Three-Year Undergraduate Programme

Diploma in Electronics & Communication Engineering

Faculty of Engineering & Technology
Parul University
Vadodara, Gujarat, India

Faculty of Engineering & Technology
Diploma in Electronics & Communication Engineering

1. Vision of the Department

Pioneering excellence in Electronics & Communication engineering education, our vision is to shape adept professionals equipped with innovative skills and a global perspective to meet the challenges of an ever-evolving technological landscape.

2. Mission of the Department

M1 Empower future Electronics & Communication engineers with cutting-edge education and practical skills for industry relevance.

M2 Cultivate a global mindset, fostering innovation and ethical responsibility in Electronics & Communication engineering practices.

M3 Strive for academic excellence, leveraging expert faculty and state-of-the-art laboratories to meet evolving industry demands.

3. Program Educational Objectives

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve during the first few years after graduation.

PEO 1	**Preparation**	To prepare students to succeed in employment/profession and/or to pursue under graduate educations in Electronics and Communication Engineering discipline in particular and allied Engineering discipline in general.
PEO 2	**Core Competence**	To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to formulate, analyse and solve engineering problems requiring knowledge of Electronics and Communication Engineering.
PEO 3	**Breadth**	To prepare students with engineering breadth to innovate, design, and develop products and to contribute in providing solutions related to multidisciplinary real life problems.
PEO 4	**Professionalism**	To inculcate in students professional and ethical attitude, effective communication skills and team work to become a successful professional.
PEO 5	**Learning Environment**	To provide students with an academic environment that makes them aware of excellence and lifelong learning in emerging technologies.

4. Program Learning Outcomes

Program Learning outcomes are statements conveying the intent of a program of study.

PLO 1	**Basic and Discipline specific knowledge**	Application of knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
PLO 2	**Problem analysis**	Identify and analyse well-defined engineering problems using codified standard methods.
PLO 3	**Design/ development of solutions**	Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
PLO 4	**Engineering Tools, Experimentation and Testing**	Execution of modern engineering tools and appropriate technique to conduct standard tests and measurements.
PLO 5	**Engineering practices for society, sustainability and environment**	Apply appropriate technology in context of society, sustainability, environment and ethical practices.
PLO 6	**Project Management**	Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
PLO 7	**Life-long learning**	Ability to analyse individual needs and engage in updating in the context of technological changes.

5. Program Specific Learning Outcomes

PSO 1	An ability to design, develop, supervise and implement solutions in the areas related to construction industry.
PSO 2	An ability to apply standard practices and strategies in identifying quality of material focusing quality output.

6. Credit Framework

Semester wise Credit distribution of the programme	
Semester-1	16
Semester-2	19
Semester-3	20
Semester-4	21
Semester-5	27
Semester-6	23
Total Credits:	**127**

Category wise Credit distribution of the programme	
Category	**Credit**
Major Core	72
Minor Stream	3
Multidisciplinary	25
Ability Enhancement Course	5
Skill Enhancement Courses	5
Value added Courses	2
Summer Internship	2
Research Project/Dissertation	13
Total Credits:	**127**

7. Program Curriculum

Semester 1						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	03605101	Environmental Science	0	2	0	0
2	03605151	Engineering Mechanics	3	3	0	0
3	03605152	Engineering Mechanics Lab	1	0	2	0
4	03607151	Fundamentals of Electrical and Electronics Engineering	3	2	0	1
5	03607152	Fundamentals of Electrical and Electronics Engineering Lab	1	0	2	0
6	03691101	Mathematics - I	3	2	0	1
7	03692153	Basic Physics	3	3	0	0
8	03692154	Basic Physics Lab	1	0	2	0
9	03693101	Communication Skills - I	1	1	0	0
		Total	**16**	**13**	**6**	**2**

Semester 2						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
10	03602107	Applied Chemistry	3	3	0	0
11	03602108	Applied Chemistry Lab	1	0	2	0
12	03606102	Introduction to IT Systems Lab	2	0	4	0
13	03607154	Electrical Workshop Practice Lab	1	0	2	0
14	03608151	Electronics devices and circuits	3	3	0	0
15	03608152	Electronics devices and circuits Lab	1	0	2	0
16	03609101	Engineering Graphics	1	1	0	0
17	03609102	Engineering Graphics Lab	2	0	4	0
18	03691151	Mathematics-II	4	3	0	1
19	03693151	Communication Skills - II	1	1	0	0
		Total	**19**	**11**	**14**	**1**

Semester 3						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
20	03600201	Entrepreneurship and Start-ups	1	1	0	0
21	03608201	Principles of Electronic Communication	3	3	0	0
22	03608202	Principles of Electronic Communication Lab	1	0	2	0
23	03608203	Digital Electronics	3	2	0	1
24	03608204	Digital Electronics Lab	1	0	2	0
25	03608205	Electronic Measurements and Instrumentation	3	3	0	0
26	03608206	Electronic Measurements and Instrumentation Lab	1	0	2	0
27	03608207	Electronic Circuits and Network	3	3	0	0
28	03608208	Electronic Circuits and Network Lab	1	0	2	0
29	03608209	Electronics Equipment and Maintenance	2	2	0	0
30	03693201	Professional Communication and Critical Thinking	1	1	0	0
		Total	**20**	**15**	**8**	**1**

Semester 4						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
31	03600251	Essence of Indian Knowledge and Tradition	0	2	0	0

32	03608251	Microcontroller and Applications	4	4	0	0
33	03608252	Microcontroller and Applications Lab	1	0	2	0
34	03608255	Digital Communication Systems	4	4	0	0
35	03608256	Digital Communication Systems Lab	1	0	2	0
36	03608259	Linear Integrated Circuits	4	3	0	1
37	03608260	Linear Integrated Circuits Lab	1	0	2	0
38	03608264	Minor Project	1	0	2	0
39	03608265	Power Electronics	3	3	0	0
40	03608266	Power Electronics Lab	1	0	2	0
41	03693251	Employability Skills	1	1	0	0
		Total	**21**	**17**	**10**	**1**

Semester 5

Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
42	03608302	Mobile and Wireless Communication Lab	1	0	2	0
43	03608303	Embedded Systems	4	4	0	0
44	03608304	Embedded Systems Lab	1	0	2	0
45	03608305	Mobile and Wireless Communication	3	3	0	0
46	03608306	Major Project-1	6	0	12	0
47	03608312	Summer Internship (4 Weeks After Sem-4)	2	0	0	0
48		Open Elective-I (CompulsoryCompulsory Subjects :1)	3	3	0	0
49		Program Elective - I (CompulsoryCompulsory Subjects :1)	3	3	0	0
50		Program Elective - II (CompulsoryCompulsory Subjects :1)	3	3	0	0
51		Program Elective Lab- I (CompulsoryCompulsory Subjects :1)	1	0	2	0
52		Program Elective Lab- II (Compulsory Subjects :1)	1	0	2	0
		Total	**28**	**16**	**20**	**0**

Program Elective - I

Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	03608333	Industrial Automation	3	3	0	0
2	03608335	Control System and Plc	3	3	0	0

Program Elective Lab - I

Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	03608334	Industrial Automation Lab	1	0	2	0
2	03608336	Control System and Plc Lab	1	0	2	0

Program Elective - II

Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	03608337	Optical Communication Networking	3	3	0	0
2	03608339	Microwave and Radar	3	3	0	0

Program Elective Lab - II

Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	03608338	Optical Communication Networking Lab	1	0	2	0
2	03608340	Microwave and Radar Lab	1	0	2	0

Semester 6

Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
53	03600351	Indian Constitution	0	2	0	0
54	03608351	Computer Networking and Data Communication	4	4	0	0
55	03608352	Computer Networking and Data Communication Lab	1	0	2	0
56	03608353	VLSI	4	4	0	0
57	03608354	VLSI Lab	1	0	2	0
58	03608355	Signal and Systems	3	3	0	0
59	03608356	Signal and Systems lab	1	0	2	0
60	03608360	Major Project-II	6	0	12	0
61		Open Elective-II (Compulsory Subjects :1)	3	3	0	0
		Total	**23**	**16**	**18**	**0**
		Total	**127**			

Open Elective-II						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
	03606281	Artificial Intelligence	**3**	**3**	**0**	**0**
	03606389	Fundamental of Python Programming	**3**	**3**	**0**	**0**
	03609339	Robotics and Automation Technology	**3**	**3**	**0**	**0**

8. Detailed Syllabus

Semester 1

(1)

a) **Course Name:** Environmental Science
b) **Course Code:** 303106201
c) **Prerequisite:** Zeal to learn the subject
d) **Rationale:** The course is designed to give developers a general awareness of these and related issues so that every student will start acting as a responsible citizen to make the country and the world a better place to live in.

e) **Course Learning Objective:**

CLOBJ 1	Extracting Ecosystem Structure and Describe the components of an ecosystem, including both biotic and abiotic factors and Interpret the significance of these cycles in maintaining ecosystem balance.
CLOBJ 2	Evaluate air and noise pollution sources, effects, and control measures, considering both natural and anthropogenic factors. Studying Air and Noise Pollution and Identify common air pollutants and their sources. Evaluate noise pollution sources, measurement techniques, and regulatory measures
CLOBJ 3	Analyze characteristics such as turbidity, pH, BOD, and COD in water. Examine primary, secondary, and tertiary methods of wastewater treatment. Investigate causes, effects, and preventive measures of soil pollution.
CLOBJ 4	Explore the basics of solar energy and different solar technologies and Evaluate biomass as an energy source, including its thermal characteristics and biogas production. Investigate new energy sources like hydrogen, ocean energy, tidal energy, and geothermal energy.
CLOBJ 5	Summerize the principles of the 3Rs (Reduce, Reuse, Recycle) in solid waste management. Evaluate methods of energy recovery and disposal, including sanitary landfill for municipal solid waste.

f) **Course Learning Outcomes:**

CLO 1	Describe the ecosystem and terminology and solve various engineering problems applying
CLO 2	Ecosystem knowledge to produce eco – friendly products.
CLO 3	Estimate the suitable air, the extent of noise pollution, and control measures and acts.
CLO 4	Interpret the water and soil pollution, and control measures and acts.

CLO 5	Classify different renewable energy resources and efficient process of harvesting.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	0	20	20	-	-	-	40

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Ecosystem:** Structure of ecosystem, Biotic & Abiotic components, Food chain and food web Carbon, Nitrogen, Sulphur, Phosphorus cycle. Global warming -Causes, effects, process, Green House Effect, Ozone depletion.	15%	3
2	**Air and Noise Pollution:** Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler). Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator). Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler, Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.	22%	6
3	**Water and Soil Pollution:** Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation. Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis), Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of	24%	8

	Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.		
4	**Renewable Sources of energy:** Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy. New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy.	**24%**	**8**
5	**Solid Waste management:** Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste.	**15%**	**3**

i) Text Book and Reference Book:

1. "Principles of Solar Engineering" By Yogi Goswami D., Frank Kreith, Jan F. Kreider | Taylor & Francis, 2003 | Second.
2. "Environmental Studies" By M.P. Poonia, S.C. Sharma | Khanna Publishing House, NewDelhi | 2017.
3. "Renewable Energy Sources" By Twidell J.W. and Weir. A | EFN Spon Ltd"Linear Systems and Signals" by B.P. Lathi.
4. "Environmental Sciences", By Daniel B Botkin & Edward A Keller, | John Wiley & Sons
5. "Air Pollution", By M. N. Rao and H. V. N. Rao | Tata McGraw-Hill Publishing Company
6. "Environmental Pollution Control Engineering", By Rao C.S | 2nd edition"Solid Waste Treatment and Disposal", By G. Tchabanoglous | McGraw Hill Pub.

(2)

a) **Course Name:** Engineering Mechanics
b) **Course Code:** 03605151
c) **Prerequisite:** Knowledge of Applied science.
d) **Rationale:** Engineering mechanics is the main subject of mechanical engineering which gives a basic base to other subjects like strength of materials, manufacturing process. The goal of this Engineering Mechanics course is to expose students to problems in mechanics as applied to plausibly real-world scenarios.

e) **Course Learning Objective:**

CLOBJ 1	Identify force systems in diverse engineering scenarios through the application of fundamental mechanics principles.
CLOBJ 2	To impart knowledge about calculate the centroid and centre of gravity for various components within engineering systems.
CLOBJ 3	To impart knowledge about force systems and methods to determine resultant.
CLOBJ 4	To impart knowledge about force systems and methods to determine resultant.
CLOBJ 5	Apply the principles of friction across various conditions to achieve practical objectives.
CLOBJ 6	Select appropriate eco-friendly lifting machines for specific purposes, considering relevant factors such as efficiency and sustainability.

f) **Course Learning Outcomes:**

CLO 1	Identify the force systems for given conditions by applying the basics of mechanics.
CLO 2	Find out the centroid and centre of gravity of various components in engineering systems.
CLO 3	Determine unknown force(s) of different engineering systems.
CLO 4	Determine unknown force(s) of different engineering systems.
CLO 5	Apply the principles of friction in various conditions for useful purposes
CLO 6	Select the eco-friendly relevant simple lifting machine(s) for given purposes

g) **Mapping of Course Learning Outcomes and Bloom's Taxonomy:**

Course Learning Outcomes	
CLO 1	Identify the force systems for given conditions by applying the basics of mechanics.
CLO 2	Find the centroid and centre of gravity of various components in engineering systems.
CLO 3	Determine unknown force(s) of different engineering systems.

CLO 4	Determine unknown force(s) of different engineering systems.
CLO 5	Apply the principles of friction in various conditions for useful purposes
CLO 6	Select the eco-friendly relevant simple lifting machine(s) for given purposes

h) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

i) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Basics of Mechanics:** Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.	10%	2
2	**Centroid and Centre of Gravity:** Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle) Centroid of composite figures composed of not more than three geometrical figures. Centre of Gravity of simple solids (Cube, cuboids, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids.	10%	6
3	**Coplanar Concurrent Forces:** Force – Unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Newton's first, second and third Law of motion Principle of transmissibility of force, Principle of superposition of force, Force system and its classification. Lami's Theorem – statement and explanation, Application for various engineering problems. Resolution of a force. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.	25%	10
4	**Equilibrium and Coplanar Non-Concurrent Forces:** Types of Equilibrium, Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analyzing	25%	10

	equilibrium. Moment and couple, Varignon's Theorem. Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load. Beam reaction graphically for simply supported beam subjected to vertical point loads only		
5	**Friction:** Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only. Ladder Friction, Engineering Problems.	**10%**	**6**
6	**Simple Lifting Machine:** Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, Work – work done , force displacement diagram, Power , Engineering Problems Energy – Kinetic & Potential energy and Engineering Problems. Law of machine. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines.	**20%**	**8**

j) Text Book and Reference Book:

1. "Applied Mechanics" by H. J. Shah and S. B. Junarkar.
2. "A Text Book of Engineering Mechanics" by Bansal R K.
3. "Engineering Mechanics" by J.L. Meriam, and L.G.Kraige."
4. Engineering Mechanics" by S.S. Bhavikatti and K. G. Rajashekarappa.

(3)

a) Course Name: Engineering Mechanics Lab
b) Course Code: 03605152
c) Prerequisite: Knowledge of Applied science
d) Rationale: Engineering mechanics is the main subject of mechanical engineering which gives a basic base to other subjects like strength of materials, manufacturing process. The goal of this Engineering Mechanics course is to expose students to problems in mechanics as applied to plausibly real-world scenarios.

e) Course Learning Objective:

CLOBJ 1	Identify force systems in diverse engineering scenarios through the application of fundamental mechanics principles.
CLOBJ 2	To impart knowledge about calculate the centroid and center of gravity for various components within engineering systems.
CLOBJ 3	To impart knowledge about force systems and methods to determine resultant.
CLOBJ 4	To impart knowledge about force systems and methods to determine resultant.
CLOBJ 5	Apply the principles of friction across various conditions to achieve practical objectives.
CLOBJ 6	Select appropriate eco-friendly lifting machines for specific purposes, considering relevant factors such as efficiency and sustainability.

f) Course Learning Outcomes:

CLO 1	Identify the force systems for given conditions by applying the basics of mechanics.
CLO 2	Find out the centroid and centre of gravity of various components in engineering systems.
CLO 3	Determine unknown force(s) of different engineering systems.
CLO 4	Determine unknown force(s) of different engineering systems.
CLO 5	Apply the principles of friction in various conditions for useful purposes
CLO 6	Select the eco-friendly relevant simple lifting machine(s) for given purposes

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. "Applied Mechanics" by H. J. Shah and S. B. Junarkar.
2. "A Text Book of Engineering Mechanics" by Bansal R K.
3. "Engineering Mechanics" by J.L. Meriam, and L.G.Kraige.
4. "Engineering Mechanics" by S.S. Bhavikatti and K. G. Rajashekarappa

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Law of Parallelogram: Verify and calculate resultant force through Law of Parallelogram.
2	Triangle Law of Forces: Verify and calculate resultant force through triangle Law of Forces.
3	Lami's Theorem: Verify and calculate resultant force through Lami's Theorem.
4	Polygon Law of Forces: Verify and calculate resultant force through Polygon Law of Forces.
5	Reactions in beam through Graphical & analytical method: Verify reactions in beam through Graphical & analytical method
6	Co efficient of Sliding Friction and angle of repose: Calculate Co efficient of Sliding Friction and angle of repose for different surfaces – Wood, Glass
7	Simple machines: To find out efficiency, velocity ratio and M.A for differential wheel and axle
8	Simple screw jack: To find out efficiency, velocity ratio and M.A for simple lifting machine using simple screw jack.
9	Centroid and Centre of Gravity: Solve numerical problems on Centroid and Centre of Gravity.

(4)

a) Course Name: Fundamentals of Electrical and Electronics Engineering

b) Course Code: 03607151

c) Prerequisite: Knowledge of Physics and Mathematics up to 10th Standard Level

d) Rationale: Electrical and electronics engineering equipment is widely used in mechanical/metallurgy/mining/Automobile/ Aeronautical engineering applications and a diploma engineer from any of these disciplines have to identify the related equipment being used in the industry with respect to their working and major faults that could occur. Electronics is an integral part of computers; hence students of computer engineering and information technology need to know the fundamental of electronics. This course has been designed to provide the needful inputs to handle

simple electronic components and circuits. Students after studying this course will be able to describe the basics of analog electronics, various electronics components and develop skills to use simple electronic instruments needed for computer-based working environment.

e) Course Learning Objective:

CLOBJ 1	Describe the fundamental principles of basic circuit elements, including resistors, capacitors, and inductors, and analyze their behavior in electrical circuits.
CLOBJ 2	Apply knowledge of logic gates to design and implement various electronic circuits, demonstrating proficiency in Boolean algebra and logic gate operations.
CLOBJ 3	Demonstrate comprehension of the basic concepts of operational amplifiers (op-amps), including their characteristics, configurations, and common applications in electronic circuits.
CLOBJ 4	Solve basic problems related to electrical circuits and machines, utilizing appropriate mathematical techniques and analytical methods to analyze circuit behaviour, troubleshoot issues, and optimize performance.

f) Course Learning Outcomes:

CLO 1	Determine the basic circuit elements.
CLO 2	Demonstrate logic gates and apply them in various electronic circuits.
CLO 3	Discuss the basic concepts of op-amps, and their applications.
CLO 4	Solve basic problems related to electrical circuits and machines.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**1**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Overview of Electronic Components & Signals** Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and	**15%**	**6**

	their Applications. Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current source, independent/dependent voltage current sources.		
2	**Introduction of Semiconductor Components** P-N junction diode, V-I Characteristics of P-N junction Diode, Zener Diode, Classification of Transistor, Transistor construction, Types of transistors (NPN & PNP)	**10%**	**5**
3	**Overview of Digital Electronics** Number systems, Base Conversion -BINARY -DECIMAL -HEX -OCTAL, Complements - 2' and 10's Complement -1's and 9's Complement, Binary addition, subtraction, multiplication and division Logic Gates -Basic Gates (AND, OR, Not), Universal Gates (NAND and NOR Gate), Complementary Gates-(EX-OR, EX-NOR), De-Morgan's Theorems, Adder and Subtractor, Multiplexer and De-multiplexer.	**25%**	**10**
4	**Electric Circuit** Generation of electricity, Different terms related to electric circuit, Concept of AC and DC, Concept of 1-phase and 3-phase supply, Electrical circuit elements – Resistor Inductor and Capacitor, Resistor in series and parallel, Ohm's law and its limitations, Factors affecting the value of resistance	**20%**	**8**
5	**Magnetic Circuit** Terms Related to magnetic circuit, Terms Related to AC circuit, Faraday's Law, Fleming's law, Lenz's Law, Hysteresis loop (B/H Curve), Types of Induced EMF, Comparison between Electric and Magnetic Circuit	**20%**	**8**
6	**Transformer and Machines** General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of motors; Basic equations of motors.	**10%**	**5**

i) Text Book and Reference Book:

1. **Basic Electrical Engineering** by Ritu Sahdev | Khanna Publishing House
2. **Fundamentals of Electrical Engineering** by Saxena, S. B. Lal | Cambridge University Press
3. **Electrical Technology Vol-1** By Theraja, B. L. | S. Chand, New Delhi

a) **Course Name:** Fundamentals of Electrical and Electronics Engineering Lab
b) **Course Code:** 03607152
c) **Prerequisite:** Knowledge of Physics and Mathematics up to 10th Standard Level.
d) **Rationale:** Electrical and electronics engineering equipment is widely used in mechanical/metallurgy/mining/Automobile/Aeronautical engineering applications and a diploma engineer from any of these disciplines have to identify the related equipment being used in the industry with respect to their working and major faults that could occur. Electronics is an integral part of computers; hence students of computer engineering and information technology need to know the fundamental of electronics. This course has been designed to provide the needful inputs to handle simple electronic components and circuits. Students after studying this course will be able to extract the basics of analog electronics, various electronics components and develop skills to use simple electronic instruments needed for computer-based working environment.

e) **Course Learning Objective:**

CLOBJ 1	Extract the fundamental principles of basic circuit elements, including resistors, capacitors, and inductors, and analyze their behavior in electrical circuits.
CLOBJ 2	Apply knowledge of logic gates to design and implement various electronic circuits, demonstrating proficiency in Boolean algebra and logic gate operations.
CLOBJ 3	Demonstrate comprehension of the basic concepts of operational amplifiers (op-amps), including their characteristics, configurations, and common applications in electronic circuits.
CLOBJ 4	Solve basic problems related to electrical circuits and machines, utilizing appropriate mathematical techniques and analytical methods to analyze circuit behaviour, troubleshoot issues, and optimize performance.

f) **Course Learning Outcomes:**

CLO 1	Interpret the basic circuit elements.
CLO 2	Classify logic gates and apply them in various electronic circuits.
CLO 3	extract the basic concepts of op-amps, and their applications.
CLO 4	Solve basic problems related to electrical circuits and machines.

g) **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**0**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous

Evaluation, **ESE-** End Semester Examination

i) Text Book and Reference Book:

1. **Basic Electrical Engineering** by Ritu Sahdev | Khanna Publishing House
2. **Fundamentals of Electrical Engineering** by Saxena, S. B. Lal | Cambridge University Press
3. **Electrical Technology Vol-1** By Theraja, B. L. | S. Chand, New Delhi

j) Mapping of Experiment List with Course Learning Outcomes:

Sr. NO.	Experiment List
1	Determine the permeability of magnetic material by plotting its B-H curve
2	Measure voltage, current and power in 1-phase circuit with resistive load.
3	Measure voltage, current and power in R-L series circuit.
4	Determine the transformation ratio (K) of 1-phase transformer.
5	Connect single phase transformer and measure input and output quantities.
6	Identify various active and passive electronic components.
7	Connect resistors in series and parallel combination on bread board and measure its value using digital Multimeter.
8	Use Multimeter to measure the value of given resistor. Determine the value of given resistor using digital multimeter to confirm with colour code.
9	Test the performance of PN-junction diode.
10	Test the half wave rectifier using CRO.
11.	Test the Bridge rectifier and capacitor filter using CRO.
12	Test the performance of Zener diode.
13	Identify the pins of IC 741.
14	Test the performance of CE NPN transistor.
15	Test the performance of transistor amplifier circuit.

a) **Course Name:** Mathematics I
b) **Course Code:** 03691101
c) **Prerequisite:** Knowledge of basic concept studied till 10th std.
d) **Rationale:** The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects**.**

e) **Course Learning Objective:**

CLOBJ 1	Apply logarithm in engineering calculation
CLOBJ 2	Analyze rational fraction into sum of partial fraction in engineering problems
CLOBJ 3	Learn trigonometric functions and its graph for engineering
CLOBJ 4	Interpret the concepts of complex numbers in engineering
CLOBJ 5	Relate the use of limit and functions in engineering
CLOBJ 6	Learn Differentiation of different functions in engineering

f) **Course Learning Outcomes:**

CLO 1	Extract the concepts logarithm with different examples
CLO 2	Illustrate rational fraction into sum of partial fraction in engineering
CLO 3	Illustrate trