNIT V**

**8**

Talking about Staff Benefits- Talking about Appraisal Systems (Gerunds and Infinitives , Reported Speech)- Talking about Marketing Disasters- Expressing hypothetical Situations- Talking about entering Foreign Markets(Conditional 3 , Grammar review)- Letter for calling quotations, Replying for quotations- Placing an order and complaint.

**TOTAL HOURS: 45**

**TEXT BOOKS**

1. Wood, Ian, Paul Sanderson, Anne Williams with Marjorie Rosenberg, Pass Cambridge BECVantage, Cengage learning. Second Edition. 2014.
2. Dr Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited, 2005.

**REFERENCE BOOKS:**

1. Whitby, Norman. Cambridge University Press- Students Book. 2013.
2. Jawahar, Jewelcy, Rathna P, English Work book, VRB Publications Pvt Ltd, 2006.
3. Gunasekaran S, 'A Text and Workbook of Technical English I', United Global Publishers, June 2010.

**WEB REFERENCES**

1. <http://www.cambridgeindia.org>
2. <http://www.cambridgeenglish.org/exams/business-certificates/business-vantage>

**COURSE PRE-REQUISITES** : Nil

**COURSE OBJECTIVES:**

1. To give the fundamental knowledge of materials which is related for engineering programme
2. To impart the knowledge on electrical and superconducting properties of materials
3. To get exposure on crystal structure and nanomaterials

**COURSE OUTCOMES:**

Upon successful completion of the course, students shall have ability to

1. Obtain necessary input about the materials science needed for their programme
2. Gain the knowledge about the electrical and magnetic properties of the materials
3. Acquire knowledge about the crystal structure and Nano materials

**UNIT I - CRYSTALLOGRAPHY**

9

Introduction - Crystalline and amorphous solids - lattice and unit cell – seven crystal system and Bravais lattices – Atomic radius, coordination number, packing factor calculation for SC, BCC, FCC and HCP, Special crystal structure: Diamond, ZnS, NaCl – Miller Indices, d-spacing -- Bragg's law of X-ray diffraction – Laue Method – powder crystal method. Crystal structure analysis: Debye Scherrer method.

**UNIT II - CONDUCTING MATERIALS**

9

Introduction – classical free electron theory of metals, Expression for electrical and thermal conductivity, Wiedemann-Franz law, merits and demerits of classical free electron theory - Band theory of Solids and classification of solids into conductors, semiconductor and Insulator- - Fermi distribution function – Density of energy states – Carrier concentration in metals.

**UNIT III - SEMICONDUCTING MATERIALS**

9

Introduction – Intrinsic semiconductor, carrier concentration for intrinsic semiconductor – Extrinsic Semiconductor – n-type semiconductor, carrier concentration for n-type semiconductor – p-type semiconductor, carrier concentration for p-type semiconductor, Variation of Fermi level with respect to temperature and impurities – Hall Effect, derivation for Hall coefficient, applications – Applications: Solar cell.

**UNIT IV - MAGNETIC MATERIALS AND SUPERCONDUCTING MATERIALS**

9

Magnetic Materials: Dia, Para, Ferro, Antiferro and Ferri magnetic materials – Properties - Heisenberg and domain theory of ferromagnetism – Hysteresis – Ferrites: Structure, preparation and its applications: Principle of magneto recording, Floppy disc- Superconductor: properties of superconductor- Meissner effect, isotope effect - types of superconductors - High T<sub>c</sub> Superconductors – BCS Theory - Application of Superconductors: SQUID, Cryotron, Magnetic levitation.

**UNIT V – NANOMATERIALS**

9

Nano materials: Synthesis, Ball milling method, chemical vapor deposition, plasma arc method and Sol-gel Technique – properties of Nano materials and applications.

Carbon nano tube (CNT): Single walled CNT and Multi walled CNT- Structure – armchair, Zig-zag and chiral - preparation: carbon arc method, pulsed laser method and chemical vapor deposition – properties and applications of CNT.

**TOTAL HOURS: 45**

**TEXT BOOKS:**

1. S.O.Pillai "Solid State Physics" New Age International Publishers, New Delhi – 2011
2. Rajendran V and Marikani A "Materials Science" Tata McGraw-Hill Education" New Delhi - 2010.
3. William D Callister, Jr "Material Science and Engineering" John Wiley and Sons, New York, 2014.
4. Raghavan, V. "Materials Science and Engineering – A First Course" Prentice Hall of India, New Delhi 2011.
5. Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2013

**REFERENCE BOOKS:**

1. William D Callister, Jr "Material Science and Engineering" John wiley and Sons, New York, 2014.
2. Raghavan, V. "Materials Science and Engineering – A First Course" Prentice Hall of India, New Delhi 2011.
3. Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2013

**WEB REFERENCES**

1. <http://nptel.ac.in/courses/>

**PREREQUISITES:** Nil

**COURSE OBJECTIVES:**

1. To learn the basics about the environment and ecology.
2. To have an awareness about the various issues prevailing in environment such as pollution, population explosion and social problems.
3. To know about the role of an individual in preserving the natural resources
4. To know about the various legislations, acts and NGO methods to control pollution

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Understand and remember the concept of ecology and environment and importance of Natural resources.
2. To understand the various environmental issues prevailing.
3. Executing the gained knowledge to prevent pollution.
4. Applying the knowledge gained about the interrelation between human and Environment.

**UNIT I ENVIRONMENT & ECOSYSTEM**

**9**

Introduction-Components of the environment-People, society and environment-Need for public awareness-Scope and importance Environmental problems and sustainable development Ecosystem –Concept-Ecosystem degradation - Structure and functions of an ecosystem-producers, consumers and decomposers - Energy flow in the ecosystem Water cycle-Carbon cycle, Oxygen cycle-Nitrogen cycleTypes of ecosystem-Forest and Grassland Desert and Aquatic ecosystem-Case studies in current scenario

**UNIT II BIODIVERSITY & NATURAL RESOURCES**

**9**

Biodiversity-introduction-Ecosystem diversity, Species & Genetic diversity-Biogeographical classification of India Values of biodiversity-Hot spots of biodiversity Threats to biodiversity – Conservation of biodiversity Resources-introduction-Renewable & Non-renewable resources Forest resource-deforestation-timber extraction Water resources-Flood-Drought-Dam-Conflict over water

Food resource-changes & effects by modern agricultural practices-Overgrazing Land resource-landslide-Biomass-Some non-renewable sources Mineral resources-Alternate energy sources-Case studies in current scenario

**UNIT III INDUSTRIAL POLLUTION**

**9**

Pollution-Classification of pollutants-Cause, Source, Effect and Control measures Air pollution- - Water pollution- Thermal pollution-Radioactive pollution-Marine pollution Pesticidal pollution- Noise pollution-Ground water pollution- Land pollution- Solid waste-Methods of solid waste disposal-Soil degradation -Solid waste management-Recovery and conservation methods, An introduction to E-waste management -Case studies in current scenario

Water conservation-Rain water harvesting-Reducing water demand-Watershed management Disaster-Tsunami-Bhopal gas disaster-Minamata tragedy Nuclear accident-Flood, Earthquake, Cyclone and Landslide Major issues in environment-Climate change, Global warming Acid rain and Ozone layer depletion-Case studies in current scenario

#### **UNIT V ENVIRONMENT & LEGAL ACTS**

**9**

Environmental emission standards- ISO 14001 standard- Hazardous waste rules, 1989, improving emission performance, Euro norms for pollution control, Bharat stage emission standards Role of individual in the prevention of pollution Role of NGO in protecting the environment-Case Studies in current scenario Environmental legislations Acts-Water act-Air act-Environment act,1986 Land act-Wildlife protection act & Forest act.

**TOTAL HOURS: 45**

#### **TEXT BOOKS**

1. AnubhaKaushik and C P Kaushik 'Environmental Science and Engineering' Third Edition, New age International (P) Limited, Publisher 2011. New Delhi
2. Aloka Debi, "Environmental Science and Engineering", Universities Press, 2011. (UNIT - 1,2,3,4,5)

#### **REFERENCE BOOKS**

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,2010. (UNIT - 4: Major issues in environment
2. Sharma, B.K., 'Environmental Chemistry', GOEL Publishing House,2011
3. Tyler Miller, Jr., 'Environmental Science, Brooks/Cole a part of Cengage Learning, 2010

#### **WEB REFERENCES**

1. <http://nptel.ac.in/courses/>

**PREREQUISITES:** Vector Algebra, Complex Numbers, Differential and Integral Calculus

**COURSE OBJECTIVES:**

1. To understand the concept of Differential and Integral calculus for Vector valued and Complex valued functions and its applications.
2. To understand Laplace transforms techniques.
3. To understand various Numerical techniques for solving Transcendental and Algebraic equations

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Solve Ordinary Differential Equations analytically and numerically, which are very useful in wave and heat equations, fluid flow problems in Engineering.
2. Apply the concept of Green's, Gauss and Stokes's theorems which arise in Fluid mechanics, Thermal Engineering and Aerodynamics.
3. Apply problem solving techniques in differential calculus, which come across in wide range of Engineering and Scientific problems.
4. Apply Laplace transform as a tool for solving Engineering problems.

**UNIT I – ORDINARY DIFFERENTIAL EQUATIONS**

9

Higher order linear differential equations with constant coefficients – Cauchy's and Legendre's linear equations – Finite difference solution of second order ordinary differential equations by Euler and Modified Euler's methods – Fourth order Runge-Kutta methods for solving first order differential equations.

**UNIT II – VECTOR CALCULUS**

10

Gradient of a scalar point function – Angle between the surfaces – Directional derivatives – Divergence and Curl of a vector point functions – Irrotational and Solenoidal vector fields – Vector integration: Green's theorem in a plane – Gauss divergence theorem – Stokes' theorem(excluding proofs) – Simple Applications involving cubes and rectangular parallelepiped.

**UNIT III – COMPLEX VARIABLES**

8

Functions of complex variable – Analytic functions – Necessary and sufficient conditions – Harmonic Function – construction of Analytic functions by Milne – Thomson method – Laurent's Series and Singularities – Cauchy's theorem – Cauchy's integral formula (Concept only) – residues – Calculus of Residues – Cauchy residue theorem.

**UNIT IV - LAPLACE TRANSFORM**

9

Laplace transform – Conditions for existence – Transform of elementary functions – First shifting theorem – Laplace transforms of  $tf(t)$  and  $\frac{f(t)}{t}$  – Transform of derivatives and integrals – Inverse Laplace transforms by Method of Partial fractions – Inverse Laplace transforms by Convolution Method – Laplace transforms of Periodic functions.

**UNIT V – NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS**

9

Solution of non linear equations by Regula-Falsi Method – Newton-Raphson method – solution of linear systems of equations by direct methods – Gauss Elimination and Gauss-Jordan Methods – Indirect method – Gauss-Seidel Method – Eigen values by Power Method – Jacobi Method.

**TOTAL HOURS: 60**

**TEXT BOOKS**

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2011.
2. N.P.Bali,Dr.ManishGoyal, 'Engineering Mathematics' Eighth Edition, Laxmi Publications (P) Ltd,2011

**REFERENCE BOOKS**

1. Grewal, B. S., ' Higher Engineering Mathematics',39<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2006.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India,2006.
- 3.Jain, M.K., Iyengar, S.R.K and Jain R.K., 'Numerical Methods for Scientific and Engineering Computation', New Age international Publishers, New Delhi, 2012.

**WEB REFERENCES**

- 1.<http://nptel.ac.in/courses/>

**PREREQUISITES:**15CS101 - Fundamentals of Computing and C Programming

**COURSE OBJECTIVES:**

1. Revisiting the C Basics
2. Study the basic concepts of Pointers and its advanced usage.
3. To understand the concepts of Structures and Files
4. Understand the Preprocessor, Command Line Arguments and Variable Length Argument List.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Understand the basics of C Programming Constructs and Apply C Program for Problems.
2. Apply Pointers for effective memory access.
3. Illustrate the concepts of Structures, Unions and Bit Fields
4. Apply Sequential and Random File Access.
5. Understand and illustrate the concepts of Preprocessors, Command Line Arguments and Variable Length Argument List.
6. Arguments and Variable Length Argument List.

**UNIT I: RECAP OF C BASICS**

**9**

Overview of C Fundamentals - Input and Output - Decision Making and Branching - Decision Making and Looping - Jumps in Loops - Arrays - Character Arrays and Strings - Functions

**UNIT II: POINTERS**

**9**

Pointers - Introduction - Pointer for Inter Function Communication - Pointers to Pointers - Compatibility - Lvalue and Rvalue. Arrays and Pointers - Pointer Arithmetic and Arrays - Passing an Array to a Function - Array of Pointers. Functions Returning Pointers - Pointer to an Array - Pointers and Strings - Array of Pointers to Strings - Null Pointer - Dangling Pointer - Pointer to void - Pointer to Function - Type Qualifier - constants - volatile - restrict. Memory Allocation: Static Memory Allocation - Dynamic Memory Allocation - Dynamic Memory Allocation Functions

**UNIT III: STRUCTURES**

**9**

The Type Definition (typedef) - Enumerated Types - Structure - Structure Type Definition - Initialization - Accessing Structures. Operation on Structures - Complex Structures - Structures and Functions - Sending the Whole Structure - Passing Structure Through Pointers - Self Referential Structure - Unions - Bit Fields - Programming Application.

**UNIT IV: FILE MANAGEMENT**

**9**

Introduction - Text versus Binary Streams - State of a File - Defining and Opening a File - Closing a File. Input/output Operations on Files - Error Handling during I/O Operations - Standard Library Functions for Files - Random Access to Files - File Program Examples

**UNIT V: ADVANCED FEATURES**

**9**

Bitwise Operators: Exact Size Integer Types - Logical Bitwise Operators - Shift Operators - Masks. Preprocessor Commands - File Inclusion - Macro Definition - Conditional Compilation - Other Commands - Command Line Arguments: Defining Command Line Arguments - Using Command Line Arguments. Variable Length Argument List

Self study: Program Development

**TOTAL : 45**

**TEXT BOOK:**

1. Behrouz A. Forouzan& Richard F. Gilberg, "A Structured Programming Approach Using C", 3E, Cengage Learning, 2008.
2. E Balagurusamy, "Programming in ANSI C", 6E, TMH, 2012.

**REFERENCE BOOKS:**

1. YashavantKanetkar, "Understanding Pointer in C", 3E, BPB Publication, 2011..
2. Stephen G. Kochan "Programming in C",Fourthedition,Addison Wesley publishing ,August 2014.

**Web Resource:**

1. <http://www.cprogramming.com/tutorial/c/lesson17.html>
2. [http://www.tutorialspoint.com/cprogramming/c\\_memory\\_management.htm](http://www.tutorialspoint.com/cprogramming/c_memory_management.htm)
3. <http://www.c4learn.com/c-programming/c-dangling-pointer-causes/>

15UB301

**ELECTRIC CIRCUITS AND ELECTRON DEVICES**

3/2/0/4

**PREREQUISITES:** Physics

**COURSE OBJECTIVES:**

1. To familiarize the students with concepts related to network theorems, resonance and transient response.
2. To introduce the concept of coupled circuits, Duality and Topology.
3. The subject aims to introduce most of the basic electronic devices and discuss about the functioning, application and selection of appropriate devices to design a circuit for a particular application

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Gain an intuitive learning of electrical networks.
2. Gain the knowledge of network theorems.
3. Gain knowledge about the coupled and resonance circuits.
4. Design and analyze circuits involving electronic components.

**UNIT -I CIRCUIT ANALYSIS AND NETWORK THEOREMS (DC only)**

9

Mesh analysis – nodal analysis – delta wye conversion - Thevenin and Norton theorem - maximum power transfer - superposition theorem.

**UNIT- II TRANSIENTS AND RESONANCE IN RLC CIRCUITS (DC only)**

9

Definition of natural, forced, transient response, DC response of RL, RC, RLC circuit, Series Resonance - Resonant frequency, Variation of impedance with frequency, Q factor, Bandwidth – Half power frequency, Parallel resonance - Resonant frequency, Variation of impedance with frequency, Q factor

**UNIT - III COUPLED CIRCUITS, DUALITY AND TOPOLOGY**

9

Self inductance – Mutual inductance – Coupling coefficient, Concept of duality, dual network, Graph's of a network, trees, Chords and branches .

**UNIT -IV BIPOLAR JUNCTION TRANSISTOR AND FIELD EFFECT TRANSISTOR**

9

Principle of transistor action–Current components–Cutoff, active and saturation region–Input and output characteristics–CE, CB, & CC Configurations – Transistor as a switch, Fundamentals of JFETs and the device characteristics – JFET parameters, MOSFET – principle of operation- Depletion and enhancement modes.

**UNIT- V SOLID STATE DEVICES**

9

Tunnel diode -Varactor diode -- SCR -- TRIAC – DIAC - UJT operation – characteristics -- applications, Diode applications - Clippers – Clampers – Voltage Multipliers .

**TOTAL HOURS = 60**

**TEXT BOOK**

1. Sudhakar.A and Shyammmohan.SPalli “Circuits and Networks : Analysis & Synthesis”, 4<sup>th</sup> Edition, Tata McGraw Hill. 2010
2. Boylestead L R and Nashelsky L “Electronic Devices and Circuit theory Pearson Education India”, New Delhi, Ninth Edition 2006.

**REFERENCE BOOKS**

1. NageswaraRao T “Electric Circuit analysis”,A R Publications 2007.

2. William Hayt and Jack E Kemmerly“Engineering Circuit Analysis”,McGrawHill, New Delhi. Sixth Edition 1993.
3. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, “Electronic Devices and Circuits”, 2<sup>nd</sup> Edition, Tata McGraw Hill, Ninth reprint 2010.
4. Sanjay Sharma, “Electronic Devices & Circuits”, 2<sup>nd</sup> edition, S.K. Kataria& sons, 2012.

**WEB REFERENCES**

1. [www.allaboutcircuits.com](http://www.allaboutcircuits.com)

**PREREQUISITES:** Nil

**COURSE OBJECTIVES**

1. To gain hands on experience on Carpentry, Fitting, Sheet metal, Plumbing, Arc welding
2. To provide exposure to the students with hands on experience on various wiring system and measurement system.
3. To provide exposure to the students with hands on experience on various Electronic Components.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Prepare simple components like try, cylinder funnel etc.
2. Prepare simple lap, butt and tee joints using arc welding equipments.
3. Prepare simple wooden joints using wood working tools.
- 4 To provide exposure to the students with hands on experience on various wiring system and measurement system.
5. To provide exposure to the students with hands on experience on various Electronic Components.

**LIST OF EXPERIMENTS**

**Mechanical**

**Civil**

1. Plumbing: basic pipe connections – mixed pipe material connection – pipe connections with different joining components.
2. Wood work, joints by sawing, planning and cutting.
3. Study of pipe connections requirements for pumps and turbines and joints in roofs, doors, windows and furniture. Demonstration of plumbing requirements of high –rise buildings.

**Electrical**

1. Identify different types of fuses, fuse carriers, mcb, elcb, mccb with ratings and usage for ac .
2. Wiring of simple circuit for controlling light using switches, fuse and indicator.
3. Wiring of light circuit using two way switches (staircase wiring).
4. Measurement of unknown resistance using dc bridges.
5. Measurement of electrical parameters using transducers.
6. Identification of electronic components with specification.
7. Testing of cro and electronic components.
8. Generation of signals.
9. Soldering practice.
10. Single phase half wave and full wave rectifier using pn junction diode.

**TOTAL LABORATORY HOURS:45**

**REFERENCES:**

1. SeropeKalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson Education, Inc. 2015 (Second Indian Reprint).
2. Suyambazhagan S, 'Engineering practices' PHI learning private limited, New Delhi, 2014.
3. Jeyapoovan T., Saravanapandian M. &Pranitha S., 'Engineering Practices Lab Manual', VikasPuplishing House Pvt.Ltd, 2014.

**WEB REFERENCES:**

1. [https://www.youtube.com/results?search\\_query=electrical+engineering+practices+lab](https://www.youtube.com/results?search_query=electrical+engineering+practices+lab)
2. <https://www.youtube.com/watch?v=rLUyP6g1VNI&list=PL425060D3C78350E1>

**PREREQUISITES:** 15CS111 - Fundamentals of Computing and CProgramming Lab

**COURSE OBJECTIVES:**

1. To Enable Students to Solve Problems using C Programming
2. To apply various C Features.

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Design programs involving decision making, loops, arrays and functions.
2. Implement Pointers, Dynamic Memory Allocation techniques and files in 'C' language.
3. Construct programs using advanced features like preprocessor, macros, Command
4. Line Arguments and Variable Length Argument List.
5. Apply Structured Programming Concepts to Solve Real Time Application.

**LIST OF EXPERIMENTS**

1. Program using Decision Making and Looping
2. Program using Arrays and Strings
3. Program using Pointer arithmetic
4. Program using Pointer on Single and Two dimensional Arrays
5. Program using Dynamic Memory Allocation
6. Program using Array of Pointer and Function Pointer
7. Program using Array of Structure using Structure passing to Function
8. Program on basic File operation
9. Program using Binary file
10. Program using Random File Access
11. Program using Preprocessor directive, Command Line Arguments and Variable Length Argument List
12. Develop a mini project implementation using the concepts from 1 to 11.

**REFERENCES**

1. Behrouz A. Forouzan& Richard F. Gilberg, "A Structured Programming Approach Using C", 3E, Cengage Learning, 2008.
2. E Balagurusamy, "Programming in ANSI C", 6E, TMH, 2012.
3. YashavantKanetkar, "Understanding Pointer in C", 3E, BPB Publication, 2011..
4. Stephen G. Kochan "Programming in C",Fourthedition,Addison Wesley publishing ,August 2014.

**PREREQUISITES:** Engineering Physics , Basics of Electrical and Electronics engineering

**COURSE OBJECTIVES:**

1. To set up and perform experiments to verify Kirchoffs voltage and current laws
2. To set up and perform experiments to verify superposition, Thevenin's and maximum power transfer theorem.
3. To set up and perform experiments to obtain the frequency response of RLC circuit
4. To set up and perform experiments on clippers, clampers and voltage doublers

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Apply Kirchoffs voltage and current laws to solve electric circuits.
2. Apply network theorems to solve any electric circuits.
3. Devise methods to determine and interpret the characteristics of electronic devices such as BJT, FET, SCR etc.,
4. Able to understand the operation of clippers, clampers etc.,

**LIST OF EXPERIMENTS**

1. Verification of Kirchoff's Voltage and Current laws.
2. Verification of Superposition Theorem &Thevenin's Theorem
3. Verification of Maximum Power Transfer theorem
4. Frequency response of RLC circuit
5. Transistor Characteristics ( CE Configuration)
6. JFET Characteristics (Common source configuration)
7. SCR characteristics.
8. UJT Characteristics
9. Clippers & Clampers
10. Tunnel Diode
11. Voltage Doubler

**TOTAL: 45**

**REFERENCES**

1. Salivahanan, N. Suresh Kumar and A. Vallavaraj, "Electronic Devices and Circuits", 2nd Edition, Tata McGraw Hill, Ninth reprint, 2010.
2. Sudhakar.A and Shyammoan.SPalli "Circuits and Networks: Analysis & Synthesis" 4th Edition, Tata McGraw Hill, 2010

**15MA133 Partial Differential Equations and Transforms Techniques 3/2/0/4**

**PREREQUISITES**

- 15UH201- Mathematics I
- 15UH204- Mathematics II

**COURSE OBJECTIVES**

1. To study the concept of mathematical formulation of certain practical problems in terms of partial differential equations and solving them for physical interpretation.
2. To understand the different possible forms of Fourier series and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data
3. To understand the concepts of Fourier transform and its inverse, their properties and the possible special cases with attention to their applications
4. To understand the basics of Z – transform and its applicability to discretely varying functions

**COURSE OUTCOMES**

Upon successful completion of the course, students shall have ability to

1. Solve the engineering problems using PDE
2. Find Fourier series solution to the engineering problems
3. Design and formulate certain problems in terms of difference equations and solve them using Z-transform technique

**UNIT 1 PARTIAL DIFFERENTIAL EQUATIONS 12**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions- Lagrange's linear equation – Linear homogeneous partial differential equations of second and higher order with constant coefficients

**UNIT 2 FOURIER SERIES 12**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Change of interval- Parseval's Identity- Harmonic analysis.

**UNIT 3 FOURIER TRANSFORM 12**

Complex form of Fourier transform-properties – Fourier sine and cosine transforms-properties- transforms and simple functions. Convolution theorem and Parseval's identity(excluding proof) . Evaluation of integrals using Parseval's identity.

**UNIT 4 Z-TRANSFORM 12**

Z-transform- Properties – Inverse Z- transform- Convolution theorem- Formation of difference equations- Solution of difference equations using Z-transform

**UNIT 5 NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 12**

Finite difference solutions of one dimensional heat equation – Bender – Schmidt's method – Crank Nicolson's method- One dimensional wave equation- Two dimensional Laplace and Poisson equations

**TOTAL:60**

**TEXT BOOKS:**

1. Grewal B.S, —Higher Engineering Mathematics, 43rd edition, Khanna Publications, Delhi, 2014.
2. Kreyszig. E, —Advanced Engineering Mathematics, tenth Edition, John Wiley and Sons (Asia) Limited, Singapore, 2014.

**REFERENCE BOOKS:**

1. Veerarajan., —Engineering Mathematics (for semester III), 5th edition, Tata McGraw-Hill Pub. Co., New Delhi, 2016.
2. Venkataraman. M.K, —Engineering Mathematics, Volume I & II Revised Enlarged Fourth Edition, National Pub. Co., Chennai, 2005.
3. Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th edition, 2012.

**WEB REFERENCES:**

1. <http://nptel.ac.in/video.php?subjectId=122107037>
2. <http://nptel.ac.in/courses/112106064>
3. <http://nptel.ac.in/courses/111105042>
4. <http://nptel.ac.in/courses/110105039/22>

**PREREQUISITES:** Fundamentals of Electrical and Electronics Engineering, Electron Devices

### **COURSE OBJECTIVES**

1. To introduce the principles of digital logic and minimize the logic expression
2. To enable the students to understand the operation of various combinational logic circuits
3. To enable the students to understand the principles of flip flops and to realise one flip flop from another
4. To prepare the students to apply flip flop concepts in designing registers and counters
5. To allow students to design synchronous and asynchronous sequential circuits

### **COURSE OUTCOMES**

Upon completion of the course, students shall have ability to

1. Recall the number systems and Boolean theorems and minimize the given logic functions using any minimization techniques
2. Understand various combinational circuits used for data processing and arithmetic and logic units
3. Differentiate between combinational and sequential circuits and analyse the storage mechanism used in digital circuits
4. Apply the concepts of flip flop in designing various types of registers and counters
5. Design both synchronous and asynchronous sequential circuits by obeying the design procedures.

### **UNIT 1 DIGITAL LOGIC AND COMBINATIONAL LOGIC CIRCUITS**

**9**

Introduction – The basic gates: NOT,OR,AND – universal logic gates: NOR,NAND – AND-OR-Invert gates – positive and negative logic – Boolean laws and theorems – SOP methods – Truth table to Karnaugh Map – Pairs, Quads and Octets – Karnaugh simplification – Don't care conditions – POS method – POS simplification – Five variable K-Map –simplification by Quine McClusky method – Hazards and Hazard covers

### **UNIT 2 DATA PROCESSING AND ARITHMETIC CIRCUITS**

**9**

Multiplexers – Demultiplexers – decoders – BCD to Decimal decoders – seven segment decoders – encoders – exclusive-OR gates – parity generators and checkers – magnitude comparators – Binary addition – binary subtraction – unsigned binary numbers – sign-magnitude numbers – 2's complement representation – 2's complement arithmetic – arithmetic building blocks – adder-subtractor – fast adder – ALU

### **UNIT 3 FLIPFLOPS**

**9**

Introduction – inverter with feedback – memory cell using inverters, NAND and NOR gates – Latch – SR latch using NAND and NOR gates – D Latch – Flip Flop – Edge triggered SR Flip Flop – cascading SR Flip Flop – SR Flip Flop with asynchronous inputs – Edge triggered D Flip Flop – D Flip Flop with asynchronous inputs – JK Flip Flop – T Flip Flop – conversion of one Flip Flop to another type

#### **UNIT 4    REGISTERS AND COUNTERS**

**9**

Introduction - Register - Shift Register – classification of shift register – uni-directional shift register - Bi-directional shift registers – shift registers: SIPO,SISO,PIPO,PISO – buffer registers – universal shift registers – counters – classification – asynchronous (Ripple) Counters – asynchronous decade counters – asynchronous Up-Down counters - Synchronous Counters – synchronous down counters – synchronous Up-Down counters – synchronous decade counters – MOD n counters – synchronous counter design steps

#### **UNIT 5    DESIGN OF SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS**

**9**

Introduction – sequential circuit model – classification of sequential circuits – state table – state diagram – state equation – design procedure of synchronous sequential circuits – state reduction of synchronous sequential circuits – asynchronous sequential circuits – design procedure of asynchronous sequential circuits **SELF STUDY:** applications of Flip Flops , registers and counters

**TOTAL:45**

#### **TEXT BOOKS:**

1. Donald P leach, Albert Paul Malvino, GoutamSaha, Digital Principles and Application, 8e., McGraw Hill education (India) Private Limited, 2014 (Units 1&2)
2. Soumitra Kumar Mandal, Digital Electronics – Principles and applications, McGraw–Hill education (India) Private Limited, New Delhi, 2010. (Units 3,4 & 5)

#### **REFERENCE BOOKS:**

1. M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi 2004
2. Thomas L. Floyd, Digital Fundamentals, Pearson Education, Inc, New Delhi, 2003
3. R.P.Jain, Modern Digital Electronics, 4 ed., McGraw Hill education (India) Private Limited, 2015

#### **WEB REFERENCES:**

1. <http://www.electrical4u.com/digital-electronics.htm>
2. <http://www.technologystudent.com/elec1/dig1.htm>

**PREREQUISITES:** Engineering Mathematics, Engineering Physics

**COURSE OBJECTIVES**

1. To analyze fields and potentials due to static charges
2. To analyze static and vector magnetic fields
3. To understand how electric and magnetic fields affect materials and the relation between the fields under time varying situations
4. To understand principles of propagation of uniform plane waves.

**COURSE OUTCOMES**

Upon completion of the course, students shall have ability to

1. Analyze EM field distribution under static and time varying (dynamic) conditions for various geometries.
2. Obtain the correlation of electromagnetic fields under various cases and for varying materials.
3. Analyze the distribution of electromagnetic waves in conductors, free space, homogenous material and lossy dielectrics.

**UNIT 1 STATIC ELECTRIC FIELD**

**12**

Introduction to Co-ordinate System -Rectangular , Cylindrical and Spherical Co-ordinate System , Differential Length, Area and Volume ,Introduction to line, Surface and Volume Integrals, Gradient of Scalar, Divergence of a vector and Divergence theorem, Curl of a Vector and Stoke's theorem, Laplacian of a Scalar, Coulomb's Law and Electric Field Intensity, Electric field due to continuous charge distribution - infinite and finite line charge, infinite sheet of charge and uniformly charged sphere.

**UNIT 2 ELECTRIC POTENTIAL AND ELECTRIC FIELDS IN MATERIALS**

**12**

Electric Flux Density, Gauss Law, Applications-point charge, infinite line charge, infinite sheet of charge, uniformly charged sphere, Electric Scalar Potential, Relationship between potential and electric field, Potential due to electrical dipole , Electric flux lines, Energy density in electrostatic fields, Electric current, Current density, continuity equation for current, point form of ohm's law, Polarization in dielectrics, Boundary conditions for electric fields, Poisson's and Laplace's equation, Definition of Capacitance - capacitance of parallel plate and coaxial cable using Gauss's law, capacitance of spherical shells using Laplace equation

**UNIT 3 STATIC MAGNETIC FIELD IN MATERIALS**

**12**

The Biot-Savart's Law - Magnetic Field intensity due to a finite and infinite wire carrying a current I - Magnetic field intensity on the axis of a circular loop carrying a current I, Ampere's circuital law and simple applications - infinite line current, infinitely long coaxial transmission line, Magnetic flux density - The Lorentz force equation for a moving charge - Force on a current element and force between two current elements, Definition of Magnetic Torque and moment, Magnetic boundary conditions, Definition of Inductance - Inductance of solenoids - Energy density in magnetic fields

**UNIT 4 TIME VARYING ELECTRIC AND MAGNETIC FIELDS**

**12**

Faraday's law -Transformer and motional electromotive forces, Displacement current, Maxwell's four equations in integral form and differential form, Poynting Theorem and Poynting Vector

**UNIT 5 ELECTROMAGNETIC WAVES**

**12**

Derivation of Wave Equation in free space - Uniform Plane Waves, Wave equation for a conducting medium -Propagation in good conductors and good dielectrics - Skin effect, Linear, Elliptical and circular polarization, Reflection of Plane Wave by a perfect conductor - normal incidence and oblique incidence, Reflection of Plane Waves by a perfect dielectric - normal and oblique incidence, Brewster angle

**SELF STUDY:** Nature of dielectric materials and Nature of magnetic materials

**TOTAL:60**

**TEXT BOOKS:**

1. Matthew.N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, 6th edition, 2014 (Unit 1-Unit 4)
2. William H. Hayt and J.A. Buck "Engineering Electromagnetics" TATA McGraw-Hill, 8th edition, 2014 (Unit 1-Unit 4)
3. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Prentice Hall of India, 4th edition, 2006( Unit 5)

**REFERENCE BOOKS:**

1. NarayanaRao, N : "Elements of Engineering Electromagnetics" 6th edition, Pearson Education, New Delhi,,2006
2. David K.Cheng: "Field and Wave Electromagnetics - Second Edition-Pearson Education, 2006.
3. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" John Wiley & Sons ,3rd edition 2003

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/117103065/>
2. <http://nptel.ac.in/video.php?subjectId=108106073>

**PREREQUISITES:** Electron Devices ,Electric Circuits

### COURSE OBJECTIVES

1. To understand the basic building blocks of linear integrated circuits
2. To learn the linear and non-linear applications of operational amplifiers
3. To understand the theory and applications of analog multipliers and PLL
4. To learn the theory of ADC and DAC
5. To learn a few special functions integrated circuits

### COURSE OUTCOMES

Upon completion of the course, students shall have the ability to

1. Analyze how the biasing of transistor play a role in Integrated Circuits design
2. linear and non-linear applications of operational amplifiers
3. Design applications of analog multipliers and PLL
4. To learn the theory of ADC and DAC using Op-Amp
5. Experiment the applications where the special function ICs are used.

#### UNIT 1 CIRCUIT CONFIGURATION FOR LINEAR ICS 9

Advantages of ICs over discrete components – Manufacturing process of monolithic ICs - Basic information of Op-Amp - Differential amplifier-differential amplifier with constant current source-current mirror – DC and AC characteristics of Op-Amp

#### UNIT 2 APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Linear and Nonlinear Circuits using operational amplifiers and their analysis: Inverting and Non inverting Amplifiers - Instrumentation amplifier - Voltage to current converter – Differentiator - Integrator - Log and Antilog amplifiers - Comparator and Schmitt trigger - Triangular wave generator - Precision rectifier - Low pass High pass and band-pass filters

#### UNIT 3 ANALOG MULTIPLIER AND PLL 9

Analog Multiplier - Gilbert cell - variable transconductance technique - Voltage controlled Oscillator – Monolithic Phase Locked Loop - Application of PLL – Frequency multiplication/division – Frequency Translation – AM Detection

#### UNIT 4 ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

High speed sample and hold circuits and sample and hold ICs, DAC techniques - Weighted Resistor DAC – R-2R Ladder DAC – Inverted R-2R ladder - A/D converter – Flash – counter type - Dual slope - Successive approximation

#### UNIT 5 SPECIAL FUNCTION ICS 9

Astable and MonostableMultivibrators using 555 Timer, Voltage regulators - 723 General purpose regulator - linear and switched mode types

**SELF STUDY:** Audio Power Amplifier - Video amplifiers - Opto-couplers - Isolation Amplifiers - Fiber optic ICs

**TOTAL:45**

**TEXT BOOKS:**

1. D.RoyChoudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd.,2010
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw-Hill, Fourth edition

**REFERENCE BOOKS:**

1. S.Salivahanan, V S KanchanaBhaaskaran, - Linear Integrated Circuits, McGraw-Hill,
2. Gray and Meyer, '\_Analysis and Design of Analog Integrated Circuits', Wiley International, 2010
3. J.Michael Jacob, '\_Applications and Design with Analog Integrated Circuits', Prentice Hall of India,1996
4. William D.Stanely, '\_Operational Amplifiers with Linear Integrated Circuits'. Pearson Education, 2004
5. RamakantA.Gayakwad, '\_OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994
6. K.R.Botkar, '\_Integrated Circuits'. Khanna Publishers, 1996
7. Taub and Schilling, Digital Integrated Electronics, McGraw-Hill, 2008

**WEB REFERENCES:**

1. <http://www.allaboutcircuits.com>
2. <http://www.electronics-tutorials.ws>

**PREREQUISITES:** Problem Solving Techniques and C Programming

### COURSE OBJECTIVES

1. To learn about Linear and Non – Linear Data Structures
2. To design and implement list, stack, queue and Linked List
3. To study and implement the complex data structures like tree and graph
4. To design and implement algorithms for sorting and searching

### COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

1. Apply the fundamental knowledge of various Data structures for designing and implementing real time problem.
2. Write programs to implement List, stack, queue and linked List.
3. Apply the concepts of trees and graphs in real world problems
4. Implement sorting and searching algorithms.

#### UNIT 1 INTRODUCTION TO ALGORITHM ANALYSIS AND DATA STRUCTURES 9

Basic terminology – classification of data structures – data structure operation – Abstract Data Types (ADT) – Algorithms notations – Asymptotic notations – Simple algorithm analysis. **Arrays, Records and Pointers:** Linear Array – Arrays as ADT – Representation – Traversing – Inserting and deleting – multidimensional arrays – representation of polynomial using arrays – pointer arrays – Dynamic Memory management – record structures – representation.

#### UNIT 2 LINEAR DATA STRUCTURES 9

**Linked List:** Representation – Traversing – searching – insertion – deletion – Header Linked List – Circular Linked List – Two way List – Polynomial addition – **Stack:** representation – ADT – polish notations – application of stack – recursion – tower of hanoi – **Queue:** representation – ADT – circular queue – priority Queue

#### UNIT 3 TREE STRUCTURES 9

**Binary Trees:** representation – traversing – traversal algorithms using stacks. Binary search tree – searching – inserting – deleting – AVL Trees – searching – inserting – deleting.

#### UNIT 4 GRAPHS 9

Introduction – Terminology – representation – Operations – **Traversing** : Breadth first search-Depth first search – shortest-path algorithms (Dijkstra Algorithm) – minimum spanning tree – Prim's and Kruskal's algorithms.

#### UNIT 5 SORTING AND SEARCHING 9

**Sorting** : Introduction – Bubble sort - Insertion sort – Selection sort – Merge sort. **Searching:** Linear search – Binary search – Hashing. **SELF STUDY:** Quick Sort

**TOTAL: 45**

## LAB COMPONENTS

1. Implementation of List ADT.
2. Implementation of student record using dynamic memory management.
3. Implementation following using Linked List
  - a. List ADT
  - b. Two way List
  - c. Stack ADT
  - d. Queue ADT
4. Implementation of stack applications
  - a. Tower of Hanoi
  - b. Checking for balanced Parenthesis
  - c. Conversion of infix to postfix
  - d. Evaluate a postfix expression
5. Implementation of Binary Tree Traversals
6. Implementation of Binary Search Tree ADT
7. Implementation of Dijkstra algorithm
8. Implementation of Minimum Spanning Tree.
9. Implementation of Insertion sort, Selection Sort, Merge Sort
10. Implementation of Linear and Binary Search

## TEXT BOOKS:

1. Seymour Lipschutz, Data Structures with C, McGraw Hill Education, Special Indian Edition, 2015. (Unit 1 – Chapter 1, 2 & 4, Unit 2 – Chapter 5 & 6, Unit 3 – Chapter 7, Unit 4 – Chapter 8, Unit 5 – chapter 9)
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education, second edition, 2005.

## REFERENCE BOOKS:

1. B. R. F. Gilberg, B. A. Forouzan, Data Structures: A Pseudocode approach with C, Second Edition, Thomson India Edition, 2005.
2. J. Tremblay, P. Sorenson, An introduction to data structures with Applications, McGraw-Hill, 2<sup>nd</sup> edition, 2007.

## WEB REFERENCES:

1. <http://nptel.ac.in/courses//106103069/>
2. <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms/1>
3. <http://web.stanford.edu/class/cs97si/>
4. <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>

**PREREQUISITES:** Basics of Electronics and Electrical Engineering, Circuit Theory

### COURSE OBJECTIVES

1. To familiarize the basic measurement concepts and measurement of various parameters using bridge configurations.
2. To analyze the signal generators and signal analyzers in measurements.
3. To elaborate the various digital instruments and the need for recording systems.
4. To introduce the recent trends in measurements and learn the concepts of Virtual Instrumentation.

### COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to:

1. Understand the need for measurement and measurement standards.
2. Analyze the various parameters that are measurable in electronic instrumentation.
3. Selection of the appropriate instrument to measure the given parameters.
4. Design of various instrumentation system using LabVIEW software.

#### UNIT 1 BASIC MEASUREMENT CONCEPTS 9

Measurement systems, Static and Dynamic characteristics, Errors in measurement, Calibration and Standards of measurement, DC Ammeters and Voltmeters, Energy meter, Wattmeter, RLC measurements using AC and DC bridges, Classification and Selection of Transducers, Displacement transducers, LVDT.

#### UNIT 2 INSTRUMENTS FOR SIGNAL GENERATION AND MEASUREMENT 9

Multimeter, Q meter, Vector impedance meter, Vector voltmeter, Pulse and Square wave generator, Function generator, Wave analyzers, Logic analyzer, Spectrum Analyzers, Harmonic Distortion Analyzers.

#### UNIT 3 DIGITAL INSTRUMENTS 9

Digital Voltmeter and Multimeter, Automatic vector voltmeter, Automation in digital instruments, Digital Tachometer, Digital pH meter, Frequency counter, Digital RLC meter, Electronic Weighing System, Data Acquisition systems.

#### UNIT 4 DISPLAY AND RECORDING SYSTEMS 9

Cathode Ray Oscilloscope, CRO measurements using Lissajous patterns, Dual beam and Dual trace CRO, Digital storage Oscilloscope, Sampling Oscilloscope, Chart recorders, Digital recorders.

#### UNIT 5 RECENT ADVANCEMENTS IN INSTRUMENTATION 9

Intelligent instruments, Smart sensors, Fiber optic measurements, Optical time domain reflectometer, Computer Controlled test systems, Introduction to Virtual Instrumentation, Basics of LabVIEW, Modular programming, Loops, Structures, Case studies using LabVIEW.

**SELF STUDY:** Basic Medical instrumentation system, Biomedical recorders-ECG, EEG.

**TOTAL HOURS:45**

## **TEXT BOOKS**

1. Albert D. Helfrick and William D. Cooper, “ Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2003. (Units 1,2,5)
2. Alan.S. Morris and Reza Langari, “Measurement and instrumentation-Theory and applications”, Elsevier,2013. (Units 3,4)
3. Jovitha Jerome, “Virtual Instrumentation using LabVIEW”, Prentice Hall of India,2010. (Unit 5)

## **REFERENCE BOOKS**

1. David.A.Bell, “Electronic Instrumentation and measurements”, Prentice Hall of India Private Ltd,2010.
2. Kalsi.H.S, “Electronic Instrumentation”, Tata McGraw Hill, New Delhi,2012.
3. Khandpur.R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi,2003.

## **WEB REFERENCES**

1. [www.ni.com](http://www.ni.com)
2. [www.radio-electronics.com](http://www.radio-electronics.com)
3. [www.meas-inst.com](http://www.meas-inst.com)
4. [www.labviewmakerhub.com](http://www.labviewmakerhub.com)

**PREREQUISITES:** Electron devices

**COURSE OBJECTIVES:** The students will be able to design, simulate, built and debug complex combinational and sequential circuits based on an abstract functional specification

### **COURSE OUTCOMES**

1. Knowledge and understanding of Combinatorial and sequential circuits and number of ways of designing them
2. Ability to use and choose between different techniques for digital circuit design
3. A standard hardware description language and how it can be used to capture digital circuit designs at different levels of abstraction.
4. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner
5. Identify and apply appropriate sources of information for conducting laboratory experiments involving digital circuits and systems.

### **LIST OF EXPERIMENTS**

1. a) Experiments on basic logic gates using diodes and transistors  
b) Verify the truth table of basic logic gates using IC
- 2.a) Implement the following logic circuits using combinational logic ICs?
  - i) Half adder
  - ii) Full adder
  - iii) Half subtractor
  - iv) Full subtractorb) Implement a 4 bit even parity generator and 5 bit odd parity checker
3. Implement a BCD adder using IC 7483
4. Experiments on combinational logic circuits:
  - a) Multiplexer & Demultiplexer
  - b) Decoder & Encoder
5. Experiments on Code Converters
  - a. BCD to XS3
  - b. Binary to Gray
  - c. Gray to Binary
6. Experiments on Flip Flops
  - a) SR Flip Flop
  - b) D Flip Flop
  - c) JK Flip Flop
  - d) T Flip Flop
7. Experiments on Registers
  - a) (i) Serial In Serial Out  
(ii) Serial In Parallel Out  
(iii) Parallel In Serial Out  
(iv) Parallel In Parallel Out
  - b) Convert the SIPO shift register into a ring counter and Johnson counter
8. Experiments on Counters
  - a) Asynchronous Counters
    - I. MOD 16
    - II. MOD 10 or Decade
    - III. MOD 12

9. Design a self-correcting synchronous counter with the following sequence 1-2-5-7-...
10. Experiment on implementation of Digital lock using a sequence detector which detects a 4 bit pattern (eg 1001).

**REFERENCES:**

1. Fundamentals of Digital Logic with VHDL Design, Stephen Brown and Zvonko Vranesic, 3rd Edition
2. Digital Design, 3rd ed., Mano, Prentice Hall
3. Fundamentals of Logic Design, Charles Roth, 2nd Edition, West Publishing Company, 1979

**PREREQUISITES:** Electron Devices ,Electric Circuits

**COURSE OBJECTIVES**

- 1 To learn the characteristics and Application of operational amplifiers
- 2 To analyse active filters using OP-AMP.
- 3 To implement multivibrators using 555 timer
- 4 To learn the characteristics of PLL and voltage regulators

**COURSE OUTCOMES**

Upon completion of the course, students shall have the ability to

- 1 Design Op-Amp circuits to perform linear and non-linear applications
- 2 Construct the Frequency Multiplier employing PLL
- 3 Build mulivibrators Circuits using NE555 timer
- 4 Design Voltage regulators circuits

**COURSE CONTNENTS**

1. Inverting, Non Inverting and Differential Amplifiers
2. Integrator and Differentiator
3. Instrumentation amplifier.
4. Active low pass and band pass filter.
5. Schmitt Trigger using op-amp.
6. PLL characteristics and Frequency Multiplier using PLL.
7. Astable and monostablemultivibrator using NE555 Timer.
8. DC power supply using LM317 and LM723.
9. Simulation of Filters, Schmitt trigger and multivibrators
10. Simulation of A/D and D/A converter.

**TOTAL HOURS:30**

**Nature of Course** :J (Problem analytical)

**Pre requisites** Basic concepts of probability , basic integration

**Course Objectives:**

- 1 To study the basic probability concepts
- 2 To acquire skills in handling situations involving more than one random variable
- 3 To understand and have a well – founded knowledge of standard distributions which can be used to describe real life phenomena
- 4 To know the probabilistic model used for characterizing a random signal and the nature of dependence relationship existing among the members of the family of the random variables

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |   |      |
|---|------|
| C143.1 Recall concepts of probability and integration                                   | [R]  |
| C143.2 Predict the correlation and regression between the random variables              | [U]  |
| C143.3 Apply skills to handle situations involving single and multiple random variables | [AP] |
| C143.4 Use distribution in cluster analysis of similar binary variables.                | [AP] |
| C143.5 Analyse various types of random processes.                                       | [AP] |
| C143.6 Use the concepts of random processes in signals and systems                      | [AP] |

**Course Contents:**

**Probability** - Probability concepts-Addition and Multiplication law of probability – Conditional probability - Total probability theorem, Bayes theorem(statement) -Problems– **Random Variables**- One dimensional random variable - Probability mass function - Probability density function – Discrete and continuous random variables – **Standard distributions**-Discrete distributions - Binomial – Poisson – Geometric – Continuous distributions - Uniform – Exponential - Normal distributions – MGF- Simple problems-**Twodimensional random variables**- Joint distributions - Marginal and conditional distributions – Covariance – Correlation and Regression- **Classification of Random processes**- Definitions - strictly stationary processes - wide – sense stationary processes - Poisson process - Markov process - Markov Chain - Transition probabilities - Limiting distributions. **Correlation and Spectral densities** - Auto correlation - Cross correlation - Properties – Power spectral density-Cross spectral density-Properties-Relationship between cross correlation and cross spectral densities.

**Total Hours: 60**

- 1 Peebles Jr. P.Z., –Probability Random Variables and Random Signal Principles,Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2010
- 2 Palaniammal, S., –Probability and Random Processes, Prentice hall of India, New Delhi, 2014 ,Reprint 2015.
- 3 Gupta, S.C., &Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand &sons, 2000,Reprint 2014.

**Reference Books:**

- 1 Ross, S., –A First Course in Probability, Sixth edition, Pearson Education, Delhi, 2014.
- 2 Henry Stark and John W. Woods –Probability and Random Processes with Applications to Signal Processing, Pearson Education, Fourth Edition, Delhi, 2011
- 3 Veerarajan., T –Probability, Statistics and Random Processes, Tata McGraw-Hill, Second Edition, New Delhi, 2010.

**Web References:**

- 1 <http://nptel.ac.in/courses/111104079/>
- 2 <http://www.nptelvideos.in/2012/12/probability-random-variables.html>
- 3 <http://freevideolectures.com/Course/3028/Econometric-Modelling/22>
- 4 <http://freevideolectures.com/Course/2311/Digital-Communication/4>
- 5 <http://nptel.ac.in/syllabus/111105041/>

**Online Resources:**

- 1 <https://www.coursera.org/learn/probability-intro>
- 2 <https://ocw.mit.edu/courses/.../18-440-probability-and-random-variables-spring-2014/>
- 3 <https://www.coursera.org/learn/wharton-introduction-spreadsheets-models/lecture/Y3bCF/3-1-random-variables-and-probability-distributions>
- 4 <http://nptel.ac.in/upcoming.courses.php>

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>					
<b>Formative assessment based on Capstone Model (Max. Marks:20)</b>					
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>			<b>Marks</b>
C143.1	Remember	Classroom or Online Quiz			2
C143.2	Understand	Class Presentation/Power point presentation			4
C143.3& C143.4	Apply	Group Assignment			7
C143.5 & C143.6	Apply	Group activities			7
<b>Summative assessment based on Continuous and End Semester Examination</b>					
<b>Bloom's Level</b>	<b>Continuous Assessment</b>			<b>End Semester Examination</b>	
	<b>CIA1</b>	<b>CIA2</b>	<b>Term End Assessment</b>		
Remember	20	20	20	20	
Understand	30	30	30	30	
Apply	50	50	50	50	
Analyse	-	-	-	-	
Evaluate	-	-	-	-	
Create	-	-	-	-	

**Nature of Course** :G (Theory analytical)

**Pre requisites** :15UH202Engineering Physics  
15UB301- Electric Circuits and Electron Devices

**Course Objectives:**

- 1 To introduce the concept of biasing of BJTs and MOSFETs and enable the students to understand the frequency analysis of amplifiers
- 2 To enable the students to understand the concept of negative feedback in amplifiers
- 3 To study about the power amplifiers and their thermal stability.
- 4 To understand the analysis and design of oscillators and multivibrators
- 5 To allow students to get familiarized with the concept of tuned amplifiers and analyze different types of tuned amplifiers.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C402.1	Recall the concepts of BJT, MOSFET and the concepts of circuit theory	[R]
C402.2	Understand the biasing of transistors, the frequency response of amplifiers and the operation of various power amplifiers	[U]
C402.3	Illustrate the operation of negative feedback, positive feedback in amplifiers and the performance of tuned amplifiers	[U]
C402.4	Apply the concepts of negative feedback and positive feedback to construct negative feedback amplifier, audio and radio frequency oscillators	[AP]
C402.5	Use the concepts of frequency response of amplifier to analyze the behavior of 2 stage RC coupled amplifier	[AN]
C402.6	Compare the different types of power amplifiers	[AN]
C402.7	Design and develop a circuit based on the concepts of oscillators and multivibrators	[C]

**Course Contents:**

**Transistor biasing:** BJT, MOFET; **Frequency response of amplifiers:** Analysis of transistor using h parameter model low frequency response, high frequency response, 2 stage RC coupled amplifier; **Feedback amplifiers:** basic feedback topologies and their properties, analysis of practical feedback amplifiers, stability; **Power amplifiers:** class A, B, AB, C, D, E stages, output stages, short circuit protection, power transistors and thermal design considerations; **Signal generation** : sinusoidal oscillators- RC, LC, and crystal oscillators, multi-vibrators, **Tuned Amplifiers** : Single tuned amplifier, Overview of Double tuned amplifier and stagger tuned amplifier

**Total Hours: 60**

**Text Books:**

- 1 Jacob Millman, Chritos C Halkias, SatyabrataJit, 'Electronic Devices and Circuits', 4<sup>th</sup> edition (SIE), McGraw Hill Education India Private Ltd., 2015
- 2 Salivhanan, 'Electron Devices and Circuits', 4<sup>th</sup> edition, McGraw Hill Education India Private Ltd., 2016

**Reference Books:**

- 1 Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 9<sup>th</sup> Edition, Pearson Education / PHI, 2014.
- 2 Floyd, "Electronic Devices", 9<sup>th</sup> Edition, Pearson Education, 2011
- 3 David A. Bell, Electronic Devices & Circuits, 5<sup>th</sup> Edition, PHI, 2008

**Web References:**

- 1 <http://www.allaboutcircuits.com>
- 2 <http://www.circuitstoday.com>

**Online Resources:**

- 1 <http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog>

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>				
<b>Formative assessment based on Capstone Model (Max. Marks:20)</b>				
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>		<b>Marks</b>
C303.1	Remember	Quiz		2
C303.2	Understand	Quiz		2
C303.3	Understand	Quiz		2
C303.4	Apply	Group Assignment		4
C303.5	Analyse	Simulation Exercise		3
C303.6	Analyse	Simulation Exercise		3
C303.7	Create	Mini Project		4
<b>Summative assessment based on Continuous and End Semester Examination</b>				
<b>Bloom's Level</b>	<b>Continuous Assessment</b>			<b>End Semester Examination [60 marks]</b>
	<b>CIA-I [6 marks]</b>	<b>CIA-II [6 marks]</b>	<b>Term End Examination [8 marks]</b>	
Remember	20	10	10	10
Understand	80	30	40	40
Apply	-	30	30	30
Analyse	-	30	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

**Nature of Course** : G (Theory analytical)

**Pre requisites** : 15UH204- Mathematics – II,  
15MA133- Partial Differential Equations and Transform  
Techniques

**Course Objectives:**

- 1 To introduce the concepts of analog communication systems and to make the students understand the functions of major building blocks of communication system and noise performance
- 2 To develop a clear insight into techniques involved in different types of modulation and demodulation of AM & FM signals.
- 3 To introduce the fundamental concepts of sampling theorem and coding.
- 4 To discuss the different types of digital pulse and band pass signalling techniques.
- 5 To describe the effect of noise in analog and pulse modulation systems

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C403.1 | Explain the fundamental parameters of a communication system and analog transmission and detection techniques  | [R]  |
| C403.2 | Outline and distinguish between different types of analog modulation techniques based on bandwidth Occupied and power transmitted                    | [U]  |
| C403.3 | Interpret the basic knowledge of Sampling theorem and various aspects of sampling theorem  | [U]  |
| C403.4 | Identify the techniques used for waveform coding and familiarized with basic techniques for generating and demodulating pulse code modulated signals | [AP] |
| C403.5 | Analyse the performance of analog communications in the presence of noise by evaluating the figure of merit for different schemes of modulation      | [AN] |
| C403.6 | Design a communication system and select an appropriate modulation technique for a particular application.   | [C]  |

**Course Contents:**

**Basic blocks in a communication system:** transmitter, channel and receiver; baseband and passband signals and their representations; concept of modulation and demodulation.

**Continuous wave (CW) modulation:** amplitude modulation (AM) - double sideband (DSB), double sideband suppressed carrier (DSBSC), single sideband suppressed carrier (SSBSC) and vestigial sideband (VSB) modulation; angle modulation - phase modulation (PM) & frequency modulation (FM); narrow and wideband FM. **Pulse Modulation:** sampling process; pulse amplitude modulation (PAM); pulse width modulation (PWM); pulse position modulation (PPM) ; pulse code modulation (PCM); line coding; differential pulse code modulation; delta modulation; adaptive delta modulation. **Noise in CW and pulse modulation systems:** Receiver model; signal to noise ratio (SNR); noise figure; noise temperature; noise in DSB-SC, SSB, AM & FM receivers; pre-emphasis and de-emphasis, noise consideration in PAM and PCM systems.

**Total Hours: 45**

**Text Books:**

- 1 J. G. Proakis and M. Salehi, Communication system engineering, 2/e, Pearson Education Asia, 2002.
- 2 R. E. Ziemer, W. H. Tranter, Principles of Communications: Systems, Modulation, and Noise, 5/e, John Wiley & Sons, 2001.
- 3 Simon Haykins and Michael Moher, "Communication Systems", 5th Edition, John Wiley and sons, 2012.

**Reference Books:**

- 1 Wayne Tomasi, "Electronic Communications Systems - Fundamentals Through advanced", 5th Edition Pearson Education, , 2012
- 2 H. Taub and D. L. Schilling, Principles of Communication Systems, 3<sup>rd</sup>Reprint , McGraw Hill, 2006.
- 3 George Kennedy and Bernard Davis, " Electronic Communication systems", 4th Edition, TMH, , 2008

**Web References:**

- 1 [nptel.ac.in/downloads/117108038/](http://nptel.ac.in/downloads/117108038/)
- 2 [elearning.vtu.ac.in/10EC53.html](http://elearning.vtu.ac.in/10EC53.html)
- 3 <https://class.coursera.org/eefun-001/lecture/32>

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>				
<b>Formative assessment based on Capstone Model (Max. Marks:20)</b>				
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>		<b>Marks</b>
C310.1	Remember	Quiz		<b>2</b>
C310.2	Understand	Group discussion		<b>2</b>
C310.3	Understand	Technical Presentation		<b>3</b>
C310.4	Apply	Group Assignment		<b>3</b>
C310.5	Analyze	Test		<b>3</b>
C310.6	Create	Mini Project		<b>4</b>
<b>Summative assessment based on Continuous and End Semester Examination</b>				
<b>Bloom's Level</b>	<b>Continuous Assessment</b>			<b>End Semester Examination [60 marks]</b>
	<b>CIA-I [6 marks]</b>	<b>CIA-II [6 marks]</b>	<b>Term End Examination [8 marks]</b>	
Remember	20	0	0	0
Understand	20	20	20	20
Apply	60	60	60	60
Analyse	0	20	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

**Nature of Course** :G (Theory analytical)

**Pre requisites** :15MA133: Partial Differential Equations and Transform Techniques

**Course Objectives:**

- 1 To introduce the transformation techniques in engineering applications and the concept of signals and systems and its classification based on properties
- 2 To enable the students to understand Laplace and Fourier transform techniques and its applications and to analyse CT systems using transformation techniques
- 3 To enable the students to understand DT Fourier series, sampling and reconstruction of signals
- 4 To enable the students to understand Z transform and DTFT and its applications and to analyse DT systems using Z transform and DTFT
- 5 To enable the students to understand the structure realization
- 6 To enable students to design, simulate and evaluate various properties of signals and systems

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C404.1 | Explore their acquired knowledge on recalling the applications of transformation techniques  | [R]  |
| C404.2 | Understand the concept of signal and its classifications, operations on signals and classifications of systems based on its properties | [U]  |
| C404.3 | Apply the concepts of converting the time domain functions into frequency domain functions of various systems                          | [AP] |
| C404.4 | Analyse the systems using various transformation techniques and their output response to various input functions                       | [AN] |
| C404.5 | Evaluate the properties of various signals and systems through design and simulation using software.                                   | [E]  |

**Course Contents:**

Signals - Classification of signals – Operations on signals – Systems- Classification of systems - System properties: linearity, causality, stability, continuous-time Linear Time Invariant (LTI) and discrete-time Linear Shift Invariant (LSI) systems - System representation using differential equations – Continuous Time Fourier transform -Properties - Laplace transform – Region of convergence –Properties- Inverse Laplace transform - Relationship between Laplace and Fourier transform - Analysis using Laplace transform and Fourier transform - impulse response and step response - frequency response –magnitude and phase response - convolution integral - Signal representation: Fourier series representation of discrete-time signals - Sampling: sampling theorem – aliasing - signal reconstruction: ideal interpolator, zero-order hold, first-order hold - Z-transform –Region of Convergence - Properties – Inverse Z-transform - Discrete Time Fourier Transform (DTFT) and its properties - system representation using difference equations – Relationship between Z-transform and DTFT - Analysis using Z-transform and DTFT

- system function - poles and zeros – stability – impulse response and step response - frequency response – magnitude and phase response - convolution sum–Realization structures: Direct form I, II, Cascade and Parallel.

**Lab Component**

- 1 Generation of Signals [E]
  - 2 Linear Convolution [E]
  - 3 Circular Convolution [E]
  - 4 Sampling Theorem [E]
  - 5 Stability of a system [E]
  - 6 Frequency response of LTI system [E]
- Total Hours: 75**

**Text Books:**

- 1 MahmoodNahvi, “Signals and systems”, McGraw Hill Education, 1/E, 2015.
- 2 Allan V. Oppenheim et al, “ Signals and Systems”, Prentice Hall of India, 2/E,2015.
- 3 Ramakrishna Rao P, "Signals and Systems", McGraw Hill Education,New Delhi,2/E,2013.

**Reference Books:**

- 1 J. Roberts, “Fundamentals of Signals and Systems”, Tata McGraw Hill, 2007.
- 2 B. P. Lathi, “Signal Processing and Linear Systems”, Oxford University Press, 1998.
- 3 R.F. Ziemer, W.H. Tranter and D.R. Fannin, “Signals and Systems – Continuous and Discrete”, Prentice Hall,4/E, 1998.

**Web References:**

- 1 <http://www.nptelvideos.in/2012/12/signals-and-system.html>
- 2 <http://freevideolectures.com/Course/3177/Signals-and-Systems>

**Online Resources:**

- 1 <https://www.edx.org/course/signals-systems-part-1-iitbombayx-ee210-1x-2>
- 2 <https://www.edx.org/course/signals-systems-part-2-iitbombayx-ee210-2x-2>

Assessment Methods & Levels (based on Bloom’s Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom’s Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	Rubric based CIA [40 Marks]	
Remember	20	20	10	-	10
Understand	80	20	20	20	20
Apply	-	30	30	30	30
Analyse	-	30	40	30	40
Evaluate	-	-	-	20	-
Create	-	-	-	-	-

**Nature of Course** :G (Theory analytical)

**Pre requisites** :15EC305ElectroMagnetic Fields

**Course Objectives:**

1. To study basics of transmission line and discuss the parameter estimation.
2. To enable the students to understand the principles of transmission line at radio frequencies.
3. To allow students to design matching networks using smith chart
4. To enable the students to understand the attenuation characteristics in different modes of waveguides
5. To learn the characteristics of guided waves and wave propagation in waveguides

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |       |
|--------|--|-------|
| C405.1 | Understand the concepts of transmission line theory and compute the electrical parameters of transmission lines at low frequencies.                                  | [U&R] |
| C405.2 | Calculate reflection and transmission co-efficients, SWR and power for transmission lines using HF applications and solve single stub and double stub problems.      | [AP]  |
| C405.3 | Describe the concepts of propagation of radio waves and possible existence of various modes in guided medium.  | [U]   |
| C405.4 | Determine and analyze parameters such as frequency, phase constant, velocity, attenuation and associated characteristic impedance for different types of waveguides. | [AN]  |
| C405.5 | Understand the concepts of propagation of radio waves and modes in circular waveguides and resonators.   | [U]   |

**Course Contents:**

TRANSMISSION LINE PARAMETERS-Transmission line Parameters- Characteristic impedance—as a cascade of T-Sections - Definition of Propagation Constant- General Solution of the transmission line – The two standard forms for voltage and current of a line terminated by an impedance- Physical significance of the equation and the infinite line- reflection coefficient – wavelength and velocity of propagation- Waveform distortion – distortion less transmission line- Input impedance of loss less lines . THE LINE AT RADIO FREQUENCIES- Parameter of the open wire at high frequencies-coaxial line- Standing waves and standing wave ratio on a line- One eighth wave line – The quarter wave line and impedance matching – the half wave line- The circle diagram for the dissipation less line- The Smith Chart – Application of the Smith Chart – single stub matching and double stub matching. GUIDED WAVES- Waves between parallel planes of perfect conductors- Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves- Transverse Electromagnetic waves - Velocities of propagation- Attenuation of TE and TM waves in parallel plane guides- Wave impedances. RECTANGULAR WAVEGUIDES- Transverse Magnetic

Waves in Rectangular Wave guides- Transverse Electric Waves in Rectangular Waveguides- Characteristic of TE and TM Waves- Dominant mode in rectangular wave guide –Attenuation of TE and TM modes in rectangular waveguides- Wave impedances. CIRCULAR WAVEGUIDES AND RESONATORS- Bessel functions – Solution of field equations in cylindrical co-ordinates- TM and TE waves in circular guides- Microwave cavities, Rectangular cavity resonators, circular cavity resonator.

**Total Hours 45**

**Text Books:**

- 1 J.D.Ryder “Networks, Lines and Fields”, PHI, New Delhi, 2003. E.C.
- 2 Jordan and K.G.Balmain “ElectroMagnetic Waves and Radiating System”, PHI, NewDelhi, 2003

**Reference Books:**

- 1 B.Somanathan Nair, “Transmission Lines and Wave guides”, Sanguine Technical Publishers, 2006.
2. David M.Pozar, “Microwave Engineering” 2/e, John Wiley 2000

**Web References:**

- 1 [http://www.allaboutcircuits.com/vol\\_2/chpt\\_14/index.html](http://www.allaboutcircuits.com/vol_2/chpt_14/index.html)
- 2 [http://en.wikipedia.org/wiki/Transmission\\_line](http://en.wikipedia.org/wiki/Transmission_line)
- 3 [www.ece.stevens-tech.edu/~fboesch/.../10-Transmission%20Lines.doc](http://www.ece.stevens-tech.edu/~fboesch/.../10-Transmission%20Lines.doc)
- 4 <http://en.wikipedia.org/wiki/Optics>
- 5 <http://www.colorado.edu/physics/2000/index.pl?Type=TOC>

<b>Assessment Methods &amp; Levels (based on Blooms’ Taxonomy)</b>				
<b>Formative assessment based on Capstone Model (Max. Marks:20)</b>				
<b>Course Outcome</b>	<b>Bloom’s Level</b>	<b>Assessment Component</b>		<b>Marks</b>
C208.1	Remember/ Understand	Quiz		<b>5</b>
C208.2	Apply	Group Assignment1		<b>5</b>
C208.3	Understand	Class Presentation		<b>5</b>
C208.4	Analyse	Group Assignment 2		<b>5</b>
C208.5	Understand			
<b>Summative assessment based on Continuous and End Semester Examination</b>				
<b>Bloom’s Level</b>	<b>Continuous Assessment</b>			<b>End Semester Examination [60 marks]</b>
	<b>CIA-I [6 marks]</b>	<b>CIA-II [6 marks]</b>	<b>Term End Examination [8 marks]</b>	
Remember	20	20	10	10
Understand	80	20	20	20
Apply	-	30	30	30
Analyse	-	30	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

**Nature of Course** : M (Practical application)

**Co requisites** : 15EC309 Electronic Circuits

**Course Objectives:**

- 1 To design and construct single stage, multistage amplifier circuits and verify the voltage gain, frequency response characteristics.
- 2 To design and construct circuits to generate sinusoidal and pulse waveforms.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C406.1 | Understand and construct various types of BJT and MOSFET biasing circuits                | [AP] |
| C406.2 | Construct amplifier circuits and analyse the performance of different amplifier circuits | [AN] |
| C406.3 | Analyse the performance of amplifier circuits with and without negative feedback         | [AN] |
| C406.4 | Construct different circuits to generate sinusoidal and non-sinusoidal waveforms         | [C]  |

**Course Contents:**

1. D.C. characterization and finding parameters of transistors (BJT and MOSFET)
2. Design of simple amplifiers (common emitter and common source)
3. Design and implementation of 2- stage RC Coupled Amplifier
4. Design and implementation of Class B Power Amplifier
5. Design and implementation of Current Series feedback amplifier
6. Implementation of Single tuned amplifier
7. Design and Implementation of radio frequency oscillator
8. Design and Implementation of audio frequency oscillator
9. Design of Astable, Monostable and Bistable multivibrators

**Total Hours: 45**

**Reference Books:**

- 1 Millman J and Halkias .C, "Integrated Electronics", Second Edition, TMH, 2012
- 2 Salivhanan, 'Electron Devices and Circuits', 4<sup>th</sup> edition, McGraw Hill Education (India) Private Ltd., 2016
- 3 David A Bell, "Laboratory Manual for Electronic Devices and Circuits", 4<sup>th</sup> edition, PHI.
- 4 Paul B Zbar and Albert P Malvino, Michael A Miller, "Basic Electronics: A Text Lab Manual", 7<sup>th</sup> edition, Tata McGraw Hill, 2009
- 5 PoornachandraRao.S and Sasikala.B, "Electronics Laboratory Primer: A Design Approach", 2<sup>nd</sup> edition, S.Chand, 2005.

**Web References:**

- 1 [www.allaboutcircuits.com](http://www.allaboutcircuits.com)
- 2 [www.circuitstoday.com](http://www.circuitstoday.com)

**Online Resources:**

- 1 <http://iitb.vlab.co.in/index.php?sub=43&brch=223>
- 2 <http://vlab.amrita.edu/?sub=3&brch=223>

<b>Assessment Methods &amp; Levels (based on Bloom's Taxonomy)</b>		
<b>Summative assessment based on Continuous and End Semester Examination</b>		
<b>Bloom's Level</b>	<b>Rubric based Continuous Assessment [60 marks] (in %)</b>	<b>End Semester Examination [40 marks] (in %)</b>
Remember	10	10
Understand	20	20
Apply	30	30
Analyse	20	20
Evaluate	10	10
Create	10	10

**15EC314**

**ANALOG COMMUNICATION LABORATORY**

**0/0/3/2**

**Nature of Course** :M (Practical application)

**Co requisites** :15EC310Analog and pulse Communication

**Course Objectives:**

- 1 To construct circuits and analyse the performance of various continuous modulation and demodulation process.
- 2 To construct circuits for different pulse modulation techniques.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C407.1 | Design circuits and to perform various continuous modulation and demodulation process.   | [AP] |
| C407.2 | Design and Analyse circuit for intermediate frequency.                                   | [AN] |
| C407.3 | Build circuits for different pulse modulation techniques.                                | [C]  |
| C407.4 | Construct the circuits for Pre-emphasis, De-emphasis and analog multiplexing techniques. | [C]  |

**Course Contents:**

1. Design an amplitude modulation system with envelope detection and study its (a) signal handling and (b) frequency response characteristics.
2. Design a DSBSC modulation system with coherent demodulation and study its (a) signal handling and (b) frequency response characteristics when carrier is suppressed.
3. Design an SSB modulation system and study its (a) signal handling and (b) frequency response characteristics.
4. Design an AGC stage at 455 kHz centre frequency for voice communication and study the effect of AGC on amplifier performance.
5. Design and test a mixer stage for translating AM signal to IF frequency stage.
6. Design Frequency modulation.
7. Design PAM, PPM and PWM.
8. Design Pre-emphasis and De-emphasis circuits.

**Total Hours: 45**

**Reference Books:**

- 1 Gerorge Kennedy and Bernard Davis, "Electronic Communication Systems", TMH, 4<sup>th</sup> Edition, 2008.
- 2 Simon Haykins, "Communication Systems", John Wiley and sons, 4<sup>th</sup> Edition, 2012.
- 3 John G. Proakis, MasoudSalehi and Gerhard Bauch, "Contemporary Communication Systems using MATLAB", Cengage Learning, 2012.

**Web References:**

- 1 [www.allaboutcircuits.com](http://www.allaboutcircuits.com)
- 2 [www.circuitstoday.com](http://www.circuitstoday.com)

**Online Resources:**

- 1 <http://nptel.ac.in/courses/117102059/7>
- 2 [http://ocw.usu.edu/Electrical and Computer Engineering/Communication Systems I/](http://ocw.usu.edu/Electrical%20and%20Computer%20Engineering/Communication%20Systems%20I/)

<b>Assessment Methods &amp; Levels (based on Bloom's Taxonomy)</b>		
<b>Summative assessment based on Continuous and End Semester Examination</b>		
<b>Bloom's Level</b>	<b>Rubric based Continuous Assessment [60 marks] (in %)</b>	<b>End Semester Examination [40 marks] (in %)</b>
Remember	10	10
Understand	20	20
Apply	20	20
Analyse	30	30
Evaluate	10	10
Create	10	10