PROGRAMME CURRICULUM

AND

SYLLABI OF

DIPLOMA PROGRAMME IN

FOOD TECHNOLOGY

UNDER RATIONALISED SEMESTER SYSTEM

(IMPLEMENTED FROM ACADEMIC YEAR 2020-2021)

BOARD OF TECHNICAL EDUCATION, GOA STATE

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SYLLABUS STRUCTURE FOR ELECTRONICS ENGINEERING

DIPLOMA IN ELECTRONICS ENGINEERING

(GC101) Communication Skills

1. COURSE OBJECTIVE :

The course aims to develop Communication skills in English by improving students' ability to write ,speak, listen and read effectively. Emphasis is also laid on students' personality development, helping them to build their confidence in interpersonal / group communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC101) Communication Skills		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		-	**-**	**02**	**32**	**-**	**-**	**25**	**25**	**50**

3 . COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC101.CO1 Understand the essentials of effective Communication.

GC101CO2 Develop reading. writing, speaking , listening and effective presentation skills.

GC101.CO3 Select the appropriate mode of Communication .

GC101.CO4 Demonstrate reading. writing, speaking , listening and effective presentation skills.

4.Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	0	0	0	0	3	3	3
CO2	1	0	1	0	3	3	3
CO3	1	0	1	0	3	3	3
CO4	1	0	0	0	3	3	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Phr = Practical hours**	**CO = Course Outcomes**		

Unit	**M**	**Phr**	**CO**
1 UNIT NAME: FUNDAMENTALS OF COMMUNICATION SKILLS	**-**		**CO1 CO2 CO3 CO4**
1.1 **Communication Skills fundamentals** Definition, communication process, importance of Communication Skills, essentials of effective communication		01	
1.2 **Types of communication**: verbal Communication and Nonverbal communication (Body language, facial expressions, gestures, eye contact, posture, dress and grooming/personal appearance, deportment, personal hygiene) Paralinguistic (Volume, pace, pitch, pauses)		02	
1.3 **Barriers to communication:** physical barriers, psychological barriers and cultural barriers		01	
2. Unit: PRESENTATION SKILLS			
2.1 Presentations: Methods and style of presentation, Importance, planning a presentation, venue selection, audience awareness (age, gender, profession background, educational and social background) time and duration, audio visual aids (OHP, LCD projector, flip charts, white/black/green board, computer, microphone)		**02**	**CO2 CO3 CO4**
2.2 Public speaking: preparatory steps, tips for good beginning and end, delivery style, techniques for a good speech (repetition, signs, pictures, humor), body language		**02**	
3 UNIT: TECHNICAL Writing			**CO1 CO2 CO4**
3.1 Report **writing** Functions and parts of a report, Qualities of a good report, and types: Report on any institute function, Accident report, Industrial visit Report		04	

3.**2 Business letters** Principles of effective letter writing, parts of a business letter, formats (Full block style, Semi block style, modified block style) Routine/ Generic letters (letter to the heads of the institute, letter to the heads of various departments/sections of the institute) Types of letters: Enquiry Letter, Quotation, Purchase Order, Letter of Complaint		06	
3.3 **Job application** Tips for a good C.V and a Resume		02	
4 UNIT GRAMMAR	-		
4.1 Fundamentals of English writing Subject verb agreement, homonyms, homophones, homographs, articles, Punctuation, synonyms, fundamentals of sentence construction		**02**	**CO1** **CO2** **CO4**
4.2 Paragraph Writing: Developing Topics (the main idea), body (supporting sentences), conclusion, proof reading		**02**	
UNIT V: LANGUAGE WORKSHOP **5.1 Reading Skills** strategies to use for building vocabulary and reading fluencies (read extensively, identify new words, use of dictionary, online dictionary apps), reading comprehension, pronunciation, debate, role play,	-	08	**CO1** **CO2** **CO4**
5.2 Listening Skills How to listen effectively, listening comprehension			
5.3 Speaking skills speech, group discussion			
5.4 Writing skills précis writing, comprehension			
Total		**32**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, videos, exercises

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**NO of lectures**	**Marks**
1	Fundamental of Communications skills	04	-
2	Presentation Skills	04	-
3	Technical Writing	12	-
4	Grammar	04	-
5	Language workshop	08	-
	Total	32	25

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**
1.	**Practical Title: Fundamental of Communications skills**
i.	Comprehension

ii.	Précis writing
iii.	Self-Introduction
2	**Practical Title: Presentation Skills**
iv.	Extempore speech
v.	Presentation on any given Topic
3	**Practical Title: Technical Writing**
vi.	Accident Report
vii.	Report on Institute function
viii.	Industrial visit report
ix.	Generic letters to the heads of various department/ Sections of the institute
x.	Inquiry letter
xi.	Quotation
xii.	Purchase or supply order
xiii.	Complaint letter
xiv.	Job application
4	**Grammar**
xv.	Exercises in subject – verb agreement
xvi.	Exercises in use of preposition
xvii.	Exercises in use of Homophones, homonyms, homographs
xviii.	Exercises in use of punctuation
xix.	Exercises relating to correcting the sentences
xx.	Paragraph writing
5	**Language workshop**
xxi.	Exercises to improve Reading skills
xxii.	Exercises to improve Writing skills
xxiii.	Group discussion
xxiv.	Listening comprehension

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R. C. Sharma & Krishna Mohan	Business Correspondence and Technical Writing	Tata McGraw Hill
2	P. Prasad, Sharma, K. Rajendra	The Functional aspects of communication skills	S.k. Kataria& sons
3	SanjayKumar,Pushpa Lata	Communication Skills	Oxford University Press
4	A.K.Jain,A.M.Shaikh&Pravin S R Bhatia	Professional communication Skills	S.Chand
5	Wren & Martin	High School English Grammar & Composition	S. Chand, N. Delhi

10.Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Raul R. Timm	How to make winning presentations	Sneha Printers
2	Dale Carnegie, Training CPI	Stand and Deliver, How to become a masterful communicator and public speaker	Cox & Wyman, UK
3	John Seely	The Oxford Guide to Effective Writing and speaking	Oxford University Press

Autobiographies, self-help books, Audio speeches given by famous personalities

Internet and Web Resources

https://www.grammarly.com/

https://www.bbc.co.uk/programmes/articles/5QFnVy3xzT5htTh13cmP2P8/teacher-resources

https://Ted.com

Videos and Multimedia Tutorials

https://you.tu.be/AykYRO5d_II

(GC102) Engineering Mathematics I

1. COURSE OBJECTIVE:

1. The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2.TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total hours**	**Examination Scheme**			
						Theory Marks		**Term Work**	**Total Marks**
(GC102) Engg.Maths I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	
		4	**2**	**-**	**96**	**75**	**25**	**25**	**125**

3.COURSE OUTCOMES:

GC102.CO1. Understand the basic mathematical concepts for Engineering applications.

GC102.CO2. Identify and use appropriate formulae for solving practical engineering problems

GC102.CO3. Apply formulae of algebra, geometry, trigonometry and calculus for solving problems.

GC102.CO4 . Co-relate mathematical formulae to practical problems.

4.Mapping Course Outcomes with Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO1	**3**	**2**	**1**	**0**	**0**	**0**	**2**
CO2	**3**	**3**	**1**	**0**	**1**	**0**	**1**
CO3	**2**	**2**	**3**	**3**	**2**	**0**	**1**
CO4	**2**	**3**	**3**	**2**	**1**	**1**	**1**

Relationship :Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**	

Unit	**Marks**	**Thr**	**CO**
1 MATHEMATICS FUNDAMENTAL	**8**	**6**	**CO1**
1.1 **Polynomials: Types** of polynomials, addition subtraction, (no question to be asked), Multiplication and division of polynomials	3	2	
1.2 **: Algebraic equations:**Different types of equations and their geometric meaning(line,circle parabola only) ,equations with one, two and three variables and solving equations with two and three variables Quadratic equations and nature of their solutions	3	2	
1.3: Logarithm: Definition of log, log with base 'e' and base'10' Properties of log, log and antilog , problems using definition and properties of log.	2	2	
2.STRAIGHT LINES AND CIRCLES	15	14	**CO1, CO4**
2.1: Straight line: Intercept, slope, intersection of lines Equations of line: 1. Slope intercept form, slope point form, two points form, parallel and perpendicular lines, angle between lines Perpendicular distance of a point from line	8	7	
2.2: Circle: circle as a locus, Centre, diameter, chord of a circle Equations of circle: Centre radius form, diameter form, general form and sums	7	7	
3. TRIGONOMETRY			**CO1, CO3**
3.1: Angle and measurement, degree and radians and conversion and related sums, arc length and area of sector and sums **3.2:** Trigonometric ratios and identities 3.3: Trigonometric ratios of compound and allied angles 3.4: Product formulae sinA$\pm$sinB, cosA$\pm$cosB **3.5:** Sum and difference formulae **3.6:** Multiple angle 2A, and their trigonometric ratios, **3.7**: Sine rule, Cosine rule in triangle, solution of triangle	12	15	
4 : MENSURATION	10	6	**CO1,**

4.1: Areas of 2D figures like quadrilaterals, circle triangle etc (no questions to be asked) **4.2:** Surface area and volumes of cube, sphere, cylinder, cone, (no question to be asked) Surface areas and volumes of prism, pyramid, **4.3**: Frustum of cone, pyramid and their surface areas and volumes. **4.4:** Simpson's 1/3 rd rule for area and volume			**CO4**
5 :CALCULUS	30	23	**CO1, CO2, CO3, CO4**
5.1:Limits 5.1.1 : Pre requisite : Sets , intervals, relation and function (no questions to be asked) 5.1.2 : Limit of a function , algebraic properties of limits 5.1.3: Limits of algebraic, trigonometric, exponential, logarithmic functions	7	6	
5.2 : Derivatives 5.2 .1: Derivative definition by first principle (no question to be asked) 5.2.2: Standard formulae, Algebraic properties of derivative ($u \pm v$) etc. 5.2.3: Derivatives of algebraic, trigonometric, exponential, logarithmic functions 5.2.4: Derivative of product of functions (uv rule). 5.2.6: Derivative of quotient of functions (u/v rule) 5.2.7: Derivative of composite functions 5.2.8: Derivative of parametric functions 5.2.9: Derivative of implicit functions 5.2.10 : Logarithmic differentiations 5.2.11: Second order derivatives (no question to be asked)	15	12	
5.3 : Applications of derivatives 5.3.1: Application to the geometry: i) derivative as a slope of a tangent ii) to find equations of tangent and normal at given point on the curve 5.3.2: Application to the Linear motion:i) displacement, velocity,acceleration 5.3.3: Application to the rate measure i) to find rate change in area and volume etc 5.3.4 : Maxima and minima	8	5	
Total	**75**	**64**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises

7. SPECIFICATION TABLE FOR THEORY

Unit No	Unit	Number of lectures	Marks
1	**Mathematics Fundamental**	06	8
2	**Straight line and circle**	14	15
3	**Trigonometry**	15	12
4	**Mensuration**	06	10
5	**Calculus**	23	30
	Total	**64**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

- Tutorial books should be maintained by students (5 marks)
- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus
- Topic-wise class assignment (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	S.B. Gore, M.B.Patil, S.P. Pawar	Applied Mathematics	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers and distributers Pvt.Ltd. ,Pune
3	Set Theory and related topics	Seymour Lipschutz	McGraw-Hill

(GC103) APPLIED PHYSICS-I

1.COURSE OBJECTIVE :

On successful completion of the course, Students completing the Applied Physics I course will be able to demonstrate competency and understanding of the basic concepts found in, Units and Dimensions, Kinematics of motion in one dimension Force Work Power and Energy, Circular Motion and Gravitation, Properties of Matter and Heat and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge

2.TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC103) Applied Physics I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		03	**0**	**02**	**80**	**75**	**25**	**25**	**-**	**125**

3.COURSE OUTCOMES:

GC103.CO1: Understand the Fundamental concepts of physical quantities, Force, Power, Energy, Motion, Matter and heat transfer used in Engineering applications.

GC103.CO2: Explain the concepts of Dimensions, Work, Power , Energy ,Motion, properties of matter and heat transfer

GC103.CO3: Apply the Knowledge of Physical quantities, Types of motions, Force, work ,Power, properties of matter and heat transfer in Engineering applications

GC103. CO4: Analyze different types of Physical quantities, motions, properties of matter, and modes of heat transfer

4. Mapping Course Outcomes with Program Outcomes

Relationship: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	**Problem Analysis**	**Design and Devlopment of Solutions**	**Engg. Tools, Experimentatn& Testing**	**Engg. Practices for Society,Sustainability& Environment**	**Project Management**	**Life -long Learning**
CO 1	3	1	1	3	2	0	3
CO 2	3	1	2	3	0	0	3
CO 3	3	1	2	2	0	1	1
CO 4	1	1	2	2	0	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | Thr = Teaching hours | CO = Course Outcomes			
Unit	**Thr**	**M**	**CO**
1 UNIT NAME: UNITS AND DIMENSIONS	**08**	**12**	**CO1, CO2, CO3, CO4**
1.1 Fundamental and Derived units ,			
1.2 Different system of units, SI unit conversion from one system to other,			
1.3 Principle of Homogeneity,			
1.4 Dimensions, dimensional formula,			
1.5 dimensonal correctness of given equation using dimensions			
1.6 least count of vernier calliper and screw gauge			
1.7 zero errors-- in case of vernier calliper and screw gauge			
1.8 Types of error.			
2. UNIT NAME: MOTION IN ONE DIMENSION, FORCE, WORK,POWER AND ENERGY	**10**	**16**	**CO1, CO2, CO3, CO4**
2.1 Distance and displacement,			
2.2 Scalar and Vectors			
2.3**,** Speed and Velocity, Uniform Velocity, ,			
2.4 Uniform acceleration,acceleration due to gravity			
2.5 Equation of motion ($v=u+at$, $v^2=u^2+2as$, $s=ut+1/2at^2$)(no derivation)			
2.6 Motion under gravity. Force and its unit.			
2.7 Work and its unit. Energy, law of conservation of energy,			
2.8. Kinetic and Potential energy equation and examples.			
3. UNIT NAME: Uniform Circular Motion and Gravitation	**10**	**16**	**CO1, CO2, CO3, CO4**
3.1 Unifrom circular motion,			
3.2 Definition angular displacement,angular velocity, ,			
3.3 Conversion from rpm to rad/sec,$v=r\omega$, tangential velocity, radial acceleration			
3.4 Centripetal force and centrifugal force, examples,			
3.5 Banking of roads,superelevation, expression for angle of banking			
3.6 Newtons law of gravitation, acceleration due to gravity ,			
3.7 Expression for acceleration due to gravity. Escape velocity, Critical velocity, and periodic time definition and expression (no derivation)			
3.8. Sattellite, types(Geosationary,communication remote sensing)			
4. UNIT NAME: PROPERTIES OF MATTER	**10**	**16**	**CO1, CO2, CO3, CO4**
4.1 Elasticity ,			
4.2 Stress, Strain,Hooke's law,			
4.3 Youngs Modulus,			
4.4 Bulk Modulus, Rigidity Modulus,			
4.5 Stress v/s Strain graph			
4.6 Yield point, breaking stress,factor of safety, ,			
4.7 Surface tension definition and example			
4.8. Adhesive and cohesive force, application,			
4.9 liquid miniscus and angle of contact, capillarity,			
4.10 Expression for surface tension (no derivation), applications. viscocity,			
4.11 Definition velocity gradient, newtons law of viscocity, terminal velocity,stokes law,			
4.12 Streamline flow and turbulent flow,critical velocity, application of			

viscocity.			
5. UNIT NAME: HEAT	**10**	**15**	**CO1, CO2, CO3, CO4**
5.1 Statements of boyles law,charles law,gay lussacs law			
5.2 General gas equation,specific heat definition and unit, Latent heat definition and unit			
5.3 Modes of transfer of heat, conduction, convection and radiation,			
5.4 Conduction of heat through a metall rod,			
5.5 Variable and Steady state			
5.6 law of thermal conductivity (With Derivation)			
5.7 Applications of thermal conductivity, ,			
5.8. Thermal expansion of solids			
5.9 linear expansion,superficial expansion,			
5.10 Cubical Expansion			
5.11 Realtion betwenn α,β,γ (no derivation)			
5.12 Engineering applications of expansion of solids.			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	UNITS AND DIMENSIONS	8	12
2	MOTION IN ONE DIMENSION, FORCE, WORK AND ENERGY	10	16
3	UNIFORM CIRCULAR MOTION AND GRAVITATION	10	16
4	PROPERTIES OF MATTER	10	16
5	HEAT	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	**Practicals**	**Marks**
1.	Basic Conversion Techniques from one system of units to the other	25
2.	Use of Vernier callipers to find the Volume of Hollow cylinder, Block	25
3.	Use of Screw gauge to find the cross-sectional area of a wire and thickness of a clip	25
4.	To find the Coefficient of Viscosity of a given liquid by stokes method	25
5.	To Find the coefficient of Thermal Conductivity by Searle's Method	25
6	To Find the Surface Tension of a given liquid by capillary rise method	25
7	To Find Young's Modulus by Searles Method	25
8	To Find acceleration due to gravity by simple pendulum method.	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC104) Applied Chemistry

1. COURSE OBJECTIVE:

Chemistry is the branch of Science which deals with the study of composition, properties and changes in matter. An understanding of the basic concepts of Applied Chemistry, chemical principles and chemical properties of materials is essential to all the engineers. The emphasis is on applying the knowledge of principles of chemistry in all the fields of engineering wherein students appreciate the significance of chemistry in day to day life. The subject develops in students the habit of scientific enquiry, the ability to investigate cause and effect relationship & the ability to interpret & analyze the results.

2. TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits (Hours)**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GN104) Applied Chemistry		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**80**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

GC 104.CO1: Understand the fundamental concepts of Atomic Structure, electrochemistry, water quality, corrosion and polymers.

GC 104.CO2: Explain the process of Chemical bonding, water softening, electroplating, corrosion control and polymerization

GC 104.CO3: Relate the principles of Chemical Bonding, Electrolysis, water hardness for domestic and Industrial applications and properties of polymers.

GC 104.CO4: Distinguish between types of Chemical bonding, Water softening methods, corrosion control methods, different processes of metal coating and different polymers.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimenting& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	2	1	1	2	1	1
CO2	2	3	2	1	3	1	2
CO3	3	2	2	2	3	1	2
CO4	3	2	2	2	2	1	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**Mks**	**Thr**	**CO**
UNIT 1.0 : ATOMIC STRUCTURE AND CHEMICAL BONDING	**15**	**10**	CO1 CO2 CO3 CO4
1.1 Atomic Structure 1.1.1 Fundamental particles and their characteristics. 1.1.2 Energy levels - Definition & designation 1.1.3 Sub Energy levels- Definition & designation 1.1.4 Orbital – Concept & shape (s and p only) **1.2** Quantum numbers 1.2.1 Designation, definition, values.			
1.3 Electronic distribution (Elements from atomic Number 1-20) 1.3.1 Bohr – Bury's laws for distribution of electrons in shells (1st three laws only) 1.3.2 Aufbau Principle. for distribution of electrons in sub-shells 1.3.3 Pauli's Exclusion Principle. 1.3.4 Hund's Rule of maximum multiplicity 1.3.5 Orbital Electronic Configuration of elements (from atomic numbers 1 to 20 only).			
1.4 Chemical Bonding 1.4.1 Lewis and Longmuir concept of stable configuration. 1.4.2 Electrovalent - Bond - Concept Formation of Electrovalent Compound (NaCL & MgO) 1.4.3 Covalent Bond – Concept Formation of Colvalent Compounds (Cl_2, O_2, N_2) 1.4.4 Co-ordinate Bond - Concept Formation of Co-ordinate Compounds (O_3) 1.4.5 Properties of Electrovalent, Colvalent & Co-Ordinate compounds.			
UNIT 2.0 : WATER	**15**	**10**	CO1 CO2 CO3 CO4
2.1 Hardness of Water 2.1.1 Soft and Hard Water - Concept Soap Test (Chemical Equation not expected) 2.1.2 Causes of Hardness 2.1.3 Types of Hardness 2.1.4 Degree of Hardness & Units of Hardness (mg/L & ppm)			
2.2 Disadvantages of Hard Water 2.2.1 Domestic Purpose Drinking, cooking, Washing & Bathing. 2.2.2 Industrial Purpose (Paper Industry, Textile & Dyeing Industry, Sugar Industry, Bakery & Concrete Making) 2.2.3 Boilers- Steam Generation Purpose.			

Sludge formation – causes & Disadvantages (No chemical equation expected)			
2.3 Water Softening 2.3.1 Zeolite and Ion Exchange process of water softening			
2.4 Desalination of water 2.4.1 Electrodialysis & Reverse Osmosis process. 2.4.2 pH- Concept, pH scale & Importance of pH			
UNIT 3.0 : <u>ELECTROCHEMISTRY</u>	**12**	**08**	CO1 CO2 CO3 CO4
3.1 Electrolytic dissociation 3.1.1 Arrhenius theory of Electrolytic dissociation 3.1.2 Factors affecting degree of Ionization- nature of solute, nature of solvent, concentration of solution and temperature.			
3.2 Electrolysis 3.2.1 Mechanism of Electrolysis. Ionization Reactions Reactions at cathode, Activity series of Cations. Reactions at Anode, Activity series of Anions. 3.2.2 Electrolysis of Molten NaCl using Carbon Electrodes. Aqueous NaCl using Platinum Electrodes. Aqueous $CuSO_4$ using Platinum Electrodes. Aqueous CuSO4 using copper Electrodes.			
3.3 Electrochemical series – Definition and Significance			
UNIT 4.0 : CORROSION AND ITS CONTROL	**25**	**14**	CO1 CO2 CO3 CO4
4.1 Dry /Direct Chemical corrosion 4.1.1 Definition 4.1.2 Oxidation corrosion 4.1.3 Corrosion due to other gases.			
4.3 Types of Electrochemical corrosion. 4.3.1 Galvanic Cell corrosion 4.3.2 Concentration cell corrosion(Metal ion concentration & differential Aeration)			
4.4 Corrosion Control Protection of metals by: 4.4.1. Using Pure Metals & Metal alloys 4.4.2 Proper designing 4.4.3 Modifying the environment (De- aeration, Deactivation, Dehumidification, Alkaline neutralization) 4.4.4 Cathodic protection (Sacrificial anode and Impressed current			

cathodic protection) 4.4.5 Metal Coating (Galvanizing, Tinning, Metal-Spraying, Electroplating & powder coating)			
UNIT 5: POLYMERS	**08**	**06**	CO1 CO2 CO3 CO4
5.1 Concept of Monomers & Polymers **5.2**Polymerization- Definition. 5. 2.1 Addition polymerization-Definition. 5.2.2 General equation of polymerization of :- Ethylene to Polyethylene. Vinyl chloride to Polyvinylchloride Tetra fluoro ethylene to Poly tetra fluoroethylene(PTFE) 5.2.3 Condensation Polymerization-Definition 5.2.4 General Equation for formation of Phenol formaldehyde Resin. **5.3** Plastics. 5.3.1 Types of plastic (Thermosetting and Thermo softening), Examples 5.3.2 Properties and applications of Poly-ethylene, PVC, polystyrene, Nylons, Bakelite & silicones.			
5.4 Rubber 5.4.1 Natural Rubber 5.4.2 Drawbacks of Crude rubber. 5.4.3 Vulcanization of Rubber (General Equation) 5.4.4 Rubber examples. 5.4.5 Properties of Synthetic Rubber & related applications.			

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	**ATOMIC STRUCTURE AND CHEMICAL BONDING**	10	15
2	**WATER**	10	15
3	**ELECTROCHEMISTRY**	08	12
4	**CORROSION & IT'S CONTROL**	14	25
5	**POLYMERS**	06	08
	Total	**48**	**75**

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
	Practical Title
1.	Double Acid-Base Titration using Phenolphthalein.
2.	Acid- Base titration using Methyl orange.
3.	Redox Titration of $KMnO_4$ soln., $FeSO_4$ soln. and Oxalic acid
4.	Determination of degree of Hardness by E.D.T.A method.
5.	Determination of Total Alkalinity of water sample.
6.	Determination of Chloride content of water sample by Mohr's method.
7.	pH- Metric titration.
8.	Conduct metric Titration.
9.	Determination of Conductivity of water samples from different water body sources.
10.	Corrosion Susceptibility of Aluminum to Acid or Base.
11.	Determination of pH of different food items.
	Total Marks: 25
	No Class room Assignments

*** Any TEN of the above.**

****Term Work Assessment Scheme**:1. Performance:15 marks (Carrying out experiment, Readings, Calculations and Results)
2.Knowledge :05 Marks(Theory of the experiment)
3. Journal : 05 Marks

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	M.M. Uppal	Text book of Engg. Chemistry	Khanna Publisher
2	V.P.Mehta	Text book of Engg. Chemistry	Jain Bros. Delhi
3	S.N Narkhede	Textbook of Engg. Chemistry	Niraj Prakashan
5	S S Dara	A Textbook of Engg. Chemistry	S Chand & Co
4	P.C. Jain and M.Jain	Engg. Chemistry.	Dhanpat Rai Publishing Co.

(GC105) Basic Engineering Practice (Electronics& Comp.)

1. COURSE OBJECTIVE:

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	100	150

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-3

PART B

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Hr = Practical Hours** | **CO = Course Outcomes**			
Unit	**M**	**Hr**	**CO**
1 General Safety, Housekeeping, Fire Fighting & First Aid	10	06	
1.1Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.			CO1
2 Fitting Workshop Practice	30	18	
2.1 Introduction to the trade. 2.2 Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools 2.3 Types of files and filing methods. 2.4 Drill bits and drilling Processes, using portable and pillar drilling machine. 2.5 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling 2.6 Threading using taps and dies.			CO1 CO2 CO3
3 Carpentry Workshop Practice	20	18	
3.1 Introduction to carpentry 3.2 Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools 3.3 Wood working processes. 3.4 Different types of joints and their usage. 3.5 Introduction to wood working machines: 3.6 Lathe 3.7 Circular saw 3.8 Band saw 3.9 Wood planner 3.10 Universal wood working machine			CO1 CO2 CO3
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety. 4.2 Use of different hand tools used in electrical trade 4.3 Collection of details of motors and transformers. 4.4Introduction to Control Panel and its various sections/components. 4.5 Making of wire joints. 4.6Measurement of current, voltage, frequency and Power Consumption. 4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor. 4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial). 4.9Wiring of Simple Electric Circuit (Bulb & plug point and switches) on wooden board 4.10 Study, connection & use of Energy Meter 4.11Testing of components using Series test lamp & Multimeter			CO1 CO2 CO3 CO4

4.12Study of Fuses & practice replacement of Fuse 4.13 Study & Troubleshooting of Tube Light			
5 Plumbing	10	06	
5.1Plumbing tools, pipe fittings and method of joining pvc pipes. 5.2 Use of spirit level and plumb bob. 5.3 Minor repairs and replacement of fittings. 5.4 Reading of plumbing drawings. *[Note: Plumbing restricted to domestic plumbing and pvc piping.]*			CO1 CO2 CO3
Total	**100**	**80**	

6. COURSE DELIVERY:

The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	Unit	Number of hrs.	Marks
1	General Safety, Housekeeping, Fire Fighting & First Aid	06	10
2	Fitting Workshop Practice	18	30
3	Carpentry Workshop Practice	18	20
4	Electrical Workshop Practice	32	30
5	Plumbing	06	10
	Total	80	100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hrs.
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06
e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**
a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03
d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03

4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter, Frequency meter, Wattmeter.	04
d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02
i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES

TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC106) Basic Engineering Practice (Mech & Elect.)

1. COURSE OBJECTIVE:

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	75	125

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-3

PART B

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Hr = Practical Hours** | **CO = Course Outcomes**			
Unit	**M**	**Hr**	**CO**
1 General Safety, Housekeeping, Fire Fighting & First Aid		06	
1.1Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.			CO1
2 Fitting Workshop Practice		18	
2.7 Introduction to the trade. 2.8 Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools 2.9 Types of files and filing methods. 2.10 Drill bits and drilling Processes, using portable and pillar drilling machine. 2.11 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling 2.12 Threading using taps and dies.			CO1 CO2 CO3
3 Carpentry Workshop Practice	20	18	
3.10 Introduction to carpentry 3.11Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools 3.12 Wood working processes. 3.13 Different types of joints and their usage. 3.14 Introduction to wood working machines: a. Lathe b. Circular saw c. Band saw d. Wood planner e. Universal wood working machine			CO1 CO2 CO3
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety. 4.2 Use of different hand tools used in electrical trade 4.3 Collection of details of motors and transformers. 4.4 Introduction to Control Panel and its various sections/components. 4.5 Making of wire joints. 4.6Measurement of current, voltage, frequency and Power Consumption. 4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor. 4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial). 4.9Wiring of Simple Electric Circuit (Bulb & plug point and switches) on wooden board 4.10 Study, connection & use of Energy Meter			CO1 CO2 CO3 CO4

4.11Testing of components using Series test lamp & Multimeter 4.12Study of Fuses & practice replacement of Fuse 4.13 Study & Troubleshooting of Tube Light			
5 Plumbing		06	
5.1 Plumbing tools, pipe fittings and method of joining pvc pipes. 5.2 Use of spirit level and plumb bob. 5.3 Minor repairs and replacement of fittings. 5.4 Reading of plumbing drawings. *[Note: Plumbing restricted to domestic plumbing and pvc piping.]*			CO1 CO2 CO3
Total		**80**	

6. COURSE DELIVERY:

The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of hrs.**	**Marks**
1	General Safety, Housekeeping, Fire Fighting & First Aid		10
2	Fitting Workshop Practice		30
3	Carpentry Workshop Practice		20
4	Electrical Workshop Practice		30
5	Plumbing		10
	Total		100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**	**Hrs.**
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06
e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**
a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03

d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03
4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter, Frequency meter, Wattmeter.	04
d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02
i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES

TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC201) ENGINEERING MATHEMATICS II

1. COURSE OBJECTIVE:

The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2. TEACHING AND EXAMINATION SCHEME

Semester	**II**								
Course code & course title		**Periods/Week (in hours)**			**Total hours**	**Examination Scheme**			
						Theory Marks		**TERM WORK**	**Total Marks**
(GC201) Engineering Mathematics II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**
		4	**2**	**-**	**96**	**75**	**25**	**25**	**-**

3.COURSE OUTCOMES:

GC201.CO1: Understand the basic principles of Matrices ,Integration, Determinants and Vectors in engineering problems.
GC201.CO2: Interpret the formulae to solve problems of Matrices ,Integration, Determinants and Vectors.
GC201.CO3: Apply appropriate mathematical methods for solving engineering problems.
GC201.CO4: Analyse the knowledge of Matrices ,Integration, Determinants and Vectors for various Engineering applications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	1	1	2	0	2	2
CO2	3	1	1	2	0	2	2
CO3	2	2	2	3	1	2	2
CO4	1	3	2	3	1	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**		
Unit		**Marks**	**Thr**	**CO**
1 .DETERMINANTS AND MATRICES		**15**	**12**	**CO1, CO2, CO4**
1.1 **Determinants**: Definition & order of determinant, value of determinant, properties of determinants(no question), Cramer's rule for solving equations with two & three variables		7	4	
1.2 **Matrices**: - Definition & order of matrix, types of matrices, Equality of matrices, addition & subtraction, multiplication of matrices, adjoint & inverse of a matrix , solution of linear equations with two & three variables using matrices		8	8	
2 .INTEGRATION		20	22	**CO1, CO2, CO4**
Definition, Standard Formulae, properties of Integration for sum, difference and scalar multiplication, integration of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, composite function, Integration by substitution, integration by partial fraction, integration by parts				
3 .DEFINITE INTEGRALS		10	08	**CO3**
Definition of definite integral and Properties of definite integral ,integration by parts Applications:Area under the curves & lines and area between the curves and Volumes (simple problems)				
4 .VECTORS		15	12	**CO1, CO2, CO4**
Definition of scalars & vectors, equality of vectors, Addition & subtraction of vectors, triangle, parallelogram laws for addition, position vector, dot product & cross product and their properties and applications, relation between dot and cross product and scalar triple product and applications				
5 .STATISTICS / COMPLEX NUMBERS		15	10	**CO3**
Statistics : **(ME and Allied courses only)** 5.1:Measures of central Tendency -mean, median, mode for ungrouped & grouped data 5.2:Measures of dispersion –Range, mean deviation, standard deviation, variance, coefficient of variation 5.3: Corrected mean and relation between standard deviation and mean.				

5.Complex Numbers (electronics and Allied courses only) 5.1:Definition of complex number and Argand diagram, equality of complex numbers, 5.2:powers of 'i' ,complex conjugates, 5.3:Addition& subtraction of complex nos. Multiplication& division of complex nos. 5.4: Modulus and argument of a complex number 5.5:Polar form & exponential form of complex no. 5.6: De Moivre's theorem., nth root of complex nos. 5.7:Hyperbolic, exponential, circular functions			**CO3**
Total	**75**	**64**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY (GC201)

Unit No	**Unit**	**Number of lectures**	**Marks**
1	**Determinants & Matrices**	12	15
2	**Integration**	22	20
3	**Definite Integrals**	08	10
4	**Vectors**	12	15
5	**Statistics /Complex Number**	10	15
	Total	**64**	**75**

- Tutorial books should be maintained by students (5 marks)
- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus
- Topic-wise class assignment (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books /reference books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	Applied Mathematics	S.B. Gore, M.B.Patil, S.P. Pawar	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers Pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers & Distributers Pvt. Ltd. Pune
3	Advanced Engineering mathematics	H.K. Dass	S. Chand

(GC 202) APPLIED PHYSICS- II

1. COURSE OBJECTIVE:

On successful completion of the course, Students completing the Applied Physics II course will be able to demonstrate competency and understanding of the basic concepts found in, Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light and Optics and Sound, and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge.

2.TEACHING AND EXAMINATION SCHEME

Semester	**II**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC202) Applied Physics- II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		03	**0**	**02**	**80**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

GC202.CO1: Understand the Fundamental Concepts of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.
GC202.CO2: Explain the basic principles of Electrostatics, Current Electricity, Electromagnetism and Electro Magnetic Induction, Light , Optics and sound.
GC202.CO3: Apply the knowledge of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound to specific applications.
GC202.CO4: Compute various parameters in the field of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.

4. Mapping Course Outcomes with Program Outcomes

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	**Problem Analysis**	**Design and Devlopment of Solutions**	**Engg. Tools, Experimentatn & Testing**	**Engg. Practices for Society,Sustain ability& Environment**	**Project Management**	**Life -long Learning**
CO 1	3	3	1	1	2	0	3
CO 2	3	3	1	1	2	0	2
CO 3	3	2	3	3	3	1	1
CO 4	2	2	2	3	1	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 UNIT NAME: ELECTROSTATICS	**12**	**8**	**CO1, CO2, CO3, CO4**
1.1 Coulomb's law, Electric field,			
1.2 Electric field Intensity, Electric lines of force and properties			
1.3 Electric potential, Definition of Absolute potential			
1.4, Potential difference, Potential of sphere,			
1.5 Potential of earth.			
1.6 Capacitance,			
1.7 Capacitors in Parallel Derivation of Expression			
1.8. Capacitor in series Derivation Of Expression			
2. UNIT NAME: CURRENT ELECTRICITY	**20**	**12**	**CO1, CO2, CO3, CO4**
2.1 Definition of Electric Current and its Unit, Ohm's Law, Resistance,			
2.2 Factors on which resistance depends, Specific resistance. Effect of temperature on resistance Temperature coefficient of resistance,			
2.3 Resistances in Series and parallel			
2.4 EMF and Internal resistance of cell			
2.5 General Equation of ohm's law.			
2.6. Wheatstone's Network and Principle of Meter Bridge			
2.7 Principle of Potentiometer (Vα L) and Applications to compare EMF of given cells by single cell method and sum difference method			
2.8 Determination of Internal resistance of a cell using potentiometer.			
2.9 Electric Power and Electric Energy, KWh			
2.10 Calculation of Energy bills			
2.11 Heating Effect of Electric current. Joule's law.			
2.12 Applications in house hold appliances			
3. **UNIT NAME: ELECTROMAGNETISM AND EM INDUCTION**	**16**	**10**	**CO1, CO2, CO3, CO4**
3.1 Magnet, Magnetic field, Magnetic flux, and magnetic flux density and its unit			
3.2 Magnetic effect of Current, Oersted's Experiment, Right hand Thumb Rule, Biot Savart law			
3.3 Magnetic field at the center of the coil (no derivation), Magnetic field due to coil (Qualitative discussion only			
3.4 Electromagnet. Force acting on a current carrying conductor placed in magnetic field and expression (no derivation)			
3.5 Fleming's left-hand rule. Electromagnetic Induction. Faraday's Experiment			
3.6. Faraday's laws Lenz's law. Self-Induction and Mutual Induction.			
3.7 Transformer Principle.			
3.8 Step up and Step-down transformer.			
3.9 Induction Heating			
3.10 Induction heater and uses			
4. **UNIT NAME: LIGHT AND OPTICS**	**16**	**10**	**CO1, CO2,**
4.1 Frequency Range of Infrared, ultraviolet and visible light and their uses			

4.2 Reflection, Refraction, Snell's law, refractive index.			**CO3, CO4**
4.3 Refraction through glass slab and prism.			
4.4 Total Internal reflection applications in optical fibers.			
4.5 Advantages of optical fibers. LASER, sources and applications.			
4.6. Luminous Intensity, Intensity of Illumination			
4.7 Inverse square law of Illumination (No derivation)			
4.8 Principle of Photometry, X rays,			
4.9 Production of X Rays by Coolidge tube			
4.10 Properties and applications			
5. **UNIT NAME: SOUND**	**11**	**08**	**CO1, CO2, CO3, CO4**
5.1 Sound as longitudinal wave,wavelength,frequency,time period, amplitude,			
5.2 Free vibration force vibration,resonance, examples,			
5.3 Echo reverberation ,pitch loudeness,intensity of sound,			
5.4 Ultrasonic waves, Piezo electric effect, Principle of Production of ultra-sonics waves			
5.5 Application of Ultra sonics in finding depth of sea,			
5.6. Detection of flaws in metal, soldering, Drilling,			
5.7 Ultrasonic Cleaning			
5.8Ultrasound for medical purposes.(Just Uses)			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	ELECTROSTATICS	8	12
2	CURRENT ELECTRICITY	12	20
3	ELECTROMAGNETISM AND EM INDUCTION	10	16
4	LIGHT AND OPTICS	10	16
5	SOUND	8	11
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	Practicals	Marks
1.	Specific Resistance by Ammeter Voltmeter Method	25
2	Specific Resistance by Meter Bridge Method	25
3	To Verify the Series Law of Resistance by Meter Bridge Method	25
4	To Verify the Parallel Law of Resistance by Meter Bridge Method	25
5	To Compare the emf of two cells by single cell method	25
6	To find the internal resistance of a cell by Potentiometer Method	25
7	To find the velocity of sound by Resonance Tube method	25
8	To find the Refractive index	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha

			Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	**Author**	**Title of Books**	**Publishers**
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC203) ENVIRONMENTAL STUDIES

1. COURSE OBJECTIVE:

Environment is the nurturing force upon which we depend. It decides our well being, our health & quality of our life. The environment is deteriorating at an alarming rate due to increasing human activity and can be saved only by timely human action. The aim of Environmental studies is to sensitize the students towards the need to conserve & protect natural resources & biological support systems. With the aim to develop an attitude of concern for the environment the students will learn to choose environmentally friendly options for sustainable development and live in harmony with nature.

2. TEACHING AND EXAMINATION SCHEME :

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC203) Environmental Studies		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		04	**-**	**-**	**64**	**75**	**25**	**-**	**-**	**100**

3. COURSE OUTCOMES:

GC203.CO1: Understand the role and importance of various elements of Environment.

GC203.CO2: Identify the concerns related to the natural resources, ecosystems, biodiversity, pollution and social issues of environment.

GC203.CO3: Develop sensitivity towards Environmental issues.

GC203.CO4: Co-relate causes affecting the environment & biodiversity.

4. Mapping Course Outcomes with Program Outcomes :

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimenta	Engg. Practices for Society,Sustainability	Project Management	Life -long Learning
CO1	2	1	1	0	3	2	2
CO2	2	1	1	0	3	2	2
CO3	1	1	1	0	3	2	2
CO4	1	1	2	0	3	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**Mks**	**Thr**	**CO1, CO3, CO4**
UNIT 1.0 : Multidisciplinary Nature of Environmental Studies	**09**	**08**	
1.1 Environmental studies : Definition , Scope and Importance			
1.2 Need for Public Awareness			
1.3 Environment & Human Health			
1.4 Environmental Ethics			
1.5 Value Education			
1.6 From Unsustainable to Sustainable Development : Concept and Guidelines			
1.7 Concept of Environmental Audit (EA) Environment Impact Assessment (EIA)			
1.8 Ecological Foot Prints			
UNIT 2.0 : ECOSYSTEM AND BIODIVERSITY	**15**	**13**	**CO1, CO2, CO3, CO4**
2.1 Ecosystem 2.1.1Concept, Structure & functions of ecosystem (Function of producer, consumer and decomposer) 2.1.2 Food chain & Food web- Concept & Examples 2.1.3 Energy flow in Ecosystem 2.1.4 Ecological Pyramids (Inverted & Upright) Pyramid of Number, Biomass & Energy. 2.1.5 Ecological Succession (Primary & Secondary Succession) 2.1.6 Study of Ecosystem: characteristic features structure and functions) Terrestrial(Forest, Grassland, Desert) Aquatic(Pond, River & Ocean)			
2.2 Biodiversity 2.2.1 Definition of Biodiversity 2.2.2. Types of Diversity (Genetic, Species & Ecosystem) 2.2.3. Value of Biodiversity (Consumptive , Productive, Social ,Aesthetic Moral & Optional value) 2.2.4 India as a Mega- diversity Nation 2.2.5 Biogeographical classification of India 2.2.6 Extinct, Endangered, Threatened & Endemic Species -Examples (of India) 2.2.7 Threats to Biodiversity (Habitat loss, Poaching of Wild life & Man Wildlife Conflict) 2.2.8 Reasons for loss of Biodiversity 2.2.9 Conservation of Biodiversity (Insitu & Exsitu conservation)			
UNIT 3.0 : NATURAL RESOURCES	**18**	**15**	**CO1, CO2, CO3, CO4**
3.1 Forest Resource 3.1.1 Direct & Indirect value of Forest 3.1.2 Deforestation-causes & effects 3.1.3 Forest Management			

3.2 Water Resource 3.2.1 Water as a scarce Resourc 3.2.2Use and over exploitation of surface and ground water 3.2.3 Need for Water Conservation 3.2.4 Construction of dams- Benefits and draw backs (Rehabilitation & Resettlement of people) 3.2.5 Rain water Harvesting. 3.2.6 Watershed Management 3.2.7 Conflicts over water in India **3.3** Energy Resource 3.3.1 Renewable & Non-Renewable sources of Energy 3.3.2 Growing Energy Needs. 3.3.3 Alternate Source of Energy (Solar ,Wind, Bio, Geothermal, Hydro & Nuclear Energy)			
3.4 Food Resource 3.4.1 Sources of Food 3.4.2 World Food Problems (Undernourishment & Malnourishment) 3.4.3 Changes caused by agriculture & overgrazing 3.4.5 Effects of modern agriculture on environment (use of synthetic fertilizers & synthetic pesticides in agriculture) **3.5** Mineral Resource 3.5.1 Types of Minerals 3.5.2 Use & Overexploitation of Minerals 3.5.3 Environmental Impact of Mining. **3.6** Land Resource 3.6.1 Pattern of Land Utilization (In India and World) 3.6.2 Land Degradation – Causes & Control Measures			
UNIT 4.0 : ENVIRONMENTAL POLLUTION- Sources , Effects & Control Measures	**24**	**20**	
4.1 Air Pollution 4.1.1 Definition, sources of air pollution(Primary and Secondary air pollutants with examples) 4.1.2 Effects on human health, animals, plants & Materials 4.1.3 Control of Air Pollution. 4.1.4 Removal of Particulate matter 4.1.5 Principles & Application of Control Equipments (Gravity and Inertial Separators, Cyclones, Filters, Electrostatic precipitators, Wet scrubbers) 4.1.6 Removal of Gaseous Pollutants (Combustion, Adsorption, Absorption) 4.1.7 Global Issues Definition, Cause & effects of Green House effect & Global Warming. Ozone layer Depletion, Acid Rain.			**CO1, CO2, CO3, CO4**

4.6 Noise Pollution :- 4.6.1 Definition. 4.6.2 Sources of Noise Pollution 4.6.3 Effects of Noise Pollution on Human health (Noise Induced hearing loss, Physiological & Psychological Effects) 4.6.4 Control of Noise Pollution.			
4.7. Nuclear Pollution / Radioactive Pollution:- 4.7.1 Definition 4.7.2. Sources of nuclear Pollution (Natural & Man made) 4.7.3. Effects of Nuclear Pollution 4.7.4. Control of Nuclear Pollution 4.7.5.Disposal of Nuclear waste (Low, Medium & High activity waste) 4.7.6 Nuclear Accidents & Holocaust – case study			
4.8 Solid Waste Pollution. Definition: Refuse, Garbage Sources of Solid waste Types of solid waste (MSW, HW, BMW & EW) Effects of Consumerism Segregation of Solid waste at source Treatment of MSW (Open dumping, Land filling, incineration & composting) Waste Utilization (Reuse, Reclaim & Recycle) Solid waste Management System – Flow sheet diagram **4.9** Role of an Individual in Prevention of Pollution.			
UNIT 5.0 : **SOCIAL ISSUES & ENVIRONMENT**	**09**	**08**	**CO2, CO3, CO4**
5.1 Environmental Legislation Article 47 & Article 51-A(g)of the constitution on Environment. 5.1.1 Protection Functions of Ministry of Environment and Forest Govt. of India Objectives & Functions of Central & state pollution Control Boards Environmental Protection Act. Air (Prevention & Control of Pollution) Act. Water (Preventation & Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Motor vehicle Act.			
5.2 Social Issues 5.2.1Women & Child Welfare 5.2.2 Role of IT in Environment & Human Health 5.2.3 AIDS 5.2.4 Population Growth & Variation among Nations 5.2.5 Human Rights			

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**MULTI-DISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**	08	09
2	**ECOSYSTEM AND BIODIVERSITY**	13	15
3	**NATURAL RESOURCES**	15	18
4	**ENVIRONMENTAL POLLUTION**	20	24
5	**SOCIAL ISSUES & ENVIRONMENT**	08	09
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Erach Bharucha	Textbook of Environmental Studies	Universities Press (India) Private Ltd.
2	Dr. Suresh K. Dhameja	Environmental studies	S.K. Kataria & Sons
3	Y. Anjaneyulu	Introduction to Environmental Science	B.S Publications
4	S. Deswal & A. Deswal	A Basic Cource in Environmental Studies	Dhanpat Rai & Co.
5	P. Meenakshi	Elements of Environmental Science and Engineering	Prentice Hall of India (PHI)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Pandya and Camy	Environmental Engineering	Tata McGraw Hill
2	Asthana D.K. and Asthana Meera	Environmental Problems and Solutions	S. Chand & Co.
3	Gilbert M. Masters	Introduction to Environmental Engineering and Science.	Prentice Hall of India (PHI)
4.	M N Rao & HVN Rao	Air Pollution	Tata McGraw Hill

FIELD ACTIVITIES (OPTIONAL)

1. Visit to Selaulim/ Anjunem Dam.
2. Visit to show Hill cuttings, mining areas.

3. Visit to show Rain water harvesting project / Vermicomposting plant / watershed management project. (Krishi Vigyan Kendra – Old Goa)
4. Visit to Garbage treatment plant.
*__On Completion of visit Report to be submitted.__

(GC204) ENGINEERING DRAWING

1. Course Objective: Drawing is a graphical language of engineering field. Engineering technician irrespective of his/her field of operation in an industry is expected to possess a thorough understanding of drawing, which includes visualization of objects and the proficiency in reading and interpreting a wide variety of engineering drawings. It is the skill, which translates an engineering idea into lines and dimensions. Besides this he/she is also expected to possess a certain degree of drafting skills- depending upon his/her job.

2. **TEACHING AND EXAMINATION SCHEME:**

Course Code & Course Title	**Periods/ Week (In Hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(GC204)	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Engineering Drawing	-	-	5	80	-	-	50	50	**100**

3. Course Outcomes:

On successful completion of the course the student will be able to:
GC204.CO1: Understand different methods of projection, sectioning of solids and development of surfaces.
GC204.CO2: Select the relevant procedural methods for preparing Engineering Drawing.
GC204.CO3: Draw Isometric views and orthographic projection of full and sectioned objects and development of surfaces
GC204.CO4: Examine and Interpret Engineering Drawings

4. Mapping Course Outcomes with Program Outcomes

Relationship- 1:Slight (low) 2:Moderate(Medium) 3: Substantial(High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	Basic and discipline specific knowledge	Problem analysis	Design & development of solution	Engg tools exptn and & testing	Engg Practice for society,sustainability and environment	Project management	Lifelong learning
CO1	3	2	1	3	1	1	1
CO2	3	1	2	3	1	2	2
CO3	2	2	2	3	1	2	2
CO4	2	2	2	2	1	2	3

5. Detailed course Contents/ Micro lesson plan

M=Marks Prhr= Teaching Hrs CO=Course Outcomes

Unit	Mark	Prhr	CO
1. Introduction 1.1 Importance of engineering drawing as a means of communication. 1.2 Planning of drawing sheet as per SP 46(latest revision) 1.3 Indian standard practices of laying out and folding of drawing 1.4 Different types of lines used in engineering drawing. 1.5 Importance of scale in Engineering Drawings. 1.6 Lettering 1.7 Methods of dimensioning, Dimensioning terms and notation -use of SP 46(latest revision), General rules for dimensioning, Dimensioning of cylinder, holes, arcs of circle, narrow space, angles, countersunk hole, taper.	05	05	CO2
2. Geometrical construction & Engineering Curves 2.1Construction of an Equilateral and Isosceles triangle, Square, Regular pentagon & Regular hexagon given length of a side using general method of construction 2.2Construction of Engineering curves like: Ellipse- by focus & directrix method and arcs of circles method Parabola- by focus & directrix method and rectangle method Hyperbola- Focus and directrix method 2.3 Cycloid- by generating circle rolling on a straight line 2.4 Involutes of a circle. 2.5 Draw normal & tangents to the above curves from given point on the curve Curves to be explained with the help of applications.	05	15	CO2
3. Orthographic projection 3.1 Definitions of various terms associated with orthographic projections. Planes of projections. Concept of Quadrants. 3.2 First and third angle method of projection. 3.3 Projection of points	18	30	CO1, CO2, CO3, CO4

3.4Projection of lines Parallel to both Principal planes Parallel to one and Perpendicular to other Principal plane. Inclined to one plane and parallel to other plane. 3.5 Projection of planes:Triangle, Square, circle when inclined to one principal plane & perpendicular to other plane. 3.6 Projection of solids: Cylinder, cone. Right regular solids such as (i) Prism: Square& Pentagonal (ii) Pyramid: Triangular & Square. Projections of above mentioned solids when axis is inclined to one principal plane & Parallel to other principal plane. 3.7 Conversion of simple pictorial views into orthographic views. *Problems where one end of the line is in one quadrant & other end in other quadrant and traces are to be excluded.* *Problems where apparent shape of plane are given, true shape & slope angle are to be drawn are excluded.*			
4. Section of solids Development of lateral surfaces **4.1** Concept of sectioning planes, Auxiliary planes and true shape of section. 4.2 Drawing section of solids like square prism, square pyramid, cylinder and cone with sectioning plane inclined to one principal plane and Perpendicular to the other principal plane (Axis of solid perpendicular to one principal plane and parallel to the other) 4.3Concept and importance of surface development in the engineering field. Methods of development of surfaces-Radial & Parallel line method. Development of surfaces for solids like square prism, square pyramid, cylinder and cone. *Development of solids standing on its base & cut by a plane inclined to HP and perpendicular to VP is also included.*	10	15	CO1, CO3
5. Isometric Views 5.1Difference between Isometric projection & Isometric view.	12	15	CO3, CO4

5.2Isometric view of geometrical planes and solids. 5.3Conversion of orthographic views into isometric views. 5.4Construction of Isometric view for any real object.			
Total	50	80	

6. Course Delivery:
The course will be delivered through Practicals, class room interaction and exercises.

7. Specification table for Practical/Macro Lesson Plan

Unit No.	**Unit**	**No. Of Practical Hrs.**	**Marks**
1	Introduction	05	05
2	Geometrical construction & Engineering Curves	15	05
3	Orthographic projection	30	18
4	Section of solids Development of lateral surfaces	15	10
5	Isometric Views	15	12
	Total	**80**	**50**

8. Specification table for Practical/ Termwork:

No.	Practical
1	TYPES OF LINES, LETTERING, DIMENSIONING.
2	GEOMETRICAL CONSTRUCTIONS
3	ENGINEERING CURVES
4	PROJECTION OF POINTS & LINES
5	PROJECTION OF PLANES
6	PROJECTIONS OF SOLIDS
7	ORTHOGRAPHIC PROJECTIONS (First angle)
8	ORTHOGRAPHIC PROJECTIONS(Third angle)
9	SECTIONS AND DEVELOPMENT OF SOLIDS
10	ISOMETRIC VIEWS

9. Learning Resources:

Text Books

S.No.	Author	Title	Publisher
1	N.D. Bhatt	Engineering Drawing	Charoter Publisher,Anand
2.	R. K. Dhawan	Engineering Drawing	S. Chand Publishing
3.	K.R. Gopalakrishna	Engineering Drawing	Subhas Publications.

Reference Books only for further study

S.No.	Author	Title	Publisher
1	P.S. Gill	Geometrical Drawing	Kataria & Sons
2	P.S. Gill	Machine Drawing	Kataria & Sons
3	N.D. Bhatt	Machine Drawing	Charoter Publisher,Anand

Indian and International codes needed

S.No.	Author	Title	Publisher
1.	BIS, India	SP 46. (Latest revision).	BIS, India

(GC205) ENGINEERING MATERIALS

1. COURSE OBJECTIVE:

This course is introduced with an objective of providing knowledge to students regarding properties and composition of materials for engineering applications and enabling them to make comparative study of materials while selecting the appropriate material for various engineering applications.

2. TEACHING AND EXAMINATION SCHEME

Semester	**II**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC205) ENGINEERING MATERIALS		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**--**	**--**	**48**	**75**	**25**	**--**	**--**	**100**

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC205.CO1: List out the properties of materials used in engineering applications.

GC205.CO2: Explain the composition and properties of various engineering materials.

GC205.CO3: Classify materials based on composition and properties.

GC205.CO4: Select the appropriate material/s for the given engineering application/s.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	3	2	0	0	0	0	1
CO2	3	2	1	0	0	0	1
CO3	2	2	2	1	1	0	1
CO4	2	3	3	2	1	0	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1 INTRODUCTION TO ENGINEERING MATERIALS			**08**	**04**	
1.1 Classification of Materials: Metal and Non-metal, Ferrous Metal & Non-ferrous Metals, Differences between Metals & Non-metals					**CO1, CO2, CO3, CO4**
1.2 Properties of Materials:(Note: Properties to be explained with relevant examples.) 1.2.1 Physical properties – Melting point, Freezing point, Boiling point, Density, Linear co-efficient of expansion, Thermal conductivity, Electrical resistivity					
1.2.2 Mechanical properties – Strength, Elasticity, Plasticity, Ductility, Malleability, Toughness, Brittleness, Hardness, Fatigue, Creep.					
1.2.3 Electrical properties – Resistivity, Conductivity, Temperature coefficient of resistance, Dielectric strength, Thermo-electricity, Super conductivity					
1.2.4 Magnetic properties – Permeability and Coercive force					
1.2.5 Chemical properties - Corrosion resistance and Chemical composition					
2 FERROUS & NON-FERROUS METALS & ITS ALLOYS			**18**	**12**	
2.1 FERROUS ALLOYS: 1.1.1 Low carbon steel, Medium carbon steel, High carbon steel, their carbon percentage, properties & uses. 1.1.2 Cast iron: grey cast iron, white cast iron, their properties & uses 1.1.3 Alloy steels: Constituents of alloy steels such as Phosphorous, Sulphur, Silicon, Manganese and their effect on properties of materials. 1.1.4 Stainless steel, Nickel-chromium-molybdenum steel, its properties & uses. 1.1.5 Tool steel – composition, HSS, properties & uses					**CO1, CO2, CO3, CO4**
2.2 NON-FERROUS METALS & ALLOYS: 2.2.1 Aluminium – Properties & uses 2.2.2 Aluminium alloys – constituents of alloy & their effect on properties of metal 2.2.3 Properties & uses of Duralumin, Y-alloy and Al-Si alloy 2.2.4 Copper – Properties & uses. 2.2.5 Copper alloys – Constituents of alloy & their effect on properties of metal 2.2.6 Properties & uses of Copper – Zinc alloys such as Muntz metal, manganese, bronze, Copper-Tin alloys such as Bronze, Copper-Aluminium alloys such as Aluminium bronzes. 2.2.7 Lead and its hazard to the environment					**CO1, CO2, CO3, CO4**
3 NON-METALLIC MATERIALS			**18**	**10**	
3.1 CONSTRUCTION MATERIALS 3.1.1 Classification of rocks, common building stones and their applications. 3.1.2 Cement: Types of cement, composition and applications 3.1.3 Bricks: Composition, properties, Classification, Special bricks- Refractory and fly-ash bricks and uses 3.1.4 Clay: Types, products of clay- tiles and pipes 3.1.5 Sand- sources – river, crushed aggregates, applications					**CO1, CO2, CO3, CO4**

3.2 ENGINEERING CERAMICS 3.2.1 Refractories: Desirable properties, Properties and Applications of Fire clay and Silica Refractory, Difference between acid, basic & neutral refractories 3.2.2 Glass: Properties & uses of soda glass, borosilicate glass and fibre glass 3.2.3 Glass wool: Composition, properties & uses 3.2.4 Timber: Common varieties of timber, uses of wood products, veneer and plywood 3.2.5 Natural & Synthetic abrasive materials: Introduction, Properties & uses			**CO1, CO2, CO3, CO4**
4 CONDUCTOR, SEMI -CONDUCTOR, AND INSULATING MATERIALS	**16**	**12**	**CO1, CO2, CO3, CO4**
4.1 Classification of Materials as Conductor, Semiconductor and Insulating materials			
4.2 Conductor Material: 4.2.1 High conductivity materials: Copper, Aluminium, Carbon, Silver, Lead & Tungsten, their properties as conducting materials and applications. 4.2.2 High resistivity materials: nichrome, constantan, manganin and their applications			
4.3 Insulating Materials: Introduction and Characteristics of Good Insulating materials 4.3.1 Solid Insulating materials- wood, paper, rubber, mica, glass fibre, porcelain, PVC, resins, their characteristics as insulating materials and applications			
4.4 Semiconductor Materials: Silicon & Germanium, their specifications as semiconductor material and uses.			
Unit 5 MAGNETIC & COMPOSITE MATERIALS	**15**	**10**	
5.1 Magnetic Materials: Classification as Diamagnetic, Paramagnetic, Ferromagnetic, List of these materials and their applications			**CO1, CO2, CO3, CO4**
5.2 Composite Materials**:** metal matrix, ceramic matrix and polymer matrix composites, types of reinforcement materials and their applications			
5.3 Paints & Lubricants: 5.3.1 Classification: oil based and polymer based paints 5.3.2 Constituents of Paints – resin, binder, pigment, additives, solvents 5.3.3 Lubricants – Functions of lubricants, Types of Lubricants**,** Composition and Applications			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures and class room interactions

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit Name**	**Number of lectures (hrs)**	**Marks**
1	Introduction to Engineering Materials	04	08
2	Ferrous & Non-Ferrous Metals & its alloys	12	18
3	Non-Metallic Materials	10	18
4	Conductor, Semi-Conductor, & Insulating Materials	12	16
5	Magnetic & Composite Materials	10	15
		48	**75**

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.S. Khurmi	Material Science	S. Chand
2	R. Srinivasan	Engineering Materials & Metallurgy	Tata McGraw Hill
3	TTTI Madras	Electrical Engineering Materials	McGraw Hill Education, 2004
4	S. K. Hajra Choudhury	Material Science and Processes	Indian book distribution
5	P. C. Varghese	Building Materials	PHI
6	J. B. Gupta	Electrical and Electronic Engineering Materials	Katson

SEMESTER III

	DIPLOMA IN ELECTRONICS ENGINEERING - CURRICULUM STRUCTURE										
	Code	**Subjects**	**L**	**T**	**P**	**H**	**TH**	**TM**	**PR**	**TW**	**TOT**
THIRD	CC304	Basic Electrical Engineering	3	0	2	5	75	25	-	25	125
	EX302	Programming in C	0		4	4	-	-	50	25	75
	CC308	Basic Electronics Engineering	3	0	2	5	75	25	25	25	150
	CC309	Digital Electronics	3	0	2	5	75	25	25	25	150
	EX301	Communication Engg	3	0	2	5	75	25	-	25	125
	CC303	Circuits & Networks	3	0	2	5	75	25	-	25	125
			15	0	14	29	375	125	100	150	750

(CC304) BASIC ELECTRICAL ENGINEERING

1. COURSE OBJECTIVES:

This course will enable the students to understand the basic concepts and principles of AC Circuits, Transformers and Motors.

1. To understand basic concepts in Electrical Engineering
2. To understand working & use of Transformer, DC & AC motors
3. To understand importance of safety precautions and use of protective devices

2. TEACHING AND EXAMINATION SCHEME

Semester	**III**								
Course code & course title	**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(Course Code) BASIC ELECTRICAL ENGINEERING	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
	3	**-**	**2**	**5**	**75**	**25**	**25**	**--**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Explain terms related to ac waveform, operating principle and functions of parts of transformer, motors, need for earthing and operation of protective devices
2. Describe the procedure for starting and speed control of different motors
3. Differentiate between types of motors, types of earthing, protective devices, star and delta connection
4. Test & Compute parameters of transformers

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	2	0	0	0	0	1
CO2	3	2	0	3	0	3	1
CO3	2	2	3	3	2	3	1
CO4	2	2	0	0	2	0	1

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1 AC CIRCUITS			15	9	CO1,3
1.1 Sinusoidal AC voltage waveform. Definition and numerical Values of, average value, RMS value, form factor, peak factor, frequency of Sinusoidal quantities. Principle of single phase alternator					
1.2 Three-phase circuits. Concept of phase sequence, balanced system and unbalanced system Relation between line and phase quantities for star and delta connections.					
1.3 Concept & definition of Real, reactive and apparent power in three-phase system.					
2 TRANSFORMER			15	10	CO1,4
2.1 Principle of operation and basic construction (Core & Shell type) of a single phase transformer. EMF equation, Calculations of Rated Currents & Voltages & Turns using emf equation					
2.2 Losses in transformer (Hysteresis, Eddy Current & copper loss, their brief description), efficiency and voltage regulation. Rating of transformer ,Applications of transformer					

3 DC MOTORS	15	10	CO 1,2,3
3.1 Working principle of DC motors, main parts of DC motor and their functions(Yoke ,pole core ,pole shoe, armature core, armature winding ,Commutator& Brushes), classification of DC motors (shunt, series and compound and their applications).			
3.2 Necessity of starter, methods of reversal of direction of rotation of DC shunt and series motor.			
3.3 Speed Equation , Armature resistance control & Field resistance control method for DC shunt Motor			
4 AC MOTORS	15	10	CO1,2,3
4.1 Principleof three phase induction motor, main parts, classification (squirrel cage & Slip ring), torque-slip characteristics and application (only diagram).			
4.2 Necessity of starter, Starters - Direct On Line starter, star delta starter(Manual) and autotransformer starter(Maual), (w.r.t. circuit diagram, working and application). Method of reversal of direction of rotation.			
4.3 Working principle and application of - Single phase induction motor (split phase only) - Universal motor -Stepper motor (Variable reluctance type & permanent Magnet type.)			
5 EARTHING & PROTECTIVE DEVICES	15	09	CO1,3
5.1 Electric shock, precautions against shock. Necessity of earthing, types of earthing- equipment earthing& system earthing (definitions only).Types of earthing electrodes- Pipe and Plate. Methods of reducing earth resistance.			
5.2 Fuse- Definition, Types of Fuses- Rewirable fuse, HRC fuse & Cartridge fuse. Rating for fuse such as Voltage ratings, Current ratings, Breaking capacity (Rupture capacity) & Minimum fusing current. MCB- Principle of operation and application. ELCB- Current operated type. Principle of operation and application. .			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**AC CIRCUITS**	09	15
2	**TRANSFORMER**	10	15
3	**DC MOTORS**	10	15

4	**AC MOTORS**	10	15
5	**EARTHING & PROTECTIVE DEVICES**	09	15
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical (Minimum 8)	Marks
1.	Connection of single transformer & Measure its Voltages, Currents, Voltage Regulation & Efficiency	
2.	Verify relationship between phase & line quantities in star connected load	
3.	Speed control of DC motor	
4.	Starting of DC shunt motor and reversal of direction of rotation	
5.	Starting of three phase induction motor using star delta starter	
6.	Verify relationship between phase & line quantities in Delta connected load	
7.	Study of MCB & ELCB (Current Operated)	
8.	Study of stepper motors	
9.	Study of servo motors	
10.	Study of universal motors	
11.	Study of rotor resistance starter for starting of Slip ring induction motor.	
12.	Checking of Ceiling fan using series test lamp	
13.	Measurement of voltages in a single phase system(between phase and neutral, phase and earth and neutral and earth)	
	Total	25
No	**Class room Assignments**	**Marks**
1	At least 2 Assignments	
2		
...		
No	**Tutorial Exercise**	**Marks**
1	NIL	
2		
...	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B.L.Theraja	Electrical Technology (Vol I and Vol II)	S. Chand
2	V.K Mehta	Principles of Electrical Engineering & Electronics	S. Chand
3	J.B.Gupta	Fundamentals of Electrical Engineering	S.K. Kataria& sons

(EX302) PROGRAMMING IN C

1. COURSE OBJECTIVES:

The course is designed to provide students with programming skills through C language. The course aims to develop student's logical skills to write C program and to compile, debug and execute them on various platforms.

2. TEACHING AND EXAMINATION SCHEME

Semester	III								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(EX302) Programming In C		L	T	P	H	TH	TM	TW	PR/OR	
		-	-	4	4	-	-	25	50	75

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the program statement and draw flow chart.
2. Develop basic programming skills and write programs using C.
3. Analyze C programs.
4. Execute C programs on various platforms.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability& Environment	Project Management	Life -long Learning
CO1	0	2	1	0	0	3	0
CO2	3	3	1	2	2	3	0
CO3	3	3	1	2	3	3	2
CO4	0	1	0	2	0	3	0

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	1	1
CO2	2	2
CO3	1	3
CO4	1	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	P	CO
1 Introduction to C			12	10	co1
1.1 Overview of C: Brief history of C language, Features of C language ,Application of C language in electronics, Structure of C language					

1.2 Flow chart: Definition and uses, symbol used in flow chart- flow line, terminal, input/output, processing, decision, on-page connector, off-page connector, predefined process/function, Simple examples of flow chart.			
2 Basic elements of C programming	18	14	co2, co4
2.1 Lexical elements of C: C character set, Variables, Constants, Data types, delimiters, reserved words			
2.2 Operators and Expressions in C: Arithmetic operators, expressions, relational operators, logical operators, increment/decrement operators, bitwise data operators,			
2.3C pre-processor: File inclusion (usage only)			
2.4Input/Output in C Different types of input functions and output functions, conversion specification, formatted input/output function			
3 Control statements of C programming	18	14	co2,co4
3.1 Decision control statements : if else, nested if			
3.2 Loops: for loop, break and continue statement, nested for loop, while loop, do-while loop			
3.3Case control statement: switch-case-default			
3.4 Functions: Call by value, call by reference, recursive function			
4 Data types	21	18	co3,co4
4.1 Arrays: Declaration of Arrays, one dimensional Array , two dimensional Array			
4.2 Strings: Declaration of String, string library functions			
4.3 Pointers: Declaration of Pointers, pointer operators, Basic pointer arithmetic			
5 Structures	06	08	co3,co4
5.1 Declaration of structure, array of structure, structure within a structure.			
Total	**75**	64	

6. COURSE DELIVERY: The Course will be delivered through practicals, laboratory interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of Practicals**	**Marks**
1	Introduction to C	10	12
2	Basic elements of C programming	14	18

3	Control statements of C programming	14	18
4	Data types	18	21
5	Structures	08	06
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS(any 8 to 10)

No	**Practical**	**Marks**
1.	Program on flow chart	
2.	program on input and output	
3.	program on calculations using operators and expressions	
4.	program on controls statements-if , switch	
5.	Program on loop	
6.	program on function	
7.	program on pointers	
8.	program on arrays	
9.	Program on strings	
10.	program on structures	
	Total	25
No	**Class room Assignments**	**Marks**
1	At least 2 assignments	
No	**Tutorial Exercise**	**Marks**
1	NIL	
…	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	**Author**	**Title of Books**	**Publishers**
1	YeshwantKanetkar	Let Us C	Jones and Bartlett publishera, USA
2	J. Jayasri	The 'C' Language Trainer with C Graphics and C++	New Age International (P) LTD.
3	Anil Bikas Chaudhuri	The Art of Programming Through Flowcharts & Algorithms	FIREWALL MEDIA, New Delhi
4	Luciano Mandli	Understanding Algorithm and Flow Chart	Create Space Independent Pub

Reference Books for further study

S. No.	**Author**	**Title of Books**	**Publishers**
1	B. W. Kernigham, D. M. Ritchie	The C programming language	
2	Byron gottfried	Programming with c- Schaum's outlines	Tata McGraw Hill
3			

(CC308) BASIC ELECTRONICS ENGINEERING

1. COURSE OBJECTIVES:

The course is designed to introduce students to semiconductor devices and their applications. The course aims to encourage students to Build and test electronic circuits based on semiconductor devices.

2. TEACHING AND EXAMINATION SCHEME

Semester	**III**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CS308		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Basic Electronics Engineering		**3**	**-**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the operation and characteristics of semiconductor devices
2. Apply the knowledge of semiconductor devices to build electronic circuits
3. Analyze semiconductor device based electronic circuits
4. Select an appropriate semiconductor device based circuit for a specific application

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainability &	Project Management	Life -long Learning
CO1	3	1	1	3	2	0	2
CO2	3	2	1	3	2	2	0
CO3	3	3	2	2	3	0	2
CO4	2	2	2	1	3	0	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	1
CO2	3	2
CO3	3	3
CO4	3	2

.

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 Introduction to Semiconductors	**10**		**CO1**
1.1 Classification of solids as conductors , semiconductors and insulators		1	
1.2 Types of semiconductors-Intrinsic and Extrinsic semiconductors, structure of intrinsic semiconductor Extrinsic semiconductor- definition of doping, pentavalent and trivalent impurity. P-type and N-type, structure, majority and minority carriers		4	
2 Semiconductor diode	18		**CO1,CO2 CO3,CO4**
2.1 P-N junction and depletion region. forward bias , reverse bias, V-I characteristics, Important diode ratings		4	
2.2 Rectifiers- Half wave rectifier, Centre tap Full wave rectifier, Full wave bridge rectifier, (working, input , output waveforms, Vdc ,PIV) , comparison between rectifiers		4	
2.3 Filters- definition of ripple factor, Types of filters, C filter operation(ripple factor, waveforms), numerical on c filter		2	
3 Zener Diode	12		**CO1,CO2 CO3,CO4**
3.1 Construction, operation, forward and reverse characteristics, breakdown mechanism, Important zener diode ratings, comparison with semiconductor diode		4	
3.2 Zener diode as voltage regulator, numerical on variable supply and variable load.		3	
4 Bipolar Junction Transistor	20		**CO1,CO2 ,CO3**
4.1 Schematic of NPN and PNP transistor, working of NPN transistor.		2	
4.2 Transistor configurations-CE, CB and CC configurations		2	
4.3 Transistor input and output characteristics in CB configuration, Transistor input and output characteristics in CE configuration ,Alpha, Beta and the relation between them		6	
4.4 leakage currents- concept of ICBO, ICEO, numerical on leakage currents		2	
4.5 Comparison between transistor configurations		1	
4.6 Transistor as a switch		1	
5 Field Effect Transistors	15		**CO1**
5.1 JFET: Structure, operation, characteristics of n and p- channel JFET,		3	
5.2 important JFET parameters (rd, μ and gm, no derivations), comparison with BJT		2	
5.3 MOSFET: Structure, operation and characteristics of n-channel and p-channel enhancement type MOSFET.		3	
5.4 Structure, operation and characteristics of n -channel and p- channel depletion type MOSFET		3	
5.5 Comparison between JFET and MOSFET		1	
Total	**75**	**48**	**-**

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to Semiconductors	5	10
2	Semiconductor diode	10	18
3	Zener Diode	7	12
4	Bipolar Junction Transistor	14	20
5	Field Effect Transistors	12	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Practical Title	
1	Plot VI characteristics of semiconductor diode	
2	Plot VI characteristics of zener diode	
3	Assemble and test zener diode as a voltage regulator	
4	Assemble and test half wave rectifier with and without capacitor filter	
5	Assemble and test bridge full wave rectifier with and without capacitor filter	
6	Plot input characteristics of transistor in CB configuration	
7	Plot output characteristics of transistor in CB configuration	
8	Plot input characteristics of transistor in CE configuration	
9	Plot output characteristics of transistor in CE configuration	
10	Assemble and test circuit of transistor as a switch	
11	Plot VI characteristics of JFET	
	Total	25
No	**Class room Assignments**	**Marks**
1	At least 2 assignments	
...	Total	25

9. LEARNING RESOURCES
Text Books

S. No.	Author	Title of Books	Publishers
1	Bhargava & others	Basic Electronics and Linear circuits	Tata McGraw Hill
2	Robert L. Boylestad	Electronic Devices and Circuit Theory	Prentice – Hall India
3	V.K. Mehta	Principles of Electronics Engineering	S. Chand

(CC309) DIGITAL ELECTRONICS

1. COURSE OBJECTIVES:

The students need to learn basic concepts of digital circuits and system which leads to design of complex digital system such as microprocessors.

The students need to know combinational and sequential circuits using digital logic fundamentals. This is the first course by which students get exposure to digital electronics world.

The students will able to

1. To understand various number representations and conversion between different representation in digital electronic circuits.
2. To introduce the students to various logic gates, SOP, POS and their minimization techniques.
3. To analyze logic processes and implementation of logical operations using combinational logic circuits.
4. To understand, analyze and design sequential circuits

2. TEACHING AND EXAMINATION SCHEME

Semester	III								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
Digital Electronics CC309		L	T	P	H	TH	TM	TW	PR/OR	
		03	-	02	05	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1: Relate the knowledge of Number Systems in Digital Applications.

CO2: Build different Sequential and Combinational Circuits.

CO3: Simplify logical problems using digital circuits.

CO4: Develop basic digital electronics circuits.

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4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	2	3	3	0	0	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	0	3
CO4	3	3	3	3	2	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**

Unit	**M**	**Thr**	**CO**
1 Number System	**14**	**09**	**CO1**
1.1 **Digital and Analog Signals**. Definition of digital and analog signals,Comparison between Analog and Digital signals			
1.**2 Number System**:- Decimal, Binary, Hexadecimal. Introduction to Decimal,Binary and Hexadecimal Number Systems. Counting in each system. Conversion from one system to other.			
1.3 Codes:- introduction and importance of Codes.BCD code, GRAY code conversion of Gray to Binary, Binary to Gray, BCD to binary and Binary to BCD. Represent Decimal Numbers in BCD and Gray codes. ASCII code and its importance.			
1.4 Binary Addition (upto 4 bits), 1's complement of a Binary number, 2's complement of a Binary number. Binary Subtraction using 2's complement method. Addition of signed decimal numbers.			
2. Combinational Circuits	**19**	**12**	**CO1, CO2, CO3**
2.1 Logic Gates:- Symbol, Expression and Truth Tables of Basic gates(AND,OR,NOT) and Combinational gates(NOR,NAND,EXOR,EXNOR).			
2.2 Boolean Algebra:- DeMorgan's Theorems, Laws of Boolean Algebra ,Duality Theorem			
2.3Simplification of Boolean Expressions using Boolean Algebraic laws and by using K-Maps Techniques(upto 4 Variables in SOP Form),			
2.4 Universal Gates:- Implementation of NOT,OR,AND,EXOR gates using NOR and NAND gates			
2.5Adders:- Half Adder circuit using logic gates , Full Adder circuit using logic gates, block diagram of 4 bit parallel adder. Subtractors:- Half subtractor circuit using logic gates, Full Subtractor using logic gates			
2.6Combinational circuits:- Block diagram and Implementation using basic gates:- Multiplexers(4 to 1), Demultiplexer(1 to 4), Encoder (4 to 2), Decoder(2 to 4). BCD to 7 segment Decoder driver (Common Cathode).			
3 Flip Flops	**12**	**08**	**CO1, CO2**
3.1 Definition of Flip Flop. Applications. Symbol, Truth Tables, Operation and timing diagrams of RS F/F using NAND gates. ,			

3.2 Symbol, Truth Tables, Operation and timing diagrams of clocked RS F/F using NAND Gates, Concept of Asynchronous inputs(Preset and Clear)			
3.3 Symbol, Truth Tables, Operation of Clocked D F/F			
3.4 Symbol, Truth Tables, Operation of Clocked JK F/F, Excitation table of JK flip flop			
3.5 Race around condition in JK F/F. Symbol, Truth Tables, Operation of JK master slave F/F.			
3.6 Symbol, Truth Tables, Operation of T F/F,			
4 Registers And Counters	**19**	**12**	**CO1, CO2, CO4**
4.1 Registers: Definition of Shift Registers, Applications of Registers Symbols and Logic block diagram of SISO,SIPO,PISO and PIPO Registers,			
4.2 Serial IN Serial Out Register (size of the register 4 bits) Logic Diagram and Operation of SISO Register usingnegative edge triggered D F/F along with the Truth Table and Timing diagrams			
4.3 Serial IN Parallel Out Register (size of the register 4 bits) Logic Diagram and Operation of SIPO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams.			
4.4 Parallel IN Serial Out Register (size of the register 4 bits) Logic Diagram and Operation of PISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams			
4.5 Parallel In Parallel Out Register (size of the register 4 bits) Logic Diagram and Operation of PISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams . Concept of Shift right, Shift left, Ring Counter.			
4.6 Counters: Introduction to counters, Modulus of counters. Count sequence, No of Flip Flops required for Specified counters			
4.7 Asynchronous Counters:- 4 bit UP counter using JK Flip Flops only and 4 bit DOWN counter using JK Flip Flops only.			
4.8 Synchronous Counters:- 4 bit UP counter using JK Flip Flops only and 4 bit DOWN counter using JK Flip Flops only, Decade (Mod 10) using JK Flip Flops only			
4.9 Design of Synchronous counters(upto 4 bit) using only JK Flip Flops			
5 DAC and ADC and Memories	**11**	**7**	**CO1, CO4**
5.1 Definitions, Types of DAC and ADC(noDescription),Applications		1	
5.2 Binary Ladder Network for DAC:- Logic circuit and operation. Simple numerical problems Successive Approximation ADC .:- Logic circuit and operation. Simple numerical problems.		4	
5.3Memories: Introduction, Semiconductor memories and its types – ROM,RAM,PROM, EPROM,EEPROM(only definition and applications)		2	
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Number System	09	14
2	Combinational Circuits	12	19
3	Flip Flops	08	12
4	Registers And Counters	12	19
5	DAC and ADC	07	11
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical (Perform any 8)	Marks
1.	Verification of Logic gates and Demorgan's Theorems	
2.	Universal gates (NAND and NOR)	
3.	Verification of Boolean Expression	
4.	Half Adder and Full Adder using logic gates	
5.	Half Subtractor and Full Subtractor using logic gates	
6.	MUX and D-MUX	
7.	RS F/F, D F/F and JK F/F	
8.	Assemble and Test Binary Counter/Decade counter	
9.	Assemble and test DAC using DAC0808	
10.	Assemble and test ADC using ADC0808	
	Total	25
No	Class room Assignments	
	At least 2 assignments	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.P.Jain,	Modern Digital Electronics	Fourth Edition, Tata McGraw-Hill Education.
2	Malvino & Leach	Digital Principles and Applications	Seventh Edition, McGraw-Hill Education

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Thomas L. Floyd,	Digital Fundamentals	10th Edition, Pearson Education Inc, 2011
2	. By A.K. Maini,	Digital Electronics: Principles and Integrated Circuits	Wiley India Publications

(EX301) Communication Engineering

1. COURSE OBJECTIVES:

The course is designed to introduce students to the basics of communication systems and to impart in depth knowledge about of AM& FM. The course aims to develop among student understanding AM/ FM transmitter and receiver and concept of radio wave propagation.

2. TEACHING AND EXAMINATION SCHEME

Semester	**III**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
Communication Engineering EX301		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		03	**-**	**02**	**05**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Describe different modulation and demodulation techniques used in communication systems.
2. Classify types of noise ,frequency bands, modulation techniques, Antennas & wave propagation techniques associated with communication systems
3. Apply the concept of modulation and demodulation in AM and FM transmitters and receivers.
4. Analyze various Analog Communication techniques.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainability &	Project Management	Life -long Learning
CO1	3	2	1	1	0	1	2
CO2	3	0	2	0	0	2	2
CO3	3	2	2	2	1	2	3
CO4	2	0	2	0	1	0	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 Basics of communication Engg	12	07	CO1 & CO2
1.1 Block diagram of communication system			
1.2 Frequency bands used in communication system			
1.3 Noise : Definition & Classification of noise • External Noise: Atmospheric noise, Industrial Noise & Extraterrestrial noise • Internal Noise: Thermal Noise, Shot Noise & Transit time Noise • Definition of signal to noise ratio & noise figure.			
1.4 Need for modulation& types of modulation • Analog Modulation techniques: AM, FM, PM Definitions, • Pulse Modulation techniques: Definition & waveforms of PAM, PWM & PPM. • Digital Modulation techniques :Definition & waveforms of ASK,FSK & PSK			
2 Amplitude Modulation	21	14	CO1& CO2
2.1 Amplitude Modulation: Waveforms, Derivation of mathematical expression of AM signal.			
2.2 Derivation of Modulation Index equation using AM waveform, Frequency Spectrum of AM, Power and current relations, Simple numericals			
2.3 Block diagram of AM Transmitter-Low level and high level			
2.4 Detection of AM Waves. Envelope detector			
2.5 Single sideband AM : • Advantages of SSB • Suppression of carrier using Balanced modulator(no derivation) • Suppression of unwanted sideband using filter method • Block diagram and operation of ISB			
3 Angle Modulation	18	12	**CO1& CO3**
3.1 Angle Modulation : Definition & types of Angle Modulation			
3.2 Frequency Modulation : • Waveforms , Mathematical expression of FM (no derivation) • Modulation index & maximum frequency deviation • Frequency spectrum of FM using expanded form of FM equation and important observations • Bandwidth of FM wave ,Carson's rule			
3.3 Narrow band & Wide band FM ,Pre-emphasis and De-emphasis			
3.4 Generation of FM using varactor diode modulator, Detection of FM wave using Balanced slope detector			

3.5 Phase Modulation : Definition and mathematical expression (No derivation)			
3.6 Comparison between AM,FM & PM			
4 Receivers	12	07	**CO1&CO3**
4.1 Characteristics of Receivers : Sensitivity, Selectivity & fidelity (definitions)			
4.2 AM Receivers : • TRF receiver : Block diagram, Operation & limitations • Superheterodyne Receiver: Block diagram & operation			
4.3 FM Receiver: • Block diagram & operation • Stereo FM multiplex transmitter and receiver: Block diagram, operation & frequency spectrum			
5 Antennas& Wave Propagation	12	08	**CO4**
5.1 Antennas: • Antenna parameters:-definitions of antenna gain, antenna resistance, beam width and polarization. • Construction and radiation pattern of Yagi-uda & parabolic reflector (horn feed) Antennas.			
5.2 Wave Propagation • Ground Wave propagation • Sky Wave Propagation: Ionosphere & its effect, definitions of virtual height, critical frequency, skip distance , fading, maximum usable frequency. • Space Wave propagation			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Basics of communication Engg	07	12
2	Amplitude Modulation	14	21
3	Angle Modulation	12	18
4	Receivers	07	12
5	Antennas& Wave Propagation	08	12
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Perform Amplitude Modulation on trainer kit. (Observe and draw the waveform of AM & calculate modulation index of AM)	
2.	Perform Amplitude Demodulation on trainer kit.(Observe and draw the input waveform and output waveform)	
3.	Test the performance of SSB SC AM Modulation on trainer kit.	
4.	Test the performance of SSB SC AM Demodulation on trainer kit	
5.	Test the performance of DSB-SC AM modulation on trainer kit.	
6.	Perform frequency modulation on trainer kit.(Observe and draw the waveform of FM)	
7.	Perform frequency demodulation on trainer kit.(Observe and draw the input waveform and output waveform)	
8.	Test the performance of Superheterodyne Receiver on trainer kit.(Observe the wave forms at various points in AM receiver)	
9.	Field visit to All India Radio Transmitter Station (**Optional**)	
	Total	25
No	**Class room Assignments**	**Marks**
1	Atleast 2 assignments	
...		
No	**Tutorial Exercise**	**Marks**
1	NIL	
...	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Kennedy, George and Bernard Davis	Electronic &Communication System	Tata McGraw Hill, India, ISBN:978-00-746-3682-4
2	Roddy Collen	Electronic communication	Pearson Education ISBN:81-297-746-0106-5
3	Mithal G.K	Radio Engineering	Khanna Publishers, NewDelhi ISBN:978-8174090140

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	R P Singh & S D Sapre	Communication Systems	Tata McGraw Hill, India ISBN:13-978-0-07-063454-1

(CC303) Circuits & Networks

1. COURSE OBJECTIVES:

The course is designed to introduce students to the facts, concepts & principles of electrical & electronics engineering circuits. The course aims to develop among student understanding to analyze and test different DC &AC circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	**III**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
		L	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Circuits &Networks (CC303)		**3**	**-**	**2**	**5**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand network concepts, theorems & resonance
2. Interpret the response of different RLC circuits to AC supply.
3. Apply various theorems to simplify resistive circuits.
4. Design basic electrical filters.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	3	3	2	2	1	2	2
CO2	3	3	3	3	0	2	3
CO3	3	3	3	3	1	3	3
CO4	3	3	3	3	1	2	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2

CO3	3	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 BASIC TERMINOLOGY	6	4	**1**
1.1 Definitions of circuit, network, voltage, current, power, mesh, loop, node & branch, port.			
1.2 Definition of network elements Active & passive, Unilateral & bilateral, Linear & non-linear, lumped & Distributed.			
1.3 Energy Source Voltage & Current Sources Concept of Ideal & practical energy source			
1.4 Series & Parallel equivalent expressions of resistors, capacitors & inductors. (No derivations), Simple numericals on it.			
2 NETWORK THEOREMS (RESISTIVE ONLY WITH DC SOURCE)	30	22	**3**
2.1 Voltage & Current Divider theorem—Statement of theorem, simple numerical on it. 2.2 Kirchhoff's voltage & current Laws-Statement of laws & simple numerical on it. 2.3 Concept of Mesh & Node analysis-Explanation of method & simple numerical(maximum 3 loops ,3 nodes) 2.4 Superposition Theorem- Explanation of statement of theorem & simple numerical 2.5 Thevenin's Theorem- Explanation of statement of theorem & simple numerical 2.6 Maximum Power Transfer Theorem -- Explanation of statement of theorem & simple numerical, 2.7 Star Delta transformation - Explanation of conversion from star to delta & vice versa, simple numerical on it			
3 AC CIRCUITS	20	10	**2,1**
3.1 Response of basic R, L, C , RL , RC, RLC elements to AC signal. 3.2 Phasor diagrams of series RC & series RL circuits, Concept of impedance. 3.3 Simple problems to find impedance,VR,VC,VL ,Phase angle in above circuits 3.4 Concept of series resonance Circuit .Graphical representation of resonance curve, bandwidth, half power frequencies. Problems based on Fr,Imax,F1,F2,Z.(Note: Resonance problems are of **L4)** 3.5 Concept of Q factor, Problems to calculate Q factor. 3.6 RC Integrator & Differentiator for sine & square wave input.			
4 NETWORKS	10	6	**3**
4.1 Introduction & Applications:			

Two port networks: Symmetrical T & Pi networks			
4.2 Characteristics of two port network: Characteristic impedance, short circuit & open circuit impedance			
4.3 Derivations& Simple numerical on Zo, Zoc, Zsc (only for T type)			
5 FILTERS	9	6	**4**
5.1 Introduction of Filter circuits			
5.2 LPF, HPF,BPF, BRF (graphical interpretation), Constant k (LPF, HPF-T type only)			
5.3 Design formulae & numerical			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Basic Terminology	4	6
2	Network Theorems(Resistive circuits with DC Source)	22	30
3	AC Circuits	10	20
4	Networks	6	10
5	Filters	6	9
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**	**Marks**
1	Verification of Ohms law and its application to series parallel circuits	
2	Verification of KVL and KCL	
3	Verification of superposition theorem	
4	Verification of Thevenin’s theorem	

5	Verification of maximum power transfer theorem	
6	Study of RLC series resonance circuits	
7	RC Integrator and RC Differentiator	
8	Study of filters LPF & HPF ,T & PI Type	
No	**Class room Assignments**	**Marks**
1	At-least two assignments	
2		
...		
No	**Tutorial Exercise**	**Marks**
1	NIL	
2		
...	Total	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Sudhakar &shyammohan	Circuits & Networks	McGrawHill Education
2	B.L.Theraja	Basic electrical eng.Vol I	S.Chand
3	Royal Signals	Handbook of Line Communication	HMSO
4	B.R.Gupta &V.Singhal	Network filters & Transmission lines	S.K.Kataria & Sons
5	Schaum Series	Electrical Circuits	McGrawHill Education

SEMESTER IV

	DIPLOMA IN ELECTRONICS ENGINEERING - CURRICULUM STRUCTURE										
	Code	**Subjects**	**L**	**T**	**P**	**H**	**TH**	**TM**	**PR**	**TW**	**TOT**
FOURTH	EX401	Electronic Circuits	3	0	2	5	75	25	-	25	125
	EX602	Power Electronics	3	0	2	5	75	25	-	25	125
	EX403	8051 Microcontroller	3	0	2	5	75	25	25	25	150
	EX404	Maintenance and Circuit simulation using CADD	0	0	4	4	-	-	50	25	75
	EX405	Linear Integrated Circuits	3	0	2	5	75	25	25	25	150
	EX406	Electronic Measurements & Instrumentation	3	0	2	5	75	25	-	25	125
			15	0	14	29	375	125	100	150	750

(EX401) ELECTRONIC CIRCUITS

1. COURSE OBJECTIVES:

The course is designed to introduce students to the working of various types of electronic circuits using transistors. The course aims to develop among student understanding to assemble and test the performance of transistor circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	**IV**									
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
(EX401) ELECTRONIC CIRCUITS		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**5**	**75**	**25**	**25**		**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1: Explain working of different electronic circuits based on transistors and their applications.

CO2: Classify and build transistor amplifiers

CO3: Analyze different types of feedback systems.

CO4: Develop transistor based electronic circuits.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	3	1	1	2	0	0	1
CO2	3	1	2	2	1	1	2
CO3	1	2	1	1	0	0	0
CO4	3	2	3	3	2	3	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	1	1
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | Thr = Teaching hours | CO = Course Objectives

Unit	M	Thr	CO
1 Transistor biasing techniques and amplifiers	**21**	**15**	**CO1/ CO2/ CO4**
1.1 Transistor biasing techniques: need and types (fixed & voltage divider biasing- comparison), Steps for selection of Q point for fixed and voltage divider biasing, simple numerical on finding Q point(fixed and voltage divider biasing)			
1.2 Single stage transistor CE amplifier- working, frequency response			
1.3 General block diagram of multi-stage amplifier, necessity of multistage amplifiers			
1.4 Different coupling methods- working, frequency response, applications and comparison of:- ➢ RC coupled ➢ Direct-coupled ➢ Transformer Coupled			
2 Feedback Circuits	**21**	**12**	**CO1/ CO3/ CO4**
2.1 Concept of feedback, block diagram of feedback systems, types of feedback, merits and limitations of negative feedback			
2.2 feedback connections-Block diagram of voltage series, voltage-shunt, current-series, current –shunt			
2.3 Derivation of input impedance, output impedance, voltage gain, stability factor (for voltage series), simple numerical on feedback			
2.4 Bandwidth of a voltage series amplifier(block diagram only) Feedback with & without bypass capacitor in single stage CE amplifier			
2.5 Emitter follower circuit			
3 Power Amplifiers	**12**	**9**	**CO1/ CO2/**
3.1 Need for Power amplifier, Difference between Power and voltage amplifier			

3.2 single ended power amplifier			**CO4**
3.3 Classification- A, B, AB; operation, comparison.			
3.4 Push pull, complimentary symmetry power amplifier (no analysis)			
4 Oscillators	**12**	**06**	**CO1/ CO3/ CO4**
4.1 Principle of oscillations; Barkhausens criteria			
4.2 Working of RC oscillators- phase shift and Wien Bridge. (numerical for frequency)			
4.3 Working of LC oscillators- Hartley, Colpitts and crystal oscillator (numerical for frequency)			
5 Multivibrators	**09**	**06**	**CO1/ CO4**
5.1 Multivibrator-operation of Astable (simple numerical on T_{on} and T_{off}), Bistable and Monostable (simple numerical on pulse width) type circuit, List of applications			
5.2 Schmitt trigger circuit			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises & practical.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Transistor biasing techniques and amplifiers	15	21
2	Feedback Circuits	12	21
3	Power Amplifiers	9	12
4	Oscillators	6	12
5	Multivibrators	6	9
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS (Any 8)

No	Practical	Marks
1.	Assemble and test fixed bias circuit to determine Q point	
2	Assemble and test voltage divider bias circuit to determine Q point	
3	Assemble & Test a single stage CE amplifier without feedback	
4	Assemble & Test a single stage CE amplifier with feedback	
5	Test the performance of RC coupled amplifier	
6	Assemble and test Emitter follower	
7	Assemble and test performance of class A power amplifier	
8	Assemble and test the performance of Hartley oscillator	
9	Assemble and test the performance of Colpitts oscillator	
10	Assemble and test RC phase shift oscillator	
11	Assemble and test performance of Bistable multivibrator	
12	Assemble and test performance of Astable multivibrator	
13	Assemble and test performance of Schmitt trigger circuit	
	Total	**25**
	Class room Assignments	
	Atleast 2 assignments	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Bhargava & Gupta	Basic Electronics & Linear circuits	McGraw Hill Education
2	Boylestad, Robert & Nashelsky Louis	Electronic Devices and circuit theory	Pearson India Education Services Pvt Ltd
3	Mottershead Allen	Electronic devices and circuits : Introduction	Prentice Hall India Learning Private Limited

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	S Salivahanan N Sreshkumar	Electronic devices and circuits	Tata McGraw-Hill
2	B.L.Theraja A.K.Theraja	A Textbook of Electrical Technology Vol. IV, Electronic Devices and Circuits	S Chand

(EX 602) POWER ELECTRONICS

1. COURSE OBJECTIVE:

This course will enable the students to understand the working of power electronic devices and converter circuits. The course aims to develop an understanding of basic concepts of Power Electronic devices and their working. It also aims at introducing the student to different triggering methods used in power electronics circuits and the working of various converter circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(EX602) POWER ELECTRONICS		03	-	02	05	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Explain working of various power electronics devices and circuits.
2. Demonstrate operation and applications of various power electronics circuits.
3. Distinguish between different types of rectifiers, converters, choppers and inverters.
4. Choose appropriate power electronic circuits for specific applications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	2	1	0	0	1
CO2	2	2	2	3	1	3	1
CO3	2	1	2	3	1	3	2
CO4	2	2	3	3	2	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1. POWER ELECTRONIC DEVICES	**21**	**16**	**CO1**
1.1 Schematic, symbol, working and characteristic of SCR, DIAC, TRIAC, LASCR, UJT, PUT.			**CO2** **CO3** **CO4**
1.2 Two transistor model of SCR, turn on-turn off characteristics of SCR,V-I characteristic of SCR Triggering methods: Voltage triggering, Gate triggering, dv/dt triggering, light triggering.			
1.3 Pulse triggering circuits using UJT & PUT			
1.4 Commutation: types & working of commutation(A ,B,C,D,E and F type) (no waveforms)			
1.5 Protection of Power Electronic Device: Snubber circuit, gate protection and over current protection			
2. PHASE CONTROLLED CONVERTERS	**15**	**06**	**CO1**
2.1 Working of half wave controlled converters with R, RL & RL with freewheeling diode. (input and output voltage waveforms only)			**CO2** **CO3** **CO4**
2.2 Working of full wave Bridge controlled converter with R and RL load, Three phase half wave controlled converter with R load (input and output voltage waveforms only)			
3. CHOPPERS AND SWITCHING MODE REGULATORS	**09**	**06**	**CO1**
3.1 Operation of Single thyristor chopper and two thyristor chopper.			**CO2**
3.2 Circuit diagram and working of Buck and Boost regulators.			**CO3** **CO4**
4. INVERTERS ,UPS AND SMPS	**15**	**08**	**CO1**
4.1 Definition, classification of inverters, Single phase half and full bridge inverter with R load, Series and parallel inverter.			**CO2** **CO3**
4.2 Block diagram of UPS (on-line and off-line), Comparison between Online and Offline UPS, Block diagram of SMPS.			**CO4**
5. AC CONTROLLERS AND CYCLOCONVERTERS	**15**	**12**	**CO1**
5.1 Working of On-Off and Phase Controlled AC voltage controllers, single phase unidirectional and bidirectional AC Voltage controllers with R load (fully controlled).			**CO2** **CO3** **CO4**
5.2 Principle of operation of cycloconverter, single phase to single phase step up (2F) and step down cycloconverter (F/2) (mid-point &bridge configuration) (circuit with waveforms), Applications of Cycloconverters (to list).			
Total	**75**	**48**	**-**

7. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**POWER ELECTRONIC DEVICES**	16	21
2	**PHASE CONTROLLED CONVERTORS**	06	15
3	**CHOPPERS AND SWITCHING MODE REGULATORS**	06	09
4	**INVERTERS ,UPS AND SMPS**	08	15
5	**AC CONTROLLERS AND CYCLOCONVERTERS**	12	15
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS (MIN 8)

No	Practical	Marks
1.	To study V-I characteristic of SCR	
2.	To study V-I characteristic of UJT	
3.	To study V-I characteristic of DIAC and TRIAC	
4	To study V-I characteristic of PUT	
5.	To study the Resistance triggering and Resistance Capacitance triggering of	
6.	To study pulse triggering using UJT and PUT firing circuits	
7.	To study of Half wave controlled rectifier using R load	
8.	To study of Full wave controlled rectifier using R load	
9.	To study of Series and Parallel inverter using SCR	
	Total	
No	**Class room Assignments**	**Marks**
1	Atleast 02 assignments	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Mohammed H. Rashid	Power Electronics	Prentice Hall of India, New Delhi
2	Bhimbhra P.S	Power Electronics	Khanna Publishers New Delhi
3	PC Sen	Power Electronics	McGraw Hill Education Private Limited,India

(EX403) 8051 MICROCONTROLLER

1. COURSE OBJECTIVES:

The course is designed to understand the architecture and features of 8051 microcontroller. The course aims to develop among student understanding to write, debug and execute 8051 programs and to develop 8051 application circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(EX403)		L	T	P	H	TH	TM	TW	PR/OR	
8051 Microcontroller		3	-	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, students will be able to:

1. Explain the features of 8051 microcontroller and contrast between microcontrollers & microprocessors
2. Classify and interpret 8051 assembly language instructions
3. Develop, execute and debug assembly language programs for various applications
4. Interface 8051 microcontroller with external hardware for various applications

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	2	3	1	1	2	3
CO2	2	2	3	3	1	3	3
CO3	3	3	3	3	3	3	3
CO4	2	3	3	2	3	3	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			**M**	**Thr**	**CO**
1 Introduction to microcontrollers and 8051 microcontroller			**15**	**09**	**CO1**
1.1 Definition of embedded system, use of microcontrollers in embedded systems					
1.2 Difference between Harvard and Von Neumann architecture, microcontroller and microprocessor					
1.3 Advantages of microcontroller-based systems					
1.4 Architecture of 8051, it's pin functions, clock and oscillator					
1.5 Memory organization of 8051 – RAM, ROM, SFRs, flags; connections to external memory					
1.6 Ports of 8051 – registers, I/O configuration, features					
2 8051 additional built-in hardware and control			**18**	**11**	**CO1**
2.1 Timers/Counters – registers, modes of operation, configuration					
2.2 Interrupts – types (external & internal), priority, registers, configuration, interrupt-handling, interrupt service routine, ISR vector addresses					
2.3 Serial I/O – registers, configuration, serial data transfer operation					
3 Assembly language instructions for 8051 microcontroller			**12**	**08**	**CO2**
3.1 Addressing modes					
3.2 Assembly language instructions – data move, arithmetic, logical, branching, bit-wise					
4 Assembly language programming for 8051 microcontroller			**18**	**12**	**CO3**
4.1 Programs using assembly language for the following: Data transfer between internal memory locations, data transfer to/from external memory, writing data to and reading data from ports Binary arithmetic (binary addition, subtraction, multiplication, division), BCD addition Logical operations Bit-wise operations Branching operations Subroutines, time delay subroutines, interrupt subroutines **(Students to be examined on assembly language programs that can include a combination of any instructions.** **Minimum instruction set should be provided to students during the examination)**					
5 Interfacing external hardware to 8051 microcontroller			**12**	**08**	**CO4**
5.1 Hardware connections and programs to interface the following to the 8051 microcontroller: LED and seven-segment display, LCD (Only interface diagram, no program for LCD) Switch and matrix keyboard Stepper motor IR sensor					
		Total	**75**	**48**	

6. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies, laboratory practical, etc.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to microcontrollers and basics of 8051 microcontroller	09	15
2	8051 additional built-in hardware and control	11	18
3	Assembly language instructions for 8051 microcontroller	08	12
4	Assembly language programming for 8051 microcontroller	12	18
5	Interfacing external hardware to 8051 microcontroller	08	12
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
	Minimum FIVE - List 1	
1.	Program to add, subtract, multiply and divide two numbers	
2.	Program to add N binary numbers	
3.	Program to add BCD numbers	
4.	Program to transfer N data bytes within memory	
5.	Programs to implement logical instructions AND, OR, XOR, NOT	
6.	Program to implement logical instructions to swap and rotate data	
7.	Program to determine the largest/smallest binary number	
	List 2	
8.	Hardware interface of 8051 board to LEDs and assembly language program for blinking LEDs using bitwise instructions and software time delay routines	
9.	Hardware interface of 8051 board to LEDs and assembly language program for blinking LEDs using timer	
10.	Hardware interface of 8051 board to stepper motor and assembly language program to drive stepper motor	
11.	Hardware interface of 8051 board to LCD and assembly language program to display data on LCD	
	Total	25
No	**Class room Assignments**	
	At least 2 assignments	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Muhammad Mazidi, Janice Mazidi, Colin McKinlay	The 8051 Microcontroller and Embedded Systems	Pearson
2	Kenneth Ayala	The 8051 Microcontroller	Cengage Learning

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	MykePredko	Programming and customizing the 8051 Microcontroller	McGraw-Hill

(EX404) MAINTENANCE AND CIRCUIT SIMULATION USING COMPUTER AIDED DESIGN AND DRAFTING

1. COURSE OBJECTIVES:

The aim of this course is to develop required skills in the students so that they are able to:
(i) Maintain the electronic circuits of various equipment
(ii) Design a Printed Circuit Board
(iii) Simulate a given circuit using EDA tools.

The students will able to:
1. Develop skills to maintain basic electronic circuitry used in consumer goods segments
2. Design a Printed Circuit Board
3. Simulate electronic circuits using EDA tools.

2. TEACHING AND EXAMINATION SCHEME

Semester	**IV**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(EX404) MAINTENANCE AND CIRCUIT SIMULATION USING CADD		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		-	**-**	**4**	**4**	**-**	**-**	**25**	**50**	**75**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Test various electronic components
2. Use test & measurement equipment to find faults and maintain electronic circuits
3. Apply EDA tools to design Printed Circuit Boards.
4. Design, simulate and analyze electronic circuits using EDA tools.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	2	2	1	2	2	2	2
CO2	3	3	1	3	3	2	2
CO3	2	1	3	1	2	2	2
CO4	2	2	2	2	2	2	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	2	0
CO2	2	0
CO3	1	3
CO4	1	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1. Testing of Electronic Components		**14**	**1,2**
1.1 Standard values and ratings of resistors and capacitors			
1.2 Reading of datasheets (IC 741, 555, 723)			
1.3 Testing of passive components- Cold testing of resistors, capacitors, switches, fuses, connectors, inductors, relays, transformers, crystals			
1.4 Testing of active components- Diodes, BJTs, JFETs, MOSFET's, SCR, DIAC,TRIAC, Displays using LED and Opto electronics components, ICs			
2. Testing and Maintenance of Electronic Circuits (Use multimeter)		**10**	**1,2**
2.1 Measurement of A.C. and D.C. voltage			
2.2 Continuity test of PCB track, wiring, switch etc.			
2.3 Inspection of solder joints, defects of soldered joints, defects of soldered joints, use of soldering gun, desoldering tools and rework station.			
2.4 Maintenance of any two home appliances			
3. PCB Design		**18**	**3,4**
3.1 Prepare components for soldering, soldering and de- soldering techniques.			
3.2 Exposure to computer aided PCB making (layout from given schematic)			
3.3 Design of PCB (any electronic circuit) using the automated layout.			
3.4 Concept of machine soldering, SMD soldering (could be imparted though online videos)			
4. Circuit building and debugging using EDA tools		**11**	**3,4**
4.1 Introduction to EDA tools and need for the same			
4.2 Simulation of simple R/RC/RLC networks			
4.3 Simulate a power supply circuit for specified I,V,P rating			
4.4 Simulation of summer/ averaging)/ comparator/ zero crossing detector/ Schmitt trigger/ integrator/differentiator using op-amps			
5. Circuit simulation and documentation using EDA tools		**11**	**3,4**
5.1 Simulation of an astable multivibrator			
5.2 Simulation of a RC amplifier			
5.3 Simulation of an oscillator			
5.4 Simulation of a controller based circuit for specified application			
5.5 Prepare documentation i.e circuit diagram, bill of material, and specification table for any of the simulated circuit.			
5.6 Drafting and modification of piping and instrumentation diagrams. (AutoCAD 3D plant may be used)			
Total	--	**64**	

NOTE 1: For units 3,4 and 5, the student may use software tools like Orcad, Eagle ,TINA, Matlab, Labview, Autocad(P&ID), Automation Studio, Multisim, Proteus or any other suitable suite.

NOTE 2: The practical examination for CADD (50) will be based on the simulations carried out using EDA tools.
Term work marks (25) may be distributed for performance in testing electronic components and fabricating the PCB.

6. COURSE DELIVERY:

The Course will be delivered through lab sessions, study videos, group interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Testing of Electronic Components	14	--
2	Testing and Maintenance of Electronic Circuits	10	
3	PCB Design	18	
4	Circuit building and debugging using EDA tools	09	
5	Circuit simulation and documentation using EDA tools	13	
	Total	64	

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hours
1.	Explore datasheet of any three electronics components/analog/ Digital IC's.	04
2	Testing of passive components- Cold testing of resistors, capacitors, switches, fuses, connectors, inductors, relays, transformers, crystal	04
3	Testing of active components- Diodes, BJTs, JFETs, MOSFET's, SCR, DIAC,TRIAC	04
4	Testing of Displays using LED and Opto electronics components, ICs	02
5	To test continuity of PCB tracks, identify solder defects and rectify faults where possible	02
6	Maintenance/repair (if possible) of any two home appliances	08
7	Study of soldering and de-soldering techniques	02
8	Study of any computer aided PCB making (layout from given schematic)	08
9	Design of a PCB of any electronic circuit	08
	The following circuits may be simulated using any suitable EDA tool	0
10	Introduction to EDA tools and need for simulation Simulation of simple R/RC/RLC networks	02
11	Simulate a power supply circuit for specified I,V,P rating	01
12	Simulation of a summer/ averaging/ comparator/ zero crossing detector/ Schmitt trigger / integrator/ differentiator using opamps	06
13	Simulation of an Astable multivibrator	02
14	Simulation of a RC amplifier	02
15	Simulation of an oscillator	02
16	Simulation of a controller based circuit for specified application	03
17	Prepare documentation i.e circuit diagram, bill of material, and specification table for any of the simulated circuit.	02
18	Use AutoCAD 3D plant to draft and modify piping and instrumentation	02

	diagrams.	
	TOTAL HOURS	64

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Singh K. Sudeep	Troubleshooting and Maintenance of Electronics Equipment	Katson Book, New Delhi, Reprint 2014
2	Khandpur R. S	Troubleshooting Electronic Equipment: Includes Repair and Maintenance	Tata McGraw-Hill Education, New Delhi, India

(EX405) LINEAR INTEGRATED CIRCUIT

1. COURSE OBJECTIVES:

The course is designed to introduce students to working and applications of different Linear ICs. The course aims to develop among student understanding to analyze the working of a given OPAMP based circuits and develop simple circuits using Linear ICs.

2. TEACHING AND EXAMINATION SCHEME

Semester IV									
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	H	TH	TM	TW	PR/OR	
(EX405) LINEAR INTEGRATED CIRCUIT	3	-	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the parameters & specifications of various ICs.
2. Explain op-amp based circuits, 555 timer and regulators.
3. Compare and select appropriate IC based circuit for specific application.
4. Analyze and build IC based circuits.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	3	2	2	1	0	0	3
CO2	3	2	1	2	0	1	2
CO3	3	3	2	2	1	1	2
CO4	2	2	2	1	1	1	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2

CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

Note:- IC Pin diagrams should not be asked in theory examination

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**		
Unit		**M**	**Thr**	**CO**
1Introduction to operational amplifiers		**12**	**8**	**CO1**
1.1 Integrated circuit –List of IC Classification List of IC Packages.				
1.2Advantages of IC over discrete components				
1.3 Op-amp—Block diagram and function of each block				
1.4 Symbol and equivalent circuit of op-amp Pin configuration of IC741.				
1.5 Characteristics of ideal and practical Op-amp.				
1.6 Op-amp Parameters(only definition)- I/p offset voltage, I/p offset current, I/p bias current, o/p offset voltage, input impedance, output impedance, bandwidth, CMRR, slew rate.				
2 Op-amp configuration		**9**	**6**	**CO1,CO2**
2.1 Concept of Negative feedback				
2.2 Voltage series feedback amplifier- block diagram, circuit diagram , expression for voltage gain.(No derivation)				
2.3 Voltage shunt feedback amplifier- block diagram, circuit diagram, expression for voltage gain. (No derivation)				
2.4 Numerical problems based on voltage gain equation				
3 Applications of Op-Amp				
3.1 Inverting Op-amp as summing, scaling , averaging amplifier		**21**	**12**	**CO1,CO2,CO3,CO4**
3.2 Subtractor				
3.3 Voltage to current convertor (with grounded load only)				
3.4 Current to voltage convertor				
3.5 Integrator				
3.6 Differentiator				
3.7 Voltage comparators: Non-inverting with positive and negative reference				
3.8 Clippers: Positive with positive and negative reference				
3.9 Clampers : Non-inverting with positive reference				
4.0 Waveform generators and Filters				
4.1 Op-amp Wein bridge oscillator		**15**	**10**	**CO1,CO2,CO3,CO4**
4.2 Op-amp as Astablemultivibrator				

4.3 Triangular waveform generator.(Using 4.2)			
4.4 Concepts of active filters, comparison of active & passive filters			
4.5 Butter worth low pass filter (1st order only)			
4.6 Butter worth high pass filter (1st order only)			
4.7 Simple numerical problems on above filters.			
5 Special function ICs			
5.1 Block diagram of IC 555 and its pin configuration/ functionality	**18**	**12**	**CO1,CO2,CO3,CO4**
5.2 IC555 as Astablemultivibrator			
5.3 IC555 as Monostablemultivibrator			
5.4 Numerical problems (no derivations)			
5.5 Voltage regulators performance parameters of a regulator – load & line regulation and ripple rejection			
5.6 Salient features of three pin regulators, IC78XX series and IC79XX series fixed voltage regulators.			
5.7 Adjustable Positive voltage regulator using LM317: Circuit diagram, working, Output voltage equation (No derivation)			
5.8 VCO IC 566 block diagram and list of applications			
Total			
	75	**48**	**-**

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Introduction to operational amplifiers	8	12
2	Op-amp configuration	6	9
3	Applications of Op-Amp	12	21
4	Waveform generators and Filters	10	15
5	Special function ICs	12	18
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**	**Marks**
1.	Determine the op-amp parameters	
2.	Determine the gain of Inverting and Non-inverting amplifier using op-amp and compare it with theoretical gain.	
3.	Verify the operation of Adder and Subtractor circuit.	
4.	Verify the working of active integrator and differentiator circuits.	
5.	Assemble and test V to I converter.	

6.	Verify the working of Comparator	
7.	Assemble and test Clipper circuit.	
8.	Assemble and test Clamper circuit.	
9.	Assemble and test first order filter.	
10.	Assemble and test Astablemultivibrator using OPAMP	
11.	Assemble and test a multivibrator circuit using IC 555.	
12.	Assemble and test a IC fixed voltage regulator	
13	Assemble and test an Adjustable positive voltage regulator	
14	Test a VCO.	
	Total	25
	Class room Assignments	
	Atleast 2 assignments	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	RamakantGayakwad	Op-Amps and Linear Integrated Circuit	Pearson Education
2	K.R. Botkar	Integrated Circuit	Khanna

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	David A.Bell	Op-amp & Linear ICs	Prentice Hall of India
2	Dr.Y. Venkataramani	Linear Integrated Circuits & Applications	ISTE

(EX406) ELECTRONIC MEASUREMENT AND INSTRUMENTATION

1. COURSE OBJECTIVES:

The course is designed to introduce students to measurements and measuring instruments and various sensors. The course aims to develop among student the following

1. Employ appropriate instruments to measure a given set of parameters.
2. Deep understanding about blocks in various instruments used in practicals.
3. Identify various sensors that will be useful in measuring different parameters in industry

2. TEACHING AND EXAMINATION SCHEME

Semester	**IV**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(EX406) ELECTRONIC MEASUREMENT AND INSTRUMENTATION		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**5**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the working of analog and digital instruments and transducers
2. Classify different types of errors in measurements
3. Use appropriate instrument/bridges for measurement and testing of electronic circuits
4. Compare and select appropriate transducer/ instrument for specific application

4. Mapping Course Outcomes with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society,Sustainability& Environment	Project Management	Life -long Learning
CO1	3	2	3	0	0	2	3
CO2	3	2	2	2	2	2	3
CO3	3	2	2	2	2	2	3
CO4	2	3	3	3	2	2	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	**PSO2**
CO1	3	2
CO2	3	2
CO3	2	2
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 Basics of Measuring Instruments	**9**	**6**	**1,2**
1.1 Static Characteristics- Accuracy, Resolution (only Definitions)			
1.2 Dynamic characteristics- Speed of response, Lag, Fidelity			
1.3 Error: Systematic, Limiting Errors, numerical on error calculation, systematic and limiting errors.			
1.4 Construction and working of PMMC movement, Block Diagram of Analog Multimeter, Digital Multimeter.			
2 Generators, Bridges and Display	24	15	**3**
2.1 Oscilloscope – Block Diagram of CRT and CRO, Types of CRO- Dual trace , DSO			
2.2 Block Diagram of Function Generator			
2.3 Block Diagram of Basic Spectrum Analyzer			
2.4 Bridges : Wheatstone, Maxwells, Schering, Wein Bridge, along with numerical for each type of bridge.			
2.5 Digital Display- working of LED and LCD			
3 Instrumentation System and Transducers	18	12	**1**
3.1 Block Diagram of Instrumentation System and their functions			
3.2 Transducer – Characteristics, classification(Active and Passive, Analog and Digital)			
3.3Resistive Transducer – Potentiometer, Strain Gauge (Bonded and Semiconductor), RTD, Thermistor.			
3.4 Inductive Transducer : LVDT			
3.5 Capacitive Transducer – Varying of distance, area, permittivity			
3.6 Piezoelectric Transducer – Principle and material used.			
3.7 Optical Transducer : Construction and characteristics of LDR, Photodiode, phototransistor			
3.8 Digital Transducer : construction and working of Shaft Encoders			
4 Applications of Transducers	15	8	**4**
4.1 Displacement Measurement – Linear and angular displacement using Resistive , Capacitive and Inductive Transducer			
4.2 Angular Speed Measurement - Photoelectric pickup, magnetic pick up			
4.3 Pressure Measurement – Diaphragm with strain gauge			
4.4 Level Measurement - Float operated resistive method			
4.5 Flow Measurement : Turbine Meter			
5 Application of Instrumentation Systems	9	8	**4**
5.1 signal conditioning – Need for Signal Conditioning, Block Diagram of AC and DC			
5.2 Block Diagram and applications of the following: • Data Acquisition System • Process Control • SCADA			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Basics of Measuring Instruments	6	9
2	Instrumentation System and Transducers	15	24
3	Instrumentation System and Transducers	12	18
4	Applications of Transducers	9	15
5	Application of Instrumentation Systems	6	9
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Measurement of current, voltage and resistance using PMMC meter	
2	Measurement of current, voltage, frequency and time period using CRO	
3	Testing of Wheatstone's Bridge	
4	Testing of Maxwell's bridge	
5	Temperature measurement using RTD	
6	Displacement measurement using LVDT	
7	Weight measurement using strain gauge bridge	
8	Speed measurement of motor using photo electric pickup	
9	Liquid level measurement	
10	Study of light sensors, photo transducers, Piezoelectric transducer	
	Total	25
	Class room Assignments	
	At least 2 assignments	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Cooper	Electronic measurement and instrumentation	Prentice Hall
2	H. S. Kalsi	Electronic measurement and instrumentation	McGraw Hill India
3	A.K. Sawhney	Electrical & Electronic Measurement and Instrumentation	Khanna Publishers, Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Curtis Johnson,	Process Control Instrumentation technology	Pearson/Prentice Hall
2	Murty, D.V.S.,	Transducers and Instrumentation	Prentice Hall of India, New Delhi,
3	Doeblin,	Measurement Systems: Application and Design	McGraw Hill India

(TR 501) Industrial Training

1. AIM

To expose & prepare the students for the Industrial work situation. This exposure and hands on experience will further enhance the prospects of student fraternity to be better placed on completion of their course.

2. COURSE OBJECTIVES:

The students will able to:

i. Understand functions of various departments of the industry while working in the industry.
ii. Observe & familiarize with features of raw materials, machines, tools, products & processes of theparticular industry
iii. Work in the team to develop teamwork, leadership & communication skills
iv. Develop technical skills as well as soft skills

3. PRE-REQUISITES:

i) Basic Engineering Skills

4. TEACHING AND EXAMINATION SCHEME

Semester	**V**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
		L	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
(TR 501) Industrial Training		0	0	4	4	-	-	30	70	GRADE

08 Weeks

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the organizational set up & functions of various departments in the industry
2. Apply the knowledge gained in the institute to correlate with the actual processes in the industry &Compile relevant data in the form of a report.
3. Develop leadership, teamwork & communication skills while having hands on experience in theindustry
4. Demonstrate consciousness towards safety & environment by adapting to the rules & regulations ofIndustry

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	2	1	2	2	3	3	3
CO2	3	3	2	3	3	3	3
CO3	1	2	2	2	3	3	3
CO4	1	2	1	2	3	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

1.1 Students are required to study and have hands-on experience wherever possible in the following areas (depending on availability):

- Company Profile
- Organizational Structure
- Company Product Range
- Manufacturing Facilities Available /Services provided
- Plant / Facility Layout
- Operations / Production Processes
- Production Planning and Control
- Detail study of Latest Equipment/ Technologies Used
- Stores Functions
- Material Handling Systems/ Equipment
- Quality Management Systems / Functions
- Maintenance and Repair Practices
- Safety Practices / Safety Equipment
- Utilities
- Logistics
- Sales and Marketing
- Ethics, Statutory Rules and Regulations followed
- Product Design and Development
- Any other area specific to the Industry providing Training

8. TERM WORK & PRACTICALS

Evaluation Scheme					
TW				**PR/OR**	TOTAL Marks
Attendance Marks*	Industrial Mentor's assessment Marks	Institute Mentor's assessment Marks	Training Report	Report Assessment & Seminar/Viva	
10	**20**	**20**	**20**	**30**	**100**

* 01 mark shall be deducted for every Absence (with or without permission).

Daily Dairy:
The daily dairy should-be maintained in a book. It should reflect the day to day activities performed by the student (including task, men and materials involved). It should be counter signed by the Industry Mentor. It will become the basis for writing reports on the complete training.

Training Report
The training report should be submitted by the training students should include the following salient points- Certificate from institute, Certificate of training from company, detailed write up as per daily dairy, detailed drawings, working drawings, photographs, safety precautions, techniques for work minimization on site, organizational chart, Importance of project to the society, special methods/techniques/equipment should be separately high lightened, including environmental aspects. The report should be informative and technical, typed with double spacing on good quality bond paper and bound. Assessment of Training Report be based on Knowledge, Presentation, and Quality of contents and sketches.

Note:

a. Student/s undergoing Industrial Training shall follow Rules and Regulations of the Industry.
b. Industrial Training will generally be organized and conducted in accordance with Industrial TrainingManual duly prescribed by the Board.

9. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS

Unit No	Name of the Unit	Teaching Hours	Marks
1	**PR/OR**	**08 weeks**	**30**
2	**TW**		**70**
	Total	**08 weeks**	**100**

Note:

1. For Industrial training Grades will be awarded based on marks scored as follows:

80% and above Marks – Grade 'A'
60% to 79% Marks – Grade 'B'
40% to 59% Marks – Grade 'C'
Marks below 40% - Grade 'D'

2. TW and PR/OR shall be separate heads of passing. Student has to secure minimum Grade 'C' forpassing.

(CC 602) BUSINESS COMMUNICATION

1. COURSE OBJECTIVES:

The students will able to:

1. Use speaking, writing and presentation skills to communicate effectively.
2. Develop business etiquettes, manners, grooming and improve personal appearance
3. Improve non-verbal forms of communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(CC 602) BUSINESS COMMUNICATION		-	-	2	2	-	-	25	25	50

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC602.CO1: Apply principles of effective communication in business environment

GC602.CO2: Use ICT in business communication effectively.

GC602.CO3: Demonstrate soft skills required in business environment.

GC602.CO4: Prepare technical writing for various functions of business communication.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	0	1	0	1	2	2	0	1
CO2	2	2	2	1	2	2	3	1	2
CO3	2	2	2	1	2	2	3	1	2
CO4	1	1	1	1	2	3	3	0	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Phr =Practical hours**	**CO = Course Outcomes**		
Unit			**M**	**Phr**	**CO**
1 COMMUNICATION SKILLS AT WORKPLACE					
1.1 **Principles of communication in business** Importance of communication in a business organization, types of communication (formal and informal Internal and External Communication), Channels of communication: Vertical, Horizontal, Diagonal, Grapevine				04	CO1 CO2 CO3 CO4
1.2 **Modern Office technology for communication**: email communication and sending text (etiquettes, components, tips for writing effective emails, spellcheck), internet and use of social media for work (to communicate, search for information about suppliers, specifications, networking, quick feedback, e-commerce, video conferencing)					
2 SEMINARS					
2.1 **Organization of seminars and workshops** Organizers role: planning, objectives, topic selection, planning the date, time, venue, creating event organization material: creating Facebook page, WatsApp group, invitations, advertisement on pamphlet, hand-outs, signage, name badges, registration form, press note, inviting key note speaker, schedule				06	CO1 CO2 CO3 CO4
2.2 **Presentation** Speakers role: Gathering relevant material, organization of the material, knowing the occasion and audience, preparing handouts for distribution, time management, interaction with audience, non-verbal communication. (Checklist of significant aspects of oral presentation to be provided)					
2.3 Role of audience Audience's role: Listening effectively and asking relevant questions, note taking					
3 TECHNICAL WRITING					
3.1 Reports Understanding objective report writing, types of reports, parts of a formal report, illustrations inspection reports: procedure and format, Project Report				10	CO1 CO2 CO3 CO4
3.2 Business letters Sales letters: parts of sales letter complaint letters: elements of a complaint letter adjustment letters: elements of an adjustment letter					

3.3 Tenders procedure, Preparation, Types of tenders, Single tender, limited tender, Open tenders, government e tender, structure of a tender document, tender notice, terms and conditions, payment details, specification, documents to be submitted, drafting advertisement for tender. **3.4** Generic notices, notice for meetings: purpose, format of notice for meeting, agenda, quorum and writing minutes			
4 JOB INTERVIEWS			
4**.1 Job application and resume** draft job application and resume, draft letter of acceptance and cold contact letter		06	CO1 CO2 CO4
4. 2 **Job interviews** preparing for job interview, guidelines on facing job interviews, mock interviews			
5 SOFT SKILLS **5.1Business etiquettes** Importance of business etiquettes and manners, Tips for good business etiquettes		06	CO1 CO2 CO3 CO4
5.2 Nonverbal Communication grooming, personal appearance, hygiene, deportment and body language **5.3 Interpersonal skills** Leadership skills, team work, active listening **5.4 Critical thinking** How to improve critical thinking, tips for critical thinking			
Total		**32**	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**	**Marks 25**
	Practical Title	
1.	Modern office technology	03
2.	Seminar	03
3.	Technical writing	10
4.	Job interviews	04
5	Soft skills	05
	Total	25
No	**Class room Assignments**	
1	Email communication	
2	Power point presentation	

3.	Drafting seminar invites	
4.	Drafting hand outs for seminars	
5	Drafting sales letter	
6	Drafting complaint letters	
7	Drafting adjustment letters	
8	Drafting tender notice	
9.	Filling maintenance reports	
10.	Drafting inspection reports	
11	Drafting abstract	
12	Drafting notice for meetings	
13	Drafting agenda of meetings	
14	Drafting minutes of meeting	
15	Drafting resume and job application	
16	Drafting letter of acceptance	
17	Drafting cold contact cover letter	
18	Group discussions	
19	Debates	
20	Group presentations	

8. LEARNING RESOURCES

8.1 Reference books

S. No.	Author	Title of Books	Publishers
1	P.Prasad, Rajendra k. Sharma	The functional aspects of communication skills	s.k. kataria &sons
2	Pal & Rorualling	Essentials of business communication	Sultan chand & sons
3	Grount Taylor	English conversation practice	Tata MCgraw Hill
4	R.C. Sharma & Krishna Mohan	Business Correspondence & report writing	Tata MCgraw Hill

(EX 501) PROGRAMMABLE LOGIC CONTROLLERS (PLC)

1. AIM

1. To introduce students to PLC Hardware and programming concepts

2. COURSE OBJECTIVES / RATIONALE:

The students will able to:

1. To understand working of a PLC based System.
2. Write simple programs using ladder symbols and functional blocks.

3. PRE-REQUISITES:

Students should know

1. Working of Digital Circuits like Shift Registers, Counters, ADC and DAC.
2. Working of a Relay and Power electronic devices like Diac and Triac.

4. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	C	TH	TM	TW	PR/OR	
(EX 501) PROGRAMMABLE LOGIC CONTROLLERS (PLC)		3	-	2	5	75	25	25	-	125

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Describe the hardware and I/O interface of PLC system.
2. Describe the procedures to commission and test PLCs in Industrial Automation Systems.
3. Develop and troubleshoot ladder programs for PLCs.
4. Design a simple automated system using PLCs.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	2	0	1	0	0	2	2
CO2	2	2	1	2	2	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	2	1
CO4	2	1

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1. PLC HARDWARE	**18**	**12**	**CO 1**
1.1 Introduction: Definition, Features, Advantages, Applications			
1.2 Types of PLC : Single box & Modular, Small, Medium and Large PLC			
1.3 PLC system: General Block diagram, Internal architecture (block diagram): CPU, Buses & Memory.			
1.4 Input and output: Types of I/O signals – Analog, Digital and Discrete Types of I/O Connections – Sourcing and Sinking Input Units: DC input unit, AC input Unit and Analog input Unit. Output Units: Basic forms of Relay output unit, transistor output unit and Triac output unit. I/O Addressing: The general format of an I/O address.			
2. PLC Instructions and Functional Blocks	18	12	**CO 3 CO 4**
2.1 PLC ladder diagram conventions, rules, standard IEC 1131-3 symbols.			
2.2 Data handling instructions – Data movement (MOV), Data comparison (EQUAL, NOT EQUAL, LESS THAN, LESS THAN OR EQUAL, GREATER THAN, GREATER THAN OR EQUAL, MASKED COMPARISON FOR EQUAL, LIMIT TEST)			
2.3 Mathematical instructions(ADD, SUBTRACT, MULTIPLY,			

DIVIDE, SQUARE ROOT)			
2.4 SET and RESET Instructions			
2.5 Subroutine: call to subroutine, return to main program			
2.6 Shift registers: Introduction, function, (SHIFT LEFT, SHIFT RIGHT, SHIFT 1 BIT AND 4 BIT AT A TIME).			
2.7 Internal Relays: Function of internal relays, Addressing of internal relays, battery backed relays, master control relay.			
3. TIMERS & COUNTERS	12	8	**CO 3 CO 4**
3.1 Timers: Function and list of applications of On-delay timers, Off-delay timers, Retentive Timers, Non retentive Timers, Pulse timers, Cascaded timers.			
3.2 Timer Parameters: Preset value, Time base, Total time delay, Significance of Timer timing and Timer Out.			
3.3 Counters: Function and list of applications of Up and Down counters.			
3.4 Counter Parameters: Preset value, Accumulated Value, Clock Input and counter Overflow and Underflow indications			
4. PROGRAMMING a PLC	15	8	**CO 3 CO 4**
4.1 ladder programs to represent logic functions (AND, OR, NOT, NAND, NOR, XOR)			
4.2 ladder programs for switches, latching circuits, multiple outputs and sequenced outputs			
4.3 Ladder programs and functional block diagrams from boolean expressions(POS, SOP)			
4.4 Simple Ladder programs using data handling and mathematical instructions.			
4.5 Simple Ladder programs using internal relay, master control relay and shift register.			
4.6 Simple Ladder programs using timers and counters			
5. DESIGNING SYSTEMS	**12**	**8**	**CO 2**
5.1 Brief overview of steps in systematic designing of a PLC based System.			
5.2 Safety in PLCs – emergency stop relays.			
5.3 Commissioning a PLC – Testing of inputs & outputs, Testing Software, and Simulation.			
5.4 Fault finding: Fault detection techniques – timing checks, last output set, replication and expected value checks.			
5.5 Brief overview of System documentation.			

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	PLC HARDWARE	12	18
2	PLC INSTRUCTIONS AND FUNCTIONAL BLOCKS	12	18
3	TIMERS & COUNTERS	08	12
4	PROGRAMMING A PLC	08	15
5	DESIGNING SYSTEMS	08	12
		48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Introduction to the PLC simulation software.	
2.	Compare Specifications of different PLCs	
3.	Ladder programming for logical functions	
4.	Ladder programming for latching functions	
5.	Ladder programming for data manipulation functions	
6.	Ladder programming for mathematical functions	
7.	Ladder programming for shift registers functions	
8.	Ladder programming for internal relay and master control relay functions.	
9.	Ladder programming for timer functions	
10.	Ladder programming for counter functions	
11.	Micro Project (simple Application)	
No	**Class room Assignments**	**Marks**
1	Atleast 02 assignments.	
...		
No	**Tutorial Exercise**	**Marks**
1	To be decided by the subject teacher as per requirements	
...	Total	25

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	William Bolton	Programmable Logic Controllers 5th Edition	ELSEVIER, Newnes. ISBN:978-93-80501-46-8
2	Frank D Petruzella	Programmable Logic Controllers 3rd Edition	McGraw Hill Higher Education or TMH

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Madhuchhanda Mitra, Samarjit Sen Gupta	PLC & Industrial Automation an introduction 5th Edition	PENRAM International publishing ISBN:9788187972297
2	John W. Webb, Ronald A. Reis	Programmable Logic Controllers: Principles and Applications 5th Edition	Prentice Hall of India ISBN :978-8120323087
3	George Batten	Programmable Logic Controllers.	Tata McGraw Hill

(CC601) INDUSTRIAL ORGANISATION AND MANAGEMENT

1. COURSE OBJECTIVES:

Management is the basic need of any organization. Organization consists of multiple activities which are to be systematically managed for effective output. The course covers various principles related to organization and management. The areas covered are finance, human resource, project management etc. After completion of the course, the student will be acquainted with management and other related aspects so that he/she will be able to apply this knowledge in order to achieve the organizational goals.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
CC601 INDUSTRIAL ORGANISATION AND MANAGEMENT	L	T	P	H	TH	TM	TW	PR/OR	100
	3	-	-	3	75	25	-	-	

3. COURSE OUTCOMES

On successful completion of the course, the student will be able to:

CC601.CO1: Describe types of business organizations.

CC601.CO2: Apply the principles of managing Men, Machines, and Materials in an industry.

CC601.CO3: Evaluate financial status of an industrial organization.

CC601.CO4: Develop problem solving skills in project management**.**

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	0	0	0	0	1	0	1	2
CO2	2	1	1	1	1	2	2	1	3
CO3	3	2	1	2	3	3	2	1	3
CO4	3	3	2	2	2	3	3	2	3

Relationship: Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS/ MICRO-LESSON PLAN

M=Marks | Thr= Teaching hours | CO= Course Outcomes			
Unit	**M**	**Thr**	**CO**
1. BUSINESS ORGANIZATION **1.1** Types of business organizations: Individual proprietorship, Partnership, Joint Stock Companies: Private Ltd and Public Ltd, Co-operative societies, Public sector **1.2** Structure of business organization: Line organization, Functional Organisation, Line and staff organization, Project organization	10	6	CO1 CO2
2. BUSINESS MANAGEMENT **2.1:** Concept of management and administration, management as an art and science, evolution and growth of scientific management- contribution of F.W Taylor. **2.2** Basic functions of management: planning, organizing, staffing, directing, controlling. Other functions: forecasting, coordinating and decision- making. **2.3** Functions in Industry: Basics of Procuring, store- keeping, material handling, production, packing and forwarding, marketing and sales, supervision, research and development. **2.4** Supervisory skills required in industry	16	9	CO1 CO2 CO3
3. BASICS OF FINANCE **3.1** Sources of finance **3.2** Cost Concepts: Necessity of costing, elements of cost: material, Labour and expense; prime cost, overhead cost, total cost, And break- even analysis. **3.3** Materials management: Inventory control-standard order, reserve stock, reorder point, lead time. Economic order quantity, ABC Analysis. Introduction to Just in time (JIT) system **3.4** Depreciation: Definition and causes. Methods of calculating depreciation charges: Straight Line Method, Diminishing Balance Method, Sinking Fund method .(Simple Numericals) **3.5** Obsolescence- definitions and reasons. **3.6** Introduction to GST.	18	13	CO1 CO2 CO3 CO4
4. HUMAN RESOURCE MANAGEMENT **4.1** Functions of Personnel Department**:** Human resource planning, selection and recruitment, training, promotion and transfer, welfare of employees. **4.2** Industrial Relations**:** Employer-employee relations, trade union, settlement of disputes of employees, collective bargaining, conciliation, arbitration, grievance handling mechanism. **4.3** Wages and Incentives**:** Factors influencing wages, types of wage plans – time rate and piece rate, Incentive – objectives and types, individual and group incentive plan, characteristics of a good wage or incentive plan, difference between incentive and	21	14	CO1 CO2 CO3 CO4

wage. **4.4** Industrial Acts: Introduction to the following Industrial Acts: Industrial Disputes Act 1947/1956; The Indian Factories Act 1948 The Workmen's Compensation Act 1923			
5.PROJECT MANAGEMENT **5.1** Introduction to Project Management **5.2** Network Analysis (Introduction to basic concepts with simple Numericals) CPM- Critical Path Method: Definition, network diagrams, critical path, advantages PERT- Programme Evaluation and Review Technique: Definition, network diagrams, advantages. Comparison of PERT and CPM.	10	6	CO1 CO2 CO3 CO4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Business Organization	6	10
2	Business Management	9	16
3	Basics of Finance	13	18
4	Human Resource Management	14	21
5	Project Management	6	10
	Total	**48**	**75**

8. LEARNING RESOURCESText

Books

S. No	Author	Title of Book	Publisher
1	O.P. Khanna	Industrial Engineering and Management	Dhanpat Rai Publications
2	T. R. Banga ,S.C. Sharma	Industrial Organisation and Engineering Economics	Khanna Publishers
3	Awate, Chunawala, Patel, Bhandarkar, Sriniwasan	Industrial Organisation and Management	Vrinda Publication
4	Martand Telsang	Industrial Engineering and Production Management	S.Chand & Company Ltd

AUDIT COURSE

(AC101) ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

1. COURSE OBJECTIVES:

This course aims at imparting basic principles of thought process, reasoning and inferencing by human being. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogis, science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course thus focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view, basic principles of Yoga and holistic health care system.

2. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(AC101) Essence of Indian Knowledge and Tradition		L	T	P	H	TH	TM	TW	PR/OR	
		2	-	-	2	-	-	-	-	-

Course Content:

Basic Structure of Indian Knowledge System:

(i) वेद (ii) उपवेद(आयुर्वेद धनुर्वेद गन्धर्ववेद स्थापत्यवेद) (iii) वेदांग (शिक्षा कल्प निरूक्त व्याकरण ज्योतिष छंद) iv) उपांग (धर्मशास्त्र मिमांसा पुराण तर्कशास्त्र)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India-Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amakuam
6.	Science of Consciousness Psychotherapy and Yoga Practices	RN Jha	Vidyanidhi Prakasham, Delhi, 2016

ELECTIVES – SEMESTER V

(EX 614) Audio & Video Engineering

1. AIM

1. To enable the students to understand the concept of sound & video recording.
2. To enable them to analyze composite video signal B/W as well as colour & VSB modulation.
3. To enable them to understand performance of B/W & colour picture tube, TV transmitter & receiver.
4. To introduce LCD & LED TV block diagrams.
5. To understand the performance of HDTV, CCTV. DTH etc.

2. COURSE OBJECTIVES :

The course will introduce the students with working principle, block diagrams of sound transducers, B/W & colour TV, LCD, LED TV, CCTV, DTH, HDTV, cable TV so that they will be able to install, test & troubleshoot simple faults in audio & Video equipment.

1. PRE-REQUISITES:

Students should know
1 .Electronic Circuits
2. Analog Communication

4. TEACHING AND EXAMINATION SCHEME

Semester	**V**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(EX 614)		**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
Audio & Video Engineering		**3**	**-**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

5.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1.Understand various concepts and characteristics of Audio Transducers.
2 Describe applications of TV such as CCTV, CATV, HDTV, DTV, DTH, LCD & LED TV.
3.Differentiate between various audio & Video recorder formats.
4. Analyze and compare B/W & colour TV system

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainability &	Project Management	Life -long Learning
CO1	2	0	0	3	0	0	3
CO2	2	1	0	3	0	0	0
CO3	2	0	2	0	0	3	3
CO4	2	1	2	3	0	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1 SOUND TRANSDUCERS			**15**	**9**	**CO 1**
1.1 Characteristics: sensitivity, signal to noise ratio, directivity, output impedance, distortion and frequency response					
1.2 Requisites of a good microphone. Construction, functioning, features, and applications of microphones: Crystal, Moving coil. And Electret.					
1.3 LOUD SPEAKERS**:** Characteristics of loudspeaker Working principles of horn type and electrodynamic type loudspeaker Baffles(Finite, infinite ,bass reflex & acoustic labyrinth) Enclosure, Multiway speaker system (Woofers & Tweeters),surround sound system(block diagram)					
2 TV COMMUNICATION SYSTEM			18	12	**CO 4**
2.1 TV PICTURE ANALYSIS: -Frequency range of various VHF/UHF band, Aspect ratio, Persistence of vision.					
2.2 Scanning: Need, Sequential scanning, flicker, interlaced scanning, interlace error, interlace error calculation, horizontal scanning, vertical scanning					
2.3 Composite Video Signal (CVS) .need for synchronization, Horizontal					

sync and blanking pulses, Vertical sync and blanking,(No equalizing pulses).			
2.4 TV Camera tube: Characteristics of camera tube, construction and working of vidicon			
2.5 VSB Modulation			
3 COLOUR TELEVISION	18	10	**CO 4**
3.1Compatibility of color TV system with monochrome system.			
3.2 Additive and subtracting mixing of colours, luminance, Hue and Saturation			
3.3 Block diagram of video camera and its explanation			
3.4 Construction and working principles of Trinitron picture tube.			
3.5 Colour signal transmission, signal modulation, transmission, bandwidth, weighing factors & chrominance signal			
3.6 Block diagram of PAL TV transmitter & receiver.			
4 TYPES OF TV & APPLICATIONS	15	11	**CO 3**
a. Introduction to DIGITAL TV (DTV):Advantages (picture quality, special features, special effects, high reliability) Digital Video production & Reproduction (Block Diagram) Digital picture transmission & Reception (Block Diagram) Picture in picture feature in DIGITAL TV Principles of working HDTV			
4.2 Principle of working, features& Block diagram of Cable TV, PAY TV THROUGH CABLE,CCTV and DTH.			
4.3 LCD TV & LED TV: Introduction & block diagram			
4.4 Night vision camera			
5 VIDEO RECORDING & PRODUCTION	9	6	**CO 3**
5.1 Comparison VCD verses DVD			
5.2 DVD formats, recording and playback on DVD			
5.3 Introduction to BLU-RAY DISC, Block diagram BD player & operation			
5.4 Comparison of BLU-RAY &DVD			
Total	**75**	**48**	

8. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies.

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Sound Transducers	9	15
2	TV Communication system	12	18
3	Colour Television	10	18
4	Types of TV & Applications	11	15
5	Video Recording & Production	6	9
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1	Test performance of pattern generator.	
2	Compare composite video signal (B/W) of different patterns	
3	Test performance of picture tube (B/W).	
4	Compare composite video signal (colour) of different patterns.	
5	. Test performance of TV receiver controls	
6	Test performance of picture tube (colour)	
7	Tracing of different sections of TV receiver	
8	Location of faults in the different sections of TV receiver	
9	. Study of a TV cable network system through internet	
10	Study of a CCTV system through internet	
No	**Class room Assignments**	**Marks**
1	At least 02 assignments	
2		
...		
No	**Tutorial Exercise**	**Marks**
1		
2		
...	Total	25

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.R Gulati	Modern Television Practice Principles,Technology and Servicing 2/Ed	New age Internationl Publisher, New Delhi **ISBN-** 9788122413601
2	. R.R Gulati	Composite Satellite & cable Television	New age Internationl Publisher, New Delhi **ISBN-** 9788122413601
3	A.M.Dhake	TV and Video Engineering	TMH Publication, New Delhi **ISBN**: 9780074601051
4	Gordon J King	Audio Handbook	Newnes-Butterworth **ISBN-13:**9780408001502
5	Maini	Colour T.V. and Video Technology	PHI Publications. New Delhi
6	K.D. Desai,	Video Cassette Recorders	Jeevan Deep Prakashan, Mumbai, 2nd , 1988
7	Ibrahim, K.F. Newnes	Guide to Television and Video Technology, Fourth Edition	Newnes-Butterworth **ISBN-13:** 9780750681650
8	John D. Lenk	Complete Guide To Laser Video Disc	PHI Publications. New Delhi, 2nd, 1995
9	R.G.Gupta	Television Engineering and video systems . second edition	second edition ,MH New Delhi
10	R.G.Gupta	Audio &Video Systems	TataMc-GrawHill education ,Delhi.
10	LCD LED Screen Panel Repair Guide	http://lcdrepairguide.com/screen-repair/	

(EX613) Advanced Microcontroller

1. AIM:

To understand advanced microcontroller concepts, interface ARM microcontroller to external hardware and program ARM-based systems for various applications

2. COURSE OBJECTIVES / RATIONALE:

Students will be able to:

1. Understand advanced microcontroller concepts
2. Interface ARM microcontroller to external hardware
3. Program ARM-based systems using assembly and embedded C languages

3. PRE-REQUISITES:

Students should have the knowledge of:

1. Digital electronics and number systems
2. Basic microcontrollers
3. Computer programming and assembly language programming

4. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(EX613) Advanced Microcontroller		L	T	P	C	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

5. COURSE OUTCOMES:

On successful completion of the course, students will be able to:

1. Recall and explain the features of ARM7TDMI microcontroller
2. Compare/contrast and select appropriate interface for a given application
3. Develop, execute and debug assembly language and embedded C programs for various applications
4. Interface ARM7TDMI microcontroller with hardware for various applications

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainability &	Project Management	Life -long Learning
CO1	2	3	3	0	0	0	3
CO2	0	3	3	0	0	0	3
CO3	0	3	3	3	3	3	3
CO4	2	3	3	3	3	3	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	0
CO2	3	0
CO3	3	3
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1 Introduction to ARM7TDMI			**12**	**7**	**CO1**
1.1 ARM7TDMI architecture, block diagram, functional diagram					
1.2 ARM7TDMI register set, 32-bit CPU registers, CPSR and SPSR registers					
1.3 ARM7TDMI three-stage pipeline					
1.4 Memory map and memory interfacing, implementation of stack					
1.5 AMBA overview					
2 ARM7TDMI on-chip peripherals			**18**	**12**	**CO1**
2.1 Timer – features, pin and register description, timer-handling					
2.2 Serial port – configuration, interfacing PC with microcontroller, UART0 and UART1-handling					
2.3 Interrupt – IRQ, FIQ, ISR and interrupt-handling					
2.4 ADC – built-in ADC, interfacing external device to ADC					
2.5 PWM – register description, application					
2.6 Real time clock – RTC features, RTC register description, RTC interrupts					
2.7 Flash – flash memory system					

2.8 Watchdog timer			
3 Communication protocols for interfacing	**10**	**6**	**CO2**
3.1 I2C interface – features, architecture, pin and register description, applications			
3.2 SPI interface – features, architecture, pin and register description, applications			
3.3 Introduction to CAN interface			
4 ARM7TDMI instruction set and programming **(Students to be examined on assembly language programs that can include a combination of any instructions.** **Minimum instruction set should be provided to students during the examination)**	**20**	**13**	**CO3**
4.1 32-bit ARM instruction set			
4.2 16-bit THUMB instruction set			
4.3 Simple programs using different types of ARM instructions			
5 Interfacing ports to external devices	**15**	**10**	**CO4**
5.1 Hardware interfacing to output devices and programming - LED, seven-segment LED display, LCD, motor			
5.2 Hardware interfacing to input devices and programming - Switches, matrix keypad			
5.3 Hardware interfacing to sensors and programming - IR, temperature sensors			
Total	**75**	**48**	

8. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies, laboratory practical, etc.

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to ARM7TDMI	7	12
2	ARM7TDMI on-chip peripherals	12	18
3	Communication protocols for interfacing	6	10
4	ARM7TDMI instruction set and programming	13	20
5	Interfacing ports to external devices	10	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
	Minimum eight to be performed	
1.	Program to add n binary numbers	
2.	Programming of timer for 8-bit PWM Generation	
3.	Programming of timer for variable frequency square wave generation	
4.	Programming of timer for frequency measurement and display on LCD	
5.	Programming of on-chip ADC	
6.	Programming of SPI port for interfacing with ADC MCP3304	
7.	Programming of SPI port for interfacing with DAC MCP4822	
8.	Programming of GPIO port for LED flashing	
9.	Programming of GPIO port for key interface	
10.	Programming of timer for accurate delays	
11.	Programming of UART for interfacing with PC	
	Total	25
No	**Class room Assignments**	**Marks**
	Atleast 2 assignments	
No	**Tutorial Exercise**	**Marks**
	To be decided by the subject teacher	

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Andrew N.SLOSS, Dominic SYMES and Chris WRIGHT	ARM System Developers Guide, Designing and Optimizing System Software	ELSEVIER
2	Steve Furber	ARM System-on-Chip Architecture, Second Edition	PEARSON

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	William Stallings	Operating Systems	Pearson

(EX611) Biomedical Instrumentation

1. AIM

Students of electronics engineering related branches opting for this course will be introduced to the basic concepts of biomedical instrumentation enabling them to pursue a career in the health care sector.

2. COURSE OBJECTIVES:

The students will able to:

1. Assist doctors in a hospital as biomedical engineers.
2. Work as service engineers for medical equipment maintenance.

3. PRE-REQUISITES:

1. Knowledge of basic principles of physics
2. Knowledge of basic electronics
3. Knowledge of sensors and transducers

4. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	C	TH	TM	TW	PR/OR	
(EX611) Biomedical Instrumentation		3	-	2	5	75	25	25	25	150

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Demonstrate a knowledge of the working principles of clinical laboratory instruments
2. Perform various physiological measurements
3. Perform pulmonary function measurements
4. Demonstrate a knowledge of medical imaging equipment and nuclear medicine

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainability &	Project Management	Life -long Learning
CO1	2	0	1	3	2	0	0
CO2	3	0	1	3	3	0	2
CO3	2	0	1	2	3	0	0
CO4	2	0	1	1	3	0	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	1	0
CO2	2	1
CO3	2	1
CO4	2	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH= Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**TH**	**CO**
1 CLINICAL LABORATORY INSTRUMENTS			**12**	**08**	**CO1**
1.1 Medical diagnosis with chemical test, principles of spectrophotometry, colorimeters and clinical flame photometers					
1.2 Types of blood cells, methods of blood cell counting- microscopic method, automatic optical method, electrical conductivity method, coulter counter					
2 PHYSIOLOGICAL INSTRUMENTATION			18	12	**CO2**
2.1 Origin of bioelectric signals, recording electrodes, electrode tissue interface, polarization, skin contact impedance, motion artifacts. Block diagram of a typical biopotential recording system					
2.2 Block diagram of Electrocardiogram system, ECG leads, effects of artefacts on ECG recordings					
2.3 Electroencephelogram (EEG)-Block diagram, electrode placement					
2.4 Electromyography(EMG)-generation of EMG signals					
2.5 Evoked response potentials					
2.6 Blood pressure , blood pressure measurement using korotkoff's method (sphygmomanometer), Invasive measurement of blood pressure					
2.7 Measurement of Oxygen in the Blood, working of Pulse Oximeter					

3 PULMONARY FUNCTION MEASUREMENTS	12	04	**CO3**
3.1 Respiratory volumes and capacities			
3.2 Spirometry and its applications, Working of water seal spirometer, wedge spirometer and Fleisch- pneumotachometer			
3.3 Measurement of volume- flow volume curve			
4 MEDICAL IMAGING FUNDAMENTALS	21	12	**CO4**
4.1 Basics of Diagnostic Radiology, Nature and properties of x-rays, production of x-rays, stationary anode tube, Rotating Anode tube, x-ray machine, collimators & grids, x-ray films, x-ray Image intensifier			
4.2 Principle of computed tomography			
4.3 Principles of Magnetic resonance imaging (MRI) systems, Basic NMR components, Biological effects of NMR imaging, advantages of NMR imaging system.			
4.4 Diagnostic ultrasound-nature of ultrasound, ultrasound generators, interaction of ultrasound with matter, Pulse-Echo display modes in ultrasonic imaging(A-mode, B-mode and M-mode), Components of an ultrasound System (Block diagram level), Scanning probes (working of linear array and curved array transducer), Principle and Applications (listing only) of Doppler ultrasound, Principle of Echocardiography			
5 NUCLEAR MEDICINE	12	12	**CO4**
5.1 Radioactivity, radioactive decay law, interaction of radiation with matter			
5.2 Working of Scintillation detectors and Gamma Camera			
5.3 Principles and applications of SPECT and PET			
5.4 Radiation hazards and prevention, biological effects of radiation Exposure			
Total	**75**	**48**	**-**

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Clinical laboratory instruments	08	12
2	Physiological instrumentation	12	18
3	Pulmonary function measurements	04	12
4	Medical imaging fundamentals	12	21
5	Nuclear medicine	12	12
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Blood pressure measurement using a sphygmomanometer	
2	Study of ECG signal measurement	
3.	Study of patient monitoring system	
4.	Study of x-ray machine	
5.	Study of CT-scanner	
6.	Study of MRI scanner	
7.	Study of Sonography machine	
8.	Field visit to a hospital to study hospital layout, patient monitoring system, x-ray machines, CT-scanners, MRI scanners, pathlab, etc.	
9.	Field visit to an occupational health centre to study pulmonary function measurements	
	Total	25

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.S. Kandpur	Handbook of biomedical instrumentation	McGraw Hill
2	Leslie Cromwell	Biomedical instrumentation and measurements	
3	John webster	Medical Instrumentation	John Wiley and sons
4	Satish K Bhargava	Step by Step: Ultrasound	
5	Sandra L. Hagen-Ansert	Textbook of diagnostic sonography	

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	D. Jennings, A. Flint, B.C.H. Turton and L.D.M. Nokes	Introduction to Medical Electronics Applications	Edward Arnold,
2	Ramesh Chandra	Introductory Physics of Nuclear Medicine	Lea & Febiger
3	Harry E Thomas	Handbook of biomedical instrument and measurement	Prentice Hall

(EX612) Autonomous Robots

1. AIM

Robotics is a fast –Growing field whose definition has been evolving over time, along with the field itself. Other than industrial applications, Robots are increasingly being used in newer field of application like medicine, space, exploration, and hazardous environment, military and domestic use. There is huge demand for innovation in autonomous robots in new areas like virtual reality, cars, personal care for disabled people. Robots are likely to be common basic necessity as human try to survive in a harsher future with security treats, depleted natural recourses and global climatic changes

2. COURSE OBJECTIVES / RATIONALE:

- To introduce students to Arduino Interactive Development IDE
- To enable them to understand the working and various types of Arduino board
- To help them build innovative projects using Arduino and IOT
- To introduce students to Internet of Things

3. PRE-REQUISITES:

Students should know

- programming concepts
- processing unit

4. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(EX612) Autonomous Robots	**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	**150**
	3	-	2	5	75	25	25	25	

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the concept of Arduino processor and IOT
2. Apply the basic protocol and working principle of interfacing Modules.
3. Analyze various application program for wide range of Arduino processors
4. Design, debug and troubleshoot Arduino/IOT based project

6. Mapping Course Outcomes with Program Outcomes

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentn&	Engg. Practices for Society,Sustainability &	Project Management	Life - long Learning
CO1	3	2	1	0	0	0	2
CO2	2	3	2	1	2	0	3
CO3	0	3	3	2	3	0	3
CO4	0	3	3	3	3	3	3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**	

Unit	**M**	**TH**	**CO**
1 Autonomous Robotics			
1.1 definition of Robot, industrial Robot, Autonomous Robot, Applications 1.2 Autonomous Robot Types: wheeled and Legged, types of Stability: dynamic and Static 1.3 Control Components of AR: wired control, IR control, Radio Control, ZigBee 1.4 Sensor Navigation: Bump Switch, IR Sensor, Ultrasonic Range Finder, Accelerometer, GPS module, GPRS module 1.5 Block Diagram and Working Principle of Servo Motor and DC motor	18	12	CO1 CO2

2 Introduction to Arduino Programming 2.1 Block diagram, input and output pins of Arduino Uno development Board 2.2 Basic Commands of Arduino Programming Void Setup (), Void Loop(), pinMode(), 2.3 basic Commands for Serial Communication, analog Input/Output, Digital Input/output, delay commands	14	8	**CO3**
3 Sensor module interfacing with Arduino Uno (interfacing diagram and Arduino sketch for the following) 3.1 motion detector: tilt sensor, PIR 3.2 light detector :LDR 3.3 Distance Measurement Ultrasonic Sensor,IR sensor 3.4 Vibration detector: Piezo sensor 3.5 sound detector: Microphone 3.6 Temperature Sensor: LM35 3.7 Rotary Encoder 3.8 GPS ***[Note: Knowledge of interfacing any of above Sensor module with Arduino is of LEVEL 2 and writing Arduino sketch for such interfacing is of LEVEL3]***	18	12	**CO2, CO3**
4 Motor control with Arduino Uno (interfacing diagram and Arduino sketch for the following) 4.1 controlling position of servo motor 4.2 Controlling direction of DC motor using transistor H-bridge ***4.3*** Controlling direction of DC motor using IC: Movements for two wheeled Robot: move forward, move back ward, stop, move left, move righ ***(LEVEL 3)***	13	8	**CO2, CO3, CO4**
5 Internet Of Things (IOT) 5.1 Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models, IOT Module ***(LEVEL 1)*** ***5.2*** interfacing IOT module to Arduino Board ***(LEVEL 2)*** ***5.3*** Arduino based IOT Applications ***(LEVEL 4)***	12	8	CO1, CO2, CO3, CO4
Total	**75**	**48**	**-**

8. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**Autonomous Robotics**	12	18
2	**Introduction to Arduino Programming**	8	14
3	**Sensor module interfacing with Arduino Uno**	12	18
4	**Motor control with Arduino Uno**	8	13
5	**Internet of Things (IOT)**	8	12
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Interfacing and Programming of Arduino with motion detector: tilt sensor, PIR, Gyroscope, Accelerometer (any one)	2
2	Interfacing and Programming of Arduino with LDR	2
3	Interfacing and Programming of Arduino with ultrasonic Sensor/IR sensor	2
4	Interfacing and Programming of Arduino with Piezo Sensor	2
5	Interfacing and Programming of Arduino with microphone	2
6	Interfacing and Programming of Arduino with LM35	2
7	Interfacing and Programming of Arduino with servo motor	2
8	Interfacing and Programming of Arduino with DC motor	2
9	Programming Arduino for two wheeled Robot interfaced to Arduino for following movement like Move forward, Move back ward, stop, move left, move right	4
10	Mini Projects: Line Follower, obstacle Avoider, etc.	5
	Total	25 marks

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Massimo Banzi	Getting started with Arduino	Second Edition, O'reilly
2	Maja J. Mataric	Robotics Primer	Latest
3	Brian Evans	Beginning Arduino Programming	A Press Publishers, Recent Edition
4	Vijay Madisetti, Arshdeep Bahga,	"Internet of Things: A Hands-On Approach"	Recent edition

SEMESTER VI

(EX601) Digital Communication Techniques

1.AIM

1. To introduce students to Digital Communication methods and techniques used in Telecommunication.
2. To introduce students to the working of electronic telephone exchange.

2. COURSE OBJECTIVES:

The students will able to:

1. To understand various digital communication techniques.
2. To understand the working of an Electronic telephone exchange.

3. PRE-REQUISITES:

Students should know

1. Basic Communication Engineering.
2. Working of Linear ICs.

4. TEACHING AND EXAMINATION SCHEME

Semester VI									
Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	C	TH	TM	TW	ORALS	
(EX601) Digital Communication Techniques	3	-	-	3	75	25	-	-	100

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Describe the working of an Electronic telephone exchange.
2. Differentiate between TD and FD multiplexing techniques.
3. Analyze the working of pulse modulation circuits used in telecommunication field.
4. Analyze the working of Digital modulation Systems used in telecommunication field.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	2	0	1	0	0	2	3
CO2	2	2	1	1	0	2	3
CO3	2	1	2	3	0	2	3
CO4	2	1	1	2	0	2	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	1
CO2	3	1
CO3	3	2
CO4	3	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**		
Unit		**M**	**Thr**	**CO**
1 Pulse Modulation Systems (No Mathematical derivations)		**23**	**14**	**CO3**
1.1 Introduction to Digital Communications Shannon Hartley Law - Equation representing the law, Relation between channel capacity and noise. Sampling Theorem - Statement and its significance. Working of sample and Hold circuit using an op-amp				
1.2 Pulse Amplitude Modulation Definition, Block diagram and typical circuit for generation of PAM. Types of PAM - Waveform for Natural, flat-top, single & double polarity PAM. Block diagram and typical circuit for demodulation of PAM. Aliasing effect and aperture effect in PAM, Anti-aliasing filter.				
1.3 Pulse Time Modulation Definition of PWM and PPM. Generation of PTM - Indirect and direct methods, Waveform for starting edge fixed, trailing edge fixed and centre fixed PWM and PPM. Modulator circuits for PWM and PPM using IC 555. Demodulation of PTM - Waveform for demodulation of PWM and PPM. Demodulator circuits for PWM and PPM using op-amp.				
2 Pulse Communication Systems(No Mathematical derivations)		**15**	**10**	**CO3**
2.1 Pulse Code Modulation Block Diagram of PCM Transmitter. Quantization, Quantization error, Companding. Block Diagram of PCM Receiver.				
2.2 Differential Pulse Code Modulation Block Diagram of DPCM Transmitter and Receiver.				
2.3 Delta Modulation Block Diagram of DM Transmitter and Receiver. Limitations of DM- Slope Overload and granular noise.				
2.4 Adaptive Delta Modulation Block Diagram of ADM Transmitter and Receiver.				

3 Digital Modulation Techniques	**14**	**09**	**CO4**
3.1 Amplitude Shift Keying Definition, waveform, block diagram for generation and detection of ASK			
3.2 Frequency Shift Keying Definition, waveform, block diagram for generation and detection of FSK Types of FSK- coherent and non-coherent type.			
3.3 Phase Shift Keying Basic Principle, waveform, Phasor diagram and block diagram for generation and detection of Binary PSK and Quadrature PSK.			
4 Multiple access techniques in Pulse communication.	**05**	**03**	**CO2**
4.1 Time Division Multiplexing Block diagram for TDM – PAM system.			
4.2 Frequency Division Multiplexing Block diagram for FDM – PAM system.			
4.3 Comparison of FDM and TDM Advantages and disadvantages of both TDM and FDM			
5 Electronic Telephone Exchange	**18**	**12**	**CO1**
5.1 Introduction to Electronic Exchange Basic terms related to an exchange. Basics of a switching system and classification of switching systems Elements of a Switching system - Block diagram and working			
5.2 Electronic Space Division Switching Concept of Stored Program Control Centralized SPC - Typical block diagram, Single and dual processor systems, Three modes of operation(Standby, Synchronous duplex and Load sharing) Distributed SPC - Level 3, Level2 and Level 1 processing			
5.3 Time Division Switching Time Division Space Switching: Concept and three types - Input controlled, output controlled and memory controlled Time Division Time Switching Concept and methods of control (listing and definition only)			
5.4 Call processing Steps involved in call processing sequence			
Total	**75**	**48**	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Pulse Modulation Systems	14	23
2	Pulse Communication Systems	10	15
3	Digital Modulation Techniques	09	14
4	Multiple access techniques in Pulse communication	03	05
5	Electronic Telephone Exchange	12	18
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical (Perform any 8)	Marks
1.	Generation and Demodulation of PAM using trainer kits/typical circuits	
2.	Generation and Demodulation of PWM using trainer kits/typical circuits	
3.	Generation and Demodulation of PPM using trainer kits/typical circuits	
4.	Generation and Demodulation of PCM & DPCM using trainer kits/typical circuits	
5.	Generation and Demodulation of DM & ADM using trainer kits/typical circuits	
6.	Generation and Demodulation of ASK using trainer kits/typical circuits	
7.	Generation and Demodulation of FSK using trainer kits/typical circuits	
8.	Generation and Demodulation of BPSK using trainer kits/typical circuits	
9.	Generation and Demodulation of TDM - PAM using trainer kits/typical circuits	
10	Generation and Demodulation of FDM - PAM using trainer kits/typical circuits	
	Total	**25**
	Class room Assignments	
	At least 2 assignments	

11. LEARNING RESOURCESText Books

S. No.	Author	Title of Books	Publishers
1	RP Singh& SD Sapre	Communication system 2nd edition	Tata McGraw-hill publishing
2	ThiagarajanViswanathan	Telecommunication Switching Systems and Networks	Prentice Hall India

(CC 502) ESSENTIALS OF ENTREPRENEURSHIP DEVELOPMENT

1. COURSE OBJECTIVES:

Today Entrepreneurship is given importance by the government to bring the youth of our country to overcome the problem of unemployment and bring them in the main stream of global business to strengthen Indian economy by Make in India philosophy. Government has announced various financial schemes for young youth and women to support them for setting up an enterprise. To fulfill this, youth are to be prepared for setting an enterprise. The students undergoing this course will be able to develop entrepreneurial traits and confidence within themselves and choose entrepreneurship as a career to brighten their future.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(CC502) ESSENTIALS OF ENTREPRE-NEURSHIP DEVELOPMENT	L	T	P	C	-	-	PR/OR	TW	25
	-	-	2	2	-	-	-	25	

3. COURSE OUTCOMES:

CC502.CO1: Recognize the type of entrepreneur and enterprises.

CC502.CO2: Describe basic financial & legal aspects of business.

CC502.CO3: Conceptualize a business idea.

CC502.CO4: Develop the project report for new enterprise.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	0	0	0	2	3	2	1	2
CO2	2	0	0	0	0	3	2	1	2
CO3	0	1	2	0	0	0	2	1	2
CO4	3	2	2	0	2	0	2	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS

M=Marks	Phr= Practical hours	CO – Course Outcomes			
Unit			M	Phr	CO
1. INDIAN BUSINESS ENVIRONMENT					
a. Introduction to Entrepreneurship Development (EDP) b. Brief details of following terms : India GDP, IIP data, Govt. business policies, Environmental policy, Effects of global policies, Anti-dumping duty, Effects of national budget on start-ups and businesses.				4	CO1
2. VARIOUS TYPES OF BUSINESSES					
2.1 Brief details of following businesses: Cyclical and Non-cyclical business, Seasonal and Non-seasonal business, Monopoly and Duopoly business, Concept base business, Commodity and Non-commodity business, Asset light business, b2b and b2c business, 2.2 Difference between Subsidiary and Associate company				6	CO1
3. SELECTION OF BUSINESS					
3.1 Types of Sectors, Steps in sectoral analysis, factors to pick up a Sector, Data collection of Sectors. 3.2 Terminologies: Sector rotation, Gross block addition. 3.3 Steps to read Outline of balance sheet, profit-loss statement, cash flow statement. 3.4 Data analysis on following factors: i) Market growth ii) Sector consolidation. 3.5 Brief details of following: Profitability, Effect of Govt policies, Pricing power, Debt, working capital, return on capital employed, Cash conversion cycle, Companies with peer group.				4	CO1 CO2

4 SETTING UP OF BUSINESS			
4.1 Various Govt depts. and organization supporting business ideas. 4.2 Methods to raise capital (difference between Banks and NBFC). 4.3Factors in machine, material, manpower procurement, advertising, product specialty, 4.4 Micro, Small and Medium Enterprises (MSME), Govt support for MSME, Private Limited and Public Limited Enterprises, 4.5 Goods & Service Tax(GST), Registering for GST and go ahead, 4.6Various income tax slabs, 4.7Application for various utility connections, various permissions required to set up business.		10	CO1 CO2 CO3
5. EXPANSION OF BUSINESS			
5.1Types of investors: angel investors, venture capitalist, promoters. 5.2Terminology: 5.2.1 EPS, EPS growth, P/E ratio, 5.2.2 Market capital, paid up capital, authorized share capital, 5.2.3Corporate governance, Related party transactions, business insiders, assets and inventory turnover, break even analysis, brown field and green field expansion. 5.3 Listing start up on stock exchange &Govt support. 5.4 Business report writing, Reading of Red Herring prospectus		8	CO1 CO2 CO3 CO4
Total		32	

6. COURSE DELIVERY:

Videos / Lectures/ Practicals /Expert lectures / Industry visits/ documentaries/movies
Suggested expert talk on

- various Govt schemes
- GST
- Financial literacy
- Any relevant topic

7. SPECIFICATION TABLE FOR PRACTICALS

Unit No.	Topic	Teaching Hours/ Semester
1	**Indian business environment**	**4**
2	**various types of businesses**	**6**
3	**selection of business**	**9**
4	**Setting up of business**	**9**
5	**Expansion of business**	**4**
	TOTAL	**32**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICAL HOURS

No	**Classroom Assignments**	**Marks**
1.	Prepare a Case Study on leading enterprise or small-scale unit	**6**
2.	Prepare a report on various government schemes for startup.	**4**
3.	Prepare SWOT analysis for a new business idea.	**5**
4.	Prepare Project Report for a new business idea.	**10**
	OR	
1.	Preparing a project report on basis of draft Red Herring prospectus	**25**

9. LEARNING RESOURCES

S.No.	Author	Title of Books	Publisher
1.	Sharadjawadekar, shobhadodlani,	Business entrepreneurship	Suvicharprakashanmandalpune,
2.	S.S. Khanna	Entrepreneurship development	S. Chand & Co. Ltd, New Delhi,
3.	Vasant Desai	Management of small-Scale Industry in India	Himalaya Publishing House
4.	DilipSarwate	Entrepreneurial development Concepts and practices	Everest Publication House, Pune
5.	CB Gupta and P Srinivasan	Entrepreneurship Development	S. Chand and Sons, New Delhi

https://ncert.nic.in/ncerts/l/leac203.pdf
https://ncert.nic.in/ncerts/l/leac204.pdf
https://www.wirc-icai.org/images/publication/IND-AS-BOOK.pdf
https://cma.org.sa/en/Awareness/Publications/booklets/Booklet_4.pdf
https://www.icsi.edu/media/portals/25/IPO.pdf
https://old.mu.ac.in/wp-content/uploads/2017/01/FINANCIAL-STATEMENT-ANALYSIS.pdf
https://ncert.nic.in/textbook/pdf/jess202.pdf
https://dea.gov.in/sites/default/files/
https://dea.gov.in/monthly-economic-report-table
https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/0HSIE_F.PDF
https://ncert.nic.in/textbook/pdf/lebs202.pdf
https://www.oecd.org/industry/inv/investmentfordevelopment/33806126.pdf
https://www.youtube.com/watch?v=NV8Ew6PcQhY
file:///C:/Users/User/Downloads/1-s2.0-S0970389617304664-main.pdf

(EX 602) Industrial Electronics

1. AIM

To explore different areas of process controls of the industry where electronic circuits can replace the conventional methods, for efficiency, ease of method and economic advantages.

2. COURSE OBJECTIVES:

The students will able to:
1. Understand industrial requirements for controlling different processes
2. Applications of different components and circuits using these components.

3. PRE-REQUISITES:

Students should know
1. Working of thyristors, Timer IC 555
2. Amplifiers and Oscillator circuits

4. TEACHING AND EXAMINATION SCHEME

Semester VI									
Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	C	TH	TM	TW	PR/OR	
(EX602) Industrial Electronics	3	-	2	5	75	25	25	-	125

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:
1. Explain different industrial, ultrasonics , high frequency heating process control circuits
2. Explain use of electronics switches to industrial circuits and in speed control of motors
3 Apply knowledge of Timers for different industrial circuits and resources used in control engineering
4. Analyze output for different variables.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	**3**	**2**	**3**	**2**	**3**	**3**	**3**
CO2	3	3	2	2	3	2	3
CO3	3	3	2	3	3	2	3
CO4	3	3	3	2	2	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**	**L - Levels**		
Unit			**M**	**Thr**	**CO**
1 Industrial circuits			**22**	**13**	**CO 1,2,3, 4**
1.1 Circuits using thyristors : Burglar alarm, smoke detector, Temperature controller using thermostat,, battery charger, Emergency light, thermistor controlled heater, power flasher,automatic Street light control using LDR					
1.2 Ic 555 Timer : Design Astable mutivibrator for specific Ton, Toff or frequency, Design of monostable multivibrator for specific pulse width					
1.3 circuits Using 555 Timer : Bistable Multivibrator, Water level indicator, water level controller, photocounter					
1.4 Cell phone jammer using tuned oscillator circuit					
1 **Ultrasonics**			09	06	**CO 1,2,3**
2.1 Wavelength and velocity in air, liquid and solid.					
2.2 Piezoelectric generation of ultrasonic waves					
2.3 Application : Flaw detection, Flow meter List of applications in Medical field					
2.3 Ultrasound welding : Principle, advantages, disadvantages					

2 **High Frequency heating**	14	9	**CO 1,2**
3.1 Induction heating: principle, Features, skin effect, advantages, disadvantages, List of applications in industry Applications in detail: surface hardening , brazing			
3.2 Dielectric heating : principle, features, generation, advantages, disadvantages, Enlist applications			
3.3 comparison : dielectric and induction heating			
4 Electric motor speed control	15	10	**CO 1,2,3, 4**
4.1 DC motor :Operating principle, types, Dc shunt motor :concept of back emf, equivalent diagram, simple numerical to calculate back emf, relationship between speed, voltage, current , torque, characteristics of shunt motor : torque, current, speed.			
4.2 Numerical on speed calculations for variable flux, torque, current , terminal voltage.			
4.2 Speed control of Dc motor using thyristors: advantages, speed control using full wave SCR. Speed control and regulation by tachometer method: for increased and decreased load.			
4.4 Simple calculations between speed, voltage and firing angle.			
4.3 Speed control of AC motors : Single phase AC series motor speed control using SCR			
5 Process control Engg	15	10	**CO 1,2,3**
5.1 Process control : Basic objective, Simple block diagram Pressure control using Pneumatic amplifier: Definition of Pneumatic amplifier, basic components, block diagram and pressure control Liquid flow control using flow control valve Mechanical movement control using Solenoid coil			
5.2 concept of servomechanism, block diagram DC servo speed control(separately excited) :Field controlled method: advantages and disadvantages armature controlled method, comparison between above two methods Speed control of AC servo motor			
5.3 Stepper motor : Basic principle of operation of 4 position Synchros : definition Synchro Transmitter and Receiver			
Total	**75**	**48**	**-**

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Industrial circuits	13	22
2	Ultrasonic	06	09
3	High Frequency heating	09	14
4	Electric motor speed control	10	15
5	Process control Engineering	10	15
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS (Any 8)

No	**Practical**	**Marks**
1.	Assemble and Test burglar alarm	
2	Assemble and test smoke detector	
3	Assemble test power flasher	
4	Assemble and test photocounter using 555	
5	Assemble and test water level indicator	
6	Assemble and test water level controller	
7	Test Induction heating	
8	Test dielectric heating	
9	Test motor speed control, using thyristor	
10	Test synchro transmitter and receiver control	
11	Flaw detection using ultrasound waves	
	TOTAL	25

11. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	Rao, Sutrave	Industrial Electronics	Tata McGraw Hill
2	S.K Bhattacharya, S. Chatterjee	Industrial Electronics and control	Tata McGraw Hill
3	Curties Johnson	Process control Instrumentation	Pearson Education
4	B.L. Theraja	Electrical Engg	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Chute and Chute	Industrial Electronics	Tata McGraw Hill
2	J.D. Ryder	Electronics Engg	Prentice Hall India
3	Bimbhra P.S.	Power electronics	Khanna publishers

(EX603) PROJECT

1. AIM

This is intended to integrate several skills and competencies which have been developed in the students during his/her course of study and gets manifested through this project.

2. COURSE OBJECTIVES:

The students will able to:

i. Cultivate the systematic methodology for problem solving using acquired technical knowledge &skills, and to enhance the generic skills & professional skills
ii. Develop problem solving, analysis, synthesis and evaluation skills.
iii. Encourage teamwork.
iv. Improve students' communication skills through project reports and presentations of their work.

3. PRE-REQUISITES:

i. Basic Engineering Skills
ii. Electronics & allied Courses

4. TEACHING AND EXAMINATION SCHEME

Semester VI									
Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(EX 603) PROJECT	L	T	P	C	TH	TM	TW	PR/OR	
	-	-	06	06	-	-	100	50	150

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify, analyze & define the problem
2. Apply acquired knowledge of engineering to execute solution
3. Develop leadership skills & teamwork to design & execute hardware & related software
4. Compile the relevant data in the form of a report and defend the project

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	2	-	-	-	-	3	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

The following are some of the suggested activities which the student has to undertake (which may slightly differ depending on the project chosen) during the project work. In so doing some process related and project related skills need to be evaluated.

- Selection/Identification of project Work by market survey/industrial survey.
- Project Proposal
- Market survey for product sales & economic viability of product (for entrepreneurship)
- Costing of the project/product i) Capital costs ii) Material & production cost
- Design of project to obtain desired output.
- Procurement of components & equivalents.
- Working skill of fabrication.
- Testing of product
    i. Drafting
    ii. Sketching
    iii. Layout
    iv. Presentation

AUDIT COURSE

(AC102) INDIAN CONSTITUTION

1. COURSE OBJECTIVES:

As a proud citizen of this country every student must be aware about the Indian Constitution to appreciate the provisions available for the people of this biggest democracy in Indian Constitution so that the youth of this country plays active role in development of the country by participating in the formation of sensitive and proactive Government at national and state level.This course intends to make students aware about various constituents of the Indian Constitution.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI									
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
		L	T	P	C	TH	TM	TW	PR/OR	
(AC102) INDIAN CONSTITUTION		2	-	-	2	-	-	-	-	-

3. Course Content

Unit 1 – The Constitution - Introduction • The History of the Making of the Indian Constitution • Preamble and the Basic Structure, and its interpretation • Fundamental Rights and Duties and their interpretation • State Policy Principles
Unit 2 – Union Government • Structure of the Indian Union • President – Role and Power • Prime Minister and Council of Ministers • Lok Sabha and Rajya Sabha
Unit 3 – State Government • Governor – Role and Power • Chief Minister and Council of Ministers • State Secretariat
Unit 4 – Local Administration • District Administration • Municipal Corporation • Zila Panchayat
Unit 5 – Election Commission • Role and Functioning • Chief Election Commissioner • State Election Commission

4. Suggested Learning Resources:

Title of Book Author Publication
1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi,2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition

5. Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-ofindia/

ELECTIVES – SEMESTER VI

(EX619) Data Communications

1. AIM

1. To introduce students to Data Communication through a network.

2. COURSE OBJECTIVES:

The students will able to:

1. To understand data flow through a computer network.

3. PRE-REQUISITES:

Students should know

1. Analog and Digital Communication Techniques.

4. TEACHING AND EXAMINATION SCHEME

Semester	VI								
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(EX619)		L	T	P	C	TH	TM	TW	PR/OR	
Data Communications		3	-	2	5	75	25	25	25	150

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Describe various Protocols for Data link layer.
2. Identify Components of computer communication and types of Computer Networks.
3. Analyze functions of various layers in the OSI model of a computer Network.
4. Interpret various errors and their control in a network.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainabilityv&	Project Management	Life -long Learning
CO1	2	1	0	1	0	2	3
CO2	2	1	0	1	0	2	3
CO3	2	1	0	1	0	2	3
CO4	2	2	0	1	0	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	2	1
CO2	2	1
CO3	2	1
CO4	2	1

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 Introduction to Data Communication and Computer Networks			15	10	CO2
1.1 Components of Data Communication system **Five major elements of the system and their meaning.**					
1.2 Types of Data **Various types of data(Picture, Video, Audio etc.) and various types of data signals (Analog and digital).**					
1.3 Direction of Data Flow **Simplex, half and full Duplex.**					
1.4Modulation techniques used **List of Analog and Digital modulation techniques, Quadrature Phase Shift keying and QAM system working.**					
1.5Type of Connection **Point to point and multipoint.**					
1.6Topologies **Mesh, Star, Bus, and Ring topologies and their comparisons.**					
1.7Categories of Networks **Brief description of LAN, WAN, MAN.**					
1.8 Protocols and Standards **Meaning and key elements of protocol, Important standard organizations.**					

2 Network Layers (No Mathematical treatment)	10	07	CO3
2.1 Internet Model **Organization and Functions of Physical, Data link, Network, Transport and Application layers.**			
2.2 OSI Model **Functions of Session and Presentation layers, Data flow through all layers.**			
2.3 Data Transmission Modes **Parallel, Serial, Synchronous and Asynchronous.**			
3 Error Detection and Correction	12	06	CO4
3.1 Types of Errors **Single bit error, Burst Error.**			
3.2 Detection of Error **Redundancy, Parity Check, CRC, Checksum.**			
3.3 Correction of Error **Forward Error Correction, Hamming Code, Burst Error correction.**			
4 Data Link Control & Protocol	27	18	CO1
4.1 Flow and Error Control **Flow and Error control meaning and Operation of error control mechanisms - Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective Repeat ARQ.**			
4.2 Data Link Protocol **HDLC Protocol- Types of frames, Frame formats of I frame, S frame and U frame, Data transparency.**			
4.3 Point – to – Point Protocol **Meaning, services provided, frame format and transition states.**			
4.4 Multiple Access Protocol **Random Access meaning, CSMA/CD procedure and CSMA/CA procedure.** **Controlled Access meaning and methods.**			
5 Local Area Networks	10	07	CO2
5.1 Wired LAN/ Ethernet **Main features of Traditional Ethernet, Fast Ethernet and Gigabit Ethernet.**			
5.2 Wireless LAN **Main features of IEEE 802.11 and Bluetooth.**			
5.3 Connecting Devices, backbone Networks and VLANs **Repeaters, Hubs and Bridges, Bus and Star as backbone networks and main features of Virtual LANs.**			
Total	75	**48**	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to Data Communication and Computer Networks	10	15
2	Network Layers	07	10
3	Error Detection and Correction	06	12
4	Data Link Control & Protocol	18	27
5	Local Area Networks	07	11
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	**Study of different types of transmission media.**	
2.	**Study and analysis of QPSK Modulation.**	
3.	**Study and analysis of QAM Modulation.**	
4	**Study of Serial Interface using RS-232.**	
5.	**Study of Pc to Pc or PC to Printer Communication using parallel port.**	
6.	**Study of LAN using Bus topology.**	
7.	**Study of LAN using Star topology.**	
8.	**To study/configure a MODEM for Computer to Internet connection**	
9.	**To configure a hub/switch**	
10.	**Study interconnection of cables for data communication.**	
11.	**Study Pc to PC communication using Ethernet LAN**	
12.	**Study Pc to PC communication using Wireless LAN**	
	Total	25
No	Class room Assignments	Marks
1	At least 02 assignments on relevant topics	
...	Total	25

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Behrouz A Forouzan	Data Communications and Networks 3rd Edition	Tata McGraw-hill publishing

(EX 616) ROBOTICS

1. AIM

To develop required skills in the students so that they are able to acquire the following competency:

1. Operate and maintain different types of robots.

2. COURSE OBJECTIVES:

Nowadays industries demand continuous and fine quality work in different processes of industries. All process is generally done by humans and as we know humans are not able to give same quantity and quality of work with respect to time, environment and complexity of the work. To get quality and quantity of work in toughest environment or the environment which is not suitable for the humans to work, industries demand for robots and its operator. Operators which operate this robot need some basic knowledge of robotics. To fulfil the demand of industries and advancement in technology it is necessary for the electronic engineers to have knowledge and skill in robotics.

The students will able to:

1. Explain different components of robot & compare various types of Robot.
2. Study the working of various robot controller & Differentiate between various robot controllers.
3. Explain the kinematics & vision system of Robot.
4. Compare the uses of various sensors & warning system & appreciate the application of robot s invarious industries.

3. PRE-REQUISITES:

Students should know

1. Basics of C programming.
2. Embedded systems.

4. TEACHING AND EXAMINATION SCHEME

Semester	**VI**									
(EX 616) ROBOTICS		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
		3	**-**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1. Define and select right parameters for robot for given application.
CO2. Distinguish between various robot controller & Actuators.
CO3. Maintain the different types of robot sensors.
CO4. Operate the robot through software and trouble-shoot minor problems.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainability &	Project Management	Life -long Learning
CO1	3	3	3	3	0	2	0
CO2	2	1	1	2	0	1	0
CO3	3	2	3	3	1	2	2
CO4	3	3	3	3	0	2	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	1
CO2	2	0
CO3	3	2
CO4	3	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**

Unit	**M**	**Thr**	**CO**
1. ELEMENTS OF ROBOT	**18**	**12**	**CO 1.3**
1.1 Basic Concepts in (Fundamentals of) robotics: Introduction, Definition, Automation and robotics, Generations of Robots, Robot applications.			
1.2 Different classifications of robot: By application (Material handling, operations, Assembly, Inspection), by coordinate system (Cartesian, Cylindrical, Spherical, Articulated, SCARA), by actuation (drive) system (Hydraulic, Electric, Pneumatic), by control system (Limited sequence, playback with point to point control, playback with continuous control, Intelligent Robots) and by programming method (Lead-through, Textual).			
1.3 Robot anatomy: Links and joints, Joint notation. Degree of Freedom. Robot resolution, accuracy and repeatability. Concept of workspace.			
2. ROBOT CONTROLLER AND ACTUATION SYSTEMS	**15**	**10**	**CO 1,2,4**
2.1 Robot controller: open and closed loop control systems (explanation with block diagram, advantages & comparison) Controllers: (On-off, Proportional, Integral, Proportional plus Integral, Proportional plus derivative, Proportional plus integral plus			

derivative- explain in brief)			
2.2 Robot Actuation and feed-back components Position Sensors (Potentiometers, encoders), Actuators (DC servo motors, Stepper motors, Pneumatic and Hydraulic), Velocity Sensors, Power Transmission Systems (Gears, Power Screws)			
3. ROBOT EFFECTORS, SENSORS & MACHINE VISION	**15**	**10**	**CO 2,4**
3.1 Robot End Effectors: Grippers and Tools. Basic Definition and operation: Mechanical grippers, Vacuum cups, Magnetic grippers. Tools as end effectors.			
3.2 Transducers and Sensors Desirable features of sensors. Basic working principle:- Tactile sensors (Touch, Force), Proximity and Range sensors (Light and Ultrasonic) Uses/ Applications of sensors in Robotics.			
3.2 Machine Vision Introduction to Machine Vision (Sensing and digitizing Image, Image processing and analysis, Application) (block diagram and explanation only) Robotic applications of machine vision			
4. ROBOT PROGRAMMING	**12**	**6**	**CO 4**
4.1 Robot programming Lead-through (Powered & Manual) and Textual robot languages. Robot Programme as a Path in Space, Motion Interpolation, WAIT, SIGNAL and DELAY Commands, Capabilities and Limitations of Lead through Methods, Robot Language Structure. Comparison of Lead-through (Powered & Manual) v/s Textual robot languages			
5. ROBOTICS APPLICATIONS, MAINTAINANCE & SAFETY	**15**	**10**	**CO 3,4**
5.1 Robotics Applications Material Transfer (Pick and place) Process operations (Arc wielding) Assembly Application (Peg in hole) Inspection Application (Sensor/Vision based inspection) Non Industrial Application (Health Care, Research and Exploration etc.) Robot maintenance: Need and Types. General Safety Norms, aspects and precautions in robot handling.			
Total	**75**	**48**	**----**

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	ELEMENTS OF ROBOT	12	18
2	ROBOT CONTROLLER AND ACTUATION SYSTEMS	10	15
3	ROBOT EFFECTORS, SENSORS & MACHINE VISION	10	15
4	ROBOT PROGRAMMING	06	12
5	ROBOTICS APPLICATIONS, MAINTAINANCE & SAFETY	10	15
	Total	**48**	**75**

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Electronic Control of a DC Servo motor	
2.	Electronic Control of a Stepper motor	
3.	Electronic control of BLDC motor	
4.	Interfacing of proximity and range sensors to Arduino	
5.	Interfacing of Accelerometers and Gyroscopes sensors to Arduino	
6.	Interfacing of force sensors to Arduino	
7.	Programming a robot arm for straight line, circular and curved paths	
8.	Programming a robot arm for pick and place operation.	
	Total	25
No	**Class room Assignments**	**Marks**
1	Atleast 02 assignments	
...	Total	25

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Mikkel P.Groover, Mite chell weiss, Rogern Negal and Nicholes G.Odress	Industrial Robotics Technology- Programming and Applications	Tata McGraw Hill
2	R.K.Mittal, I.J.Nagrath	Robotics and controls	Tata McGraw Hill
3	K.S. Fu, R. C. Gonzalez, C.S.G. Lee	Robotics: Control, Sensing, Vision and Intelligence	McGraw Hill

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Doughlaes –R. Halcoojr	An Introduction to robotics	

Internet and Web Resources

S. No.	Author
1	*http://enggmechanical.blogspot.com/2010/06/classification-of-robot.html*

(EX 615)VHDL

1. AIM: To introduce hardware description language VHDL and its application in designing digital circuits and hardware in FPGAs

2. COURSE OBJECTIVES: Learn VHDL programming and use it to design and simulate differenttypes of digital circuits and programmable logic devices and field programmable gate arrays..

The students will able to:

1. Learn VHDL programming.
2. Design and write codes for different digital circuits
3. Use VHDL for simulating the operation of digital hardware

3. PRE-REQUISITES: Students should know

1. Basic knowledge of c programming
2. Combinational and synchronous sequential circuits
3. Flip flops, registers and counters

4. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(EX 615) VHDL		**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Develop basic programming skills in VHDL
2. Write/Develop VHDL codes for combinational and sequential digital circuits
3. Compile, debug and simulate VHDL codes for combinational and sequential digital circuits.
4. Design digital circuits and logic devices

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO1	2	2	3	1	0	2	3
CO2	2	3	3	2	0	2	3
CO3	2	3	1	3	0	2	3
CO4	2	3	3	2	2	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	2	2
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1.Overview of digital design with VHDL			**9**	**5**	**CO 1**
1.1 1.1 VHDL:-What is VHDL • Hardware abstraction • Why use VHDL • Shortcomings of VHDL steps in using VHDL for design Synthesis					
1.2 Hierarchical Modeling techniques- Top down and bottom up design methodology, difference between modules and instances (only definition)					
2. VHDL reference			15	9	**CO 1**
2.1 Documentation (comment line) • Data objects • Data object names • Data object values and numbers • Signal data objects • Bit and Bit vector types • STD_LOGIC and STD_LOGIC_VECTOR types • Signed and unsigned type • INTEGER type • CONSTANT data objects • VARIABLE data objects					

• Arrays Operators			
2.2 **VHDL design entity**-Entity declaration, Architecture, Package. writing simple VHDL code for a given logic function			
3 VHDL code for combinational circuits	21	14	**CO 2,3**
3.1 selected signal assignment- 4-to-1 mux			
3.2 conditional signal assignment-priority encoder, 4 bit comparator			
3.3 process statement-2-to-1 mux using if-then-else statement			
3.4 case statement- 2-to-4 binary decoder,BCD to 7 segment			
3.55 **VHDL code for:** • And,,or,nand,nor gates • 4 bit arithmetic adder,4 bit arithmetic subtractor			
4 Flip Flops, Registers	12	8	**CO 2,3**
4.1 **Circuit,timing diagram,graphical symbol and VHDL code of**:- gated D latch,D flip flop,T flip flop and JK flip flop			
4.2 **Circuit diagram and VHDL code of-** simple shift register and parallel-access shift register			
5 Synchronous Sequential circuits and logic devices	18	12	**CO 3,4**
5.1 Circuit diagram and timing diagram of-4-bit up counter,4-bit down counter,2-digit BCD counter.			
5.2 Moore type finite state machine-state diagram and VHDL code			
5.3 Mealy type finite state machine-state diagram and VHDL code.			
5.4 Programmable logic devices-PAL,PLA,CPLD,FPGA, applications of CPLD and FPGA			
Total	**75**	**48**	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**Overview of digital design with VHDL**	5	9
2	**VHDL reference**	9	15
3	**VHDL code for combinational circuits**	14	21
4	**Flip Flops, Registers**	8	12
5	**Synchronous Sequential circuits**	12	18
	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
	Design and simulate using -VHDL language	
1.	Design and implementation of Basic gates-AND,OR,NOT gates	
2	Design and implementation of 4-to-1 mux	
3	Design and implementation of 2-t0-4 Decoder	
4	Design and implementation of RS Flip Flop	
5	Design and implementation of JK Flip Flop	
6	Design and implementation of D Flip Flop	
7	Design and implementation of 4 bit up counter	
8	Design and implementation of shift register	
9	Design and implementation of logic devices	
		Marks
No	**Assignments**	
1	At-least 02 assignments	
2		
...		
No	**Tutorial Exercise**	**Marks**
1	NIL	
2		
...	Total	25

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Stephen Brown and Vranesic	Fundamentals of Digital Logic with VHDL design	Tata McGraw Hill,2008, India, ISBN 978–0–07–352953–0
2	Samir Palnitkar	Verilog HDL: A Guide to Digital Design and Synthesis,	Prentice Hall ISBN: 0-13-044911-3 (downloadable)
3	Jayaram Bhaskar	A VHDL primer	PTR Prentice Hall

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Kevin Skahill and Cyress	VHDL for Programmable Logic	Pearson Education (downloadable)
2	Douglas Perry	VHDL:Programming by example	Tata McGraw Hill,2008, India, ISBN 978-0-07-049944-7

(EX 621) Digital Signal Processing

1. AIM:-To study signal representation in time and frequency domain, DFT, Z transform and design of digital filters.

2. COURSE OBJECTIVES: To learn different types of discrete signals, its classification and representation. Introduce Z transforms, DFT, FFT and study FIR and IIR filters.

The students will able to:
1.analyze given signal or system using tool such as Z transform and DFT
2.learn properties of signal and systems
3.process the signal to make it useful.

3. PRE-REQUISITES:

1. linear algebra,calculus and trigonometry
2. knowledge of complex numbers
3. programming knowledge

4. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
		L	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
(**EX621**) Digital Signal Processing		**3**	**-**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

5.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand Fourier transform, Discrete Fourier Transform and Fast Fourier Transform with regards toDSP
2. Interpret, represent and process different types of digital signals and systems and their properties.3 Make use of Z transform technique for ROC.
4. Ability to analyze DSP systems like FIR and IIR digital filters.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopment of	Engg. Tools, Experimentatn&	Engg. Practices for Society,Sustainability &	Project Management	Life -long Learning
CO1	3	2	2	1	2	3	3
CO2	3	3	2	1	2	3	3
CO3	3	3	2	2	2	3	3
CO4	3	3	3	2	2	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
1. Introduction to Digital Signal Processing			**6**	**5**	**CO 2**
1.1 Basic components of DSP system • Advantages of DSP • Digital Signal processors • Importance of Digital signal processing					
1.2 **Define**-signal, analog-signal, discrete-signal, continuous time signal, discrete time signal, digital signals, Quantization levels					
2. Discrete Time signals and Systems			24	15	**CO 2**
2.1 **Representation of Discrete Time signals**-Functional, Graphical					
2.2 **Define Standard discrete time signals**-Unit step sequence, Unit Ramp Sequence, Unit Impulse sequence, Sinusoidal sequence. Functional and graphical representation of the above-mentioned signals					
2.3 **Classification of Discrete time signals (only definition)** - Deterministic and nondeterministic signals, Periodic and Aperiodic Signals, Symmetric and antisymmetric signals, Causal and noncausal signals, Energy and power signals.(No problem solving)					

2.4 **Mathematical operations on Discrete time signals (with numerals)**-Scaling(Amplitude and time),Folding, shifting(right shift and left shift), addition and multiplication.			
2.5 Explain Discrete time system, LTI and Impulse response.			
2.6 **Classification of Discrete time signals (only definition)**-Static and dynamic systems, Time invariant and variant systems, Linear and non Linear,Causal and non causal,stable and unstable FIR and IIR, Recursive and nonrecursive 2.7 Discrete or linear Convolution and its procedure.			
3. Z transforms	18	**12**	**CO 2,3**
3.1 Define Z-Transform, one-sided and two-sided Z-transform, Inverse Z-Transform (no proof only equations)			
3.2 ROC Definition, **study of ROC for**- finite duration right-sided(causal) signal, finite duration left-sided (anticausal) signal, finite duration two-sided (noncausal) signal			
3.2 **Properties of Z-transform(only proof, no problem solving)**-Linearity ,shifting, one sided, time reversal, convolution theorem			
3.3 Advantages of Z-Transform			
4. Discrete Fourier Transform(DFT) and Fast Fourier Transform(FFT)	15	**8**	**CO 1,2**
4.1 Definition of DFT, inverse DFT((no proof only equations)			
4.2 **Properties of DFT(only proof, no problem solving)**-Linearity, Periodicity, Time reversal, circular time shift			
4.3 Definition –FFT • Radix-2 DIT FFT-explanation of basic computation and butterfly diagram • Radix-2 DIF FFT-explanation of basic computation and butterfly diagram • Differences and similarities of DIT and DIF Radix-2 FFT			
5. FIR and IIR filters	12	**8**	**CO 1,4**
5.1 FIR filters • Definition ,advantages and Disadvantages • Define window, state different types of window sequences, procedure for designing FIR filter using windows • Define window, state different types of window sequences, procedure for designing FIR filter using windows			
5.2 **IIR Filters-** • IIR filters- Definition ,advantages and Disadvantages • Comparison of analog and digital filters			

• Frequency response of analog and digital IIR filter • Properties of butterworth and chebychev filters			
Total	**75**	**48**	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**Introduction to Digital Signal Processing**	05	06
2	**Discrete Time signals and Systems**	15	24
3	**Z transforms**	12	18
4	**Discrete Fourier Transform(DFT) and Fast Fourier Transform(FFT)**	08	15
5	**FIR and IIR filters**	08	12
	TOTAL	**48**	**75**

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Introduction to toolbox and its various instructions
2	Program to generate unit step, unit ramp, Unit impulse, sinusoidal
3	Program to study basic operation on Discrete time signal-amplitude scaling, shifting
4	Program for linear convolution
5	Program to perform Z transform for the given sequence
6	Program to perform Discrete Fourier Transform for the given sequence
7	Program to design FIR filter using rectangular window
8	Program to perform Radix-2 DIT FFT and Radix-2 DIF FFT
1	At least 02 assignments

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Nagoor Kani	Digital Signal Processing	Tata McGraw Hill, India, ISBN:978-0-07-008665-4
2	Anand Kumar	Digital Signal Processing	PHI Learning- ISBN-978-81-203-4620-8 (downloadable)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	V K Khanna	Digital Signal Processing	S Chand
2	Oppenheim & Schafer	Digital Signal Processing	Pearsons Education

(EX 624) CONSUMER ELECTRONICS

1.AIM:

1. To know penetration of electronics applications in various fields of society.
2. Appreciate influence of electronics in consumer, entertainment, automobile applications.

2. COURSE OBJECTIVES:

- Many of the domestic and office gadgets at home and around are electronically controlled. This course on Consumer Electronics will enable students to understand the underlying working principles of many of the electronic devices used in the consumer industry. The student will be able to apply this knowledge to carry out maintenance, fault finding, repairs and servicing of such devices along with laboratory equipment
- The students will able to

  1. To provide fundamental knowledge about the various gadgets of Consumer electronics

3. PRE-REQUISITES:

Students should know

1. Concept**s** of Basic Electronics
2. Concepts of Electronic Instrumentation
3. Concept of communication and computers

4. TEACHING AND EXAMINATION SCHEME

Semester	**VI**									
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
EX624 Consumer Electronics		**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
		03	**-**	**02**	**05**	**75**	**25**	**25**	**25**	**150**

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the electronics engineering concepts used in consumer electronics
2. Identify the working of various consumer electronic devices used as office gadgets
3 Examine the working of various consumer electronic devices such as washing machine, AC's, Microwave ovens with sketches of the block diagram.
4. Discuss the need of preventive maintenance and safety measures in various electronic appliances

.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	2	2	0	0	0	3
CO2	2	1	2	2	2	0	3
CO3	2	0	1	2	2	2	3
CO4	3	3	3	3	2	0	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	3

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**

Unit	**M**	**Thr**	**CO**
1 Electronically controlled low power Home appliances	**16**	**10**	**CO1,CO2**
1.1 Digital Clock:- Detailed block diagram, working 1.2 Digital Calculator:- Structure of Calculator, Block diagram of Calculator, Working 1.3 Digital Thermometer:- , Block diagram of Digital thermometer, Working, Advantages ,Applications 1.4 Digital Weighing Machines:- , Block diagram of Digital weighing machine, Working, Applications, Comparison of Mechanical and Electronic Weighing Machines.			
2 Electronically controlled High power Home appliances	22	14	**CO1,CO3**

2.1 Microwave Oven:- Microwaves, Advantages of microwaves over conventional electrical heating system, working principle, Microwave oven functional block diagram, Safety instructions for Microwaves. 2.2 Washing Machines:- working principle, Electronic controller for washing machines, Washing machine hardware and washing cycle. Introduction to types of washing machines---Semi automatic , Fully automatic, Fuzzy logic washing machines. 2.3 Air conditioning :- Introduction to Air Conditioning, Components of Air Conditioning systems, All water Air Conditioning systems, All air Air conditioning systems ,Introduction to unitary and Central Air conditioning systems and Split Air conditioner 2.4 Refrigerators:- Refrigeration ,Vapour Compression Refrigeration System, Domestic Refrigerator 2.5 Voltage Stabilizers:-Introduction to voltage Stabilizer, Need for voltage stabilizer, Need for voltage stabilizer, Specifications,Working of basic Series stabilizer.			
3 Electronicallycontrolled Entertainment,Commercial and surveillance appliances	**18**	12	**CO1,CO3**
3.1 Digital Camera:- Working principle of digital camera,Techanical specifications Features of typical Electronic Surveillance system 3.2 Bar codes:- Introduction to Bar codes, Bar code formats(UPC and AIAC) , Barcode scanner and decoder 3.3Xerography:- Operation of photocopier			
3.4Metal detector :- Working and Applications*(LEVEL4)*			
4 Electronically controlled Communication appliances	13	08	**CO1,CO3**
4.1 Cordless phones:- Transmitter section and Receiver Section 4.2 EPABX System :- Block diagram and working			
4.3 Public Addressing System*(LEVEL4)*			
5 Maintenance and safety Precautions	06	04	**CO4**
5.1 Electricity in home, Dangers of electricity, Safety Precautions, Hazards associated with electric current voltage, Approaches to prevent accidents, Fire prevention and fire fighting.			
Total	**75**	**48**	-

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**Electronically controlled low power Home appliances**	10	16
2	**Electronically controlled High power Home appliances**	14	22
3	**Electronically controlled Entertainment ,Commercial and surveillance appliances**	12	18
4	**Electronically controlled Communication appliances**	08	13
5	**Maintenance and safety Precautions**	04	06
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Use of Test and Measurement Instruments and Interpretation of manuals of CRO,Multimeter,Power Supply, and Function Generator	
2	Identification and testing of different types of components such as Resistors,Capacitors,Diodes,Transistors,Switches and Relays	
3	Soldering and Desoldering	
4	Explore the various functions of Washing machines and locate various sensors used in that washing machines	
5	Check the wiring of ACs and explore all functions	
6	Test various functions of Microwave ovens	
7	Explore settings Digital Cameras	
8	Demonstration of Photocopy Machine	
9	Demonstration of EPABX system	
10	Demonstration of CCTV Or simple Public address system	
	Total	25
No	**Class room Assignments**	**Marks**
1	At least 2 assignments	
No	**Tutorial Exercise**	**Marks**
1	NIL	
...	Total	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S.P.Bali	Consumer Electronics	Pearson Education
2	B.R. Gupta and V. Singhal	Consumer Electronics	New Age Int. Pub.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	J S Chitode	Consumer Electronics	Technical Publications Pune

(EX 617) MOBILE COMMUNICATION

1. COURSE OBJECTIVES:

The students will able to:

i. Understand the basic cellular communication concepts
ii. Describe various features & services provided by GSM & CDMA
iii. Understand features of modern cellular system.

2. PRE-REQUISITES:

i. Communication Engineering

3. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(EX 617) Mobile Communication		**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

4.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Describe the concepts, components & processes used in cellular communication
2. Differentiate various multiple access techniques, cellular systems & handoffs used in cellular communication
3 Apply the concepts of Cellular Communication to describe various processes in of GSM & CDMA
4. Analyze the features of various cellular communication systems

5. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	2	2	2	-	1	2	3
CO2	3	2	2	-	-	1	2
CO3	2	2	2	1	1	2	3
CO4	2	3	1	-	2	-	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	3
CO2	3	2
CO3	3	3
CO4	3	3

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**		
Unit			**M**	**Thr**	**CO**
1 Introduction to Cellular Communication Systems			24	16	CO1 CO2
1.1 Need of Mobile telephone system, Conventional Mobile telephone system & its limitations					
1.2 Analog & digital cellular system : Brief comparison					
1.3 A basic cellular system: Diagram & operation of each subsystem					
Cellular communication Concepts: • Cell, Cell geometry • Frequency reuse concept, frequency reuse schemes, frequency reuse distance • Co-channel interference & adjacent channel interference(definitions) • Co-channel reduction factor • Cell splitting: need & types, sectoring, segmentation & dualization Handoff: need, types (based on signal strength and C/I ratio),delayed handoff, power difference handoff, mobile assisted handoff , soft handoff & Intersystem handoff.(No Mathematical Treatment)					
2 Components and Working Principle of Cellular Communication Systems			15	09	C O1 C O2 C O3
2.1 Components of cellular communication system: Base station, MTSO, Mobile handset (Block Diagram Operation).					
2.2 Processes: Logon & Monitoring Process in cellular system					
2.3 Routing cellular calls: mobile to land line, landline to mobile, mobile to mobile & handoff mechanism.					

2.4 Frequency spectrum utilization, Setup Channels: Access & Paging Channels			
2.5 Multiple access techniques: Basic concepts & features of FDMA,TDMA & CDM			
3 Digital Cellular system-GSM	09	06	CO2 CO3 CO4
Global system for mobile(GSM): • Services & Features • Architecture & Operation of each subsystem • Frequency channels(TCHs,CCHs in brief) • Location update management • Authentication & encryption			
4 Digital Cellular system-CDMA	09	06	CO2 CO3 CO4
CDMA cellular system: • Services & Features • Radio aspects, forward channel structure and reverse channel structure • Power control • Soft handoff • Authentication, encryption and privacy			
5 Modern cellular systems	18	11	CO2 CO4
5.1 Limitations of 2G Cellular System			
5.2 Features of 2.5G Cellular system, Features of EDGE and GPRS systems			
3G technology networks: Features of • CDMA-2000 • WCDMA(UMTS). • Wireless Local area network(WLAN) • Bluetooth & Personal Area Networks(PANS)			
5.4 Features of 4G cellular system , Comparison of 3G & 4G cellular system			
Overview of 5G cellular system: • Performance Targets • Usage Scenario: Enhanced Mobile Broadband (eMBB),Ultra Reliable Low Latency Communications (URLLC), Massive Machine Type Communications (mMTC) • Advantages of 5G			
Total	**75**	**48**	

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to Cellular Communication Systems	16	24
2	Components and Working Principle of Cellular Communication Systems	09	15
3	Digital Cellular system-GSM	06	09
4	Digital Cellular system-CDMA	06	09
5	Modern cellular systems	11	18
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Study the features, specification and block diagram operation of mobile handset	
2.	Identify various sections of a mobile handset (hardware)	
3.	Measure/Observe signals at different sections of Mobile Phone	
4.	Identify various hardware faults in a mobile handset	
5.	Study of various software faults in a mobile handset	
6.	Comparision of GSM & CDMA cellular technology	
7.	Study the concept of Bluetooth & Wi-Fi(WLAN)	
8.	Study of advancement in modern Cellular communication systems	
9.	Visit to GSM /CDMA Base station (Optional)	
	Total	25
No	**Class room Assignments**	**Marks**
1	At least 2 assignments	

11. LEARNING RESOURCES Text

Books

S. No.	Author	Title of Books	Publishers
1	William Lee	Mobile cellular telecommunications	McGraw Hill ISBN 978-0-07-063599-9
2	Theodore s. Rappaport	Wireless communications- Principles & Practice	Prentice Hall of India ISBN 81-203-2381-5

3	Raj Pandya	Mobile & Personal Communication systems & services	Prentice Hall of India ISBN 81-203-1710-6
4	Wayne Tomasi	Advanced Electronic Communication systems	Pearson Education ISBN 81-297-0107-3

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	T.G.palanivelu & R.Nakkeeran	Wireless & Mobile Communication	PHI learning pvt ltd ISBN 978-81-203-3607-0
2	Rishabh Anand	Wireless Communication	S.Chand & company Ltd. ISBN 81-219-4055-9

Internet and Web Resources

1	https://en.wikipedia.org/wiki/5G
2	https://www.zdnet.com/article/what-is-5g-everything-you-need-to-know/
3	https://pdfs.semanticscholar.org/b2ab/1c503c76a4b3870feaec5c3a6a157972a555.pdf

(CC503) RENEWABLE ENERGY SYSTEMS AND ENERGY MANAGEMENT

1. COURSE OBJECTIVES:

To compare the different conventional energy sources with renewable energy sources. This course will also provide valuable insight on different energy conservation devices and its applications in the real world. It will also help to conduct energy audits using energy management techniques for energy conservation.

2. TEACHING AND EXAMINATION SCHEME

Semester									
Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	C	TH	TM	TW	PR/OR	
(CC503) Renewable Energy Systems And Energy Management	3	-	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:
CO1: Understand the various renewable energy sources and concepts of Energy management.
CO2: Describe the characteristics of various renewable energy sources and types of Energy Audits.
CO3: Design elementary Solar and wind energy systems
CO4: Apply the knowledge of energy conservation and energy management techniques to conduct energy audits.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	2	0	0	0	2	0	2	1	1
CO2	2	1	2	0	2	2	2	2	2
CO3	2	2	2	2	2	1	2	2	3
CO4	2	2	2	2	2	2	2	2	3

Relationship: Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**				
Unit			**M**	**Thr**	**CO**
Unit 1 INTRODUCTION TO RENEWABLE ENERGY SOURCES			**10**	**06**	**CO1**
1.1 Energy Scenario in India					
1.2 Need of Renewable energy sources.					
1.3 Types of Renewable energy sources - Basic concepts of Solar energy, Wind Energy, Tidal energy, Biomass Energy, Fuel Cell					
Unit 2 SOLAR ENERGY SYSTEMS			**16**	**10**	**CO1 CO2 CO3**
Solar Energy					
2.1 Principle of conversion of solar energy into heat and electricity					
2.2 Solar Radiation: Solar Radiations at earth's surface					
2.3 Solar Radiation Geometry: Declination angle, hour angle, altitude angle, incident angle, zenith angle, solar azimuth angle					
2.4 Characteristics of PV cell and concept of MPPT					
2.5 Construction and working of typical flat plate collector and solar concentrating collectors and their applications, advantages and limitations					
2.6 Space heating and cooling.					
2.7 Solar distillation, Solar cooking and furnace.					
Unit 3 WIND ENERGY SYSTEMS			**16**	**10**	**CO1 CO2 CO3**
3.1 Basic Principle of wind energy conversion.					
3.2 Advantages and limitations of wind energy conversion.					
3.3 Classification of wind mills					
3.4 Construction and working of horizontal and vertical axis wind mills, their comparison					
3.5 Main considerations in selecting a site for wind mills.					
3.6 Wind turbine Efficiency, Wind turbine control parameters- Yaw angle, Pitch angle, hub height, Solidity					
Unit 4 APPLICATIONS OF SOLAR AND WIND ENERGY SYSTEMS			**18**	**12**	**CO2 CO3**
4.1 PV system for street lights					
4.2 Design of PV system for domestic load.					
4.3 PV water pumping system					
4.4Design of household thermal heating system					
4.5Design of micro wind turbine for domestic load.					
Unit 5 ENERGY MANAGEMENT			**15**	**10**	**CO4**
5.1 Energy scenario in various sectors and Indian economy					
5.2 Need and importance of energy conservation and management					
5.3 Principles of energy conservation.					
5.4 Concept of Energy audit					
5.5 Types of Energy Audit					
5.6 Energy Conservation – Case study of Domestic system					
5.7Energy Conservation – Case study of Industrial system					
Total			**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction To Energy Sources	06	10
2	Solar Energy Systems	10	16
3	Wind Energy Systems	10	16
4	Applications of Solar and Wind energy systems	12	18
5	Energy Management	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Collect information about Indian energy market and prepare a report.	
2.	Study the construction and working of photo voltaic cell.	
3.	Study the construction, working of a solar cooker.	
4.	V-I, P-V Characteristics of Photovoltaic panel	
5.	Case Study on a nearest wind farm.	
6.	Visit to plant of solar heating system for hotel/hostel/railway station etc. and prepare a report.	
7.	Perform energy audit for workshop/Office/Home/SSI unit.	
8.	Study of various waste heat recovery devices.	
	Total	25

9. LEARNING RESOURCESText

Books

S. No.	Author	Title of Books	Publishers
1	DrB.H.Khan	Non-conventional	Tata McGraw Hill
2	S. P. Sukhatme	Energy Resources	Tata McGraw Hill
3	Arrora	Solar energy	Dhanpat Rai & co.
4	Domkundwar	Power plant engineering	Wiley Press
5	Gilbert M Masters	Renewable and Efficient Electric Power Systems	Wiley Interscience, New Jersey, 2004
6	Chetan Singh Solanki	Solar Photovoltaics; Fundamentals, Technologies and applications	PHI

(EX620) Image Processing

1. AIM

This course will expose the students with fundamentals of digital image processing and prepare them for a strong footing to pursue advanced digital image processing techniques.

2. COURSE OBJECTIVES:

This course will provide students exposure to digital image processing and impart fundamental image transformations and enhancements along with an insight into image compression. The course will also teach the students to detect basic object boundaries and know how to represent them.

3. PRE-REQUISITES:

1. Basic Mathematics (algebra)
2. Digital Electronics
3. Concept of time and frequency domain

4. TEACHING AND EXAMINATION SCHEME

Semester	**VI**									
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
(EX620) Image Processing		L	T	P	C	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

5. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Explain how an image is represented and processed in a computer system.
2. Apply suitable transformations to images for specific processing.
3. Make use of suitable algorithms to minimize noise in images and enhance them.
4. Analyze and select the most suitable algorithm, depending on the requirement and resources athand.

6. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn& Testing	Engg. Practices for Society,Sustaina bility & Environment	Project Management	Life -long Learning
CO1	3	2	2	0	0	1	2
CO2	3	1	2	1	1	0	0
CO3	3	2	1	0	2	1	2
CO4	2	3	1	2	2	2	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	2	1
CO2	3	1
CO3	2	2
CO4	3	2

7. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | Thr = Teaching hours | CO = Course Objectives	**M**	**Thr**	**CO**
UNIT 1: Introduction and Digital Image Fundamentals	12	08	**CO** 1,2,3
1.1 What is digital image processing, applications of Digital Image Processing.			
1.2 Digital Image Fundamentals: Human visual system- Structure of the human eye, Image formation in the eye, brightness adaptation and discrimination.			
1.3 Image sampling and quantization –Basic Concepts, representing digital images.			
1.4 Basic relationships between pixels			
UNIT 2: Image transformation	15	08	**CO** 1,2,3,4
2.1 Basic Gray Level Transformations: Image negatives, Log transformation, gamma correction.			
2.2 Concept of Piecewise –Linear Transformation Functions: contrast stretching, gray-level slicing, bit-plane slicing.			
2.3 Significance of a Histogram in image processing			
UNIT 3. Image enhancement	18	12	**CO** 1,2,3,4

3.1 Sources of noises (Gaussian, rayleigh, gamma, exponential, uniform, salt and pepper noise)—only brief description)			
3.2 Spatial Filtering (smoothing filters, averaging and median filters, sharpening filters- Laplacian filter)			
3.3 Enhancement using arithmetic/logic operations, Image subtraction, image averaging			
UNIT 4: Image Segmentation, Representation & Description			
4.1 Point, line and edge detection	18	12	**CO** 1,2,3,4
4.2 Basic Global Thresholding			
4.3 Regions Based segmentation- Region growing, region splitting and merging			
4.4 Representation: Chain codes, Polygonal approximations, Signatures			
4.5 Descriptors: Some simple descriptors, Shape numbers, Regional descriptors: Topological descriptors			
UNIT 5: Image Compression			
5.1 Fundamentals of redundancies	12	08	**CO** 1,2,3,4
5.2 Basic Compression Methods: Huffman coding, Arithmetic coding, Bit-plane coding, Constant area coding, run length coding.			
5.3 JPEG Compression standard			
	75	48	

7. COURSE DELIVERY:

The Course will be delivered through lectures and practicals.

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours	Marks
1	Introduction and Digital Image Fundamentals	08	12
2	Image transformation	08	15
3	Image enhancement	12	18
4	Image Segmentation, Representation & Description	12	18
5	Image Compression	08	12
	Total	**48**	**75**

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practicals
1.	To read and display images
2.	To identify different types of images and convert from one type to the other
3.	Gray scale transformations programs
4.	Programs illustrating Histogram Processing of an image
5.	Filtering of an image by an averaging filter
6.	Filtering of an image by a median filter
7.	Sharpening of an image using Laplacian
8.	Identification of segments in an image using Region filling/ growing algorithms
9.	Hough Transform for object detection
10.	Study of JPEG Compression standard

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Rafael C Gonzalez and Richard E Woods	Digital Image Processing	Pearson Education.
2	Anil K Jain	Fundamentals of Digital Image Processing	PHI

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Bhabatosh Chanda and Dwijesh Majumder	Digital Image Processing	PHI
2	Rafel C. Gonzalez and Richard E. Woods	Digital Image Processing Using Matlab	Pearson Education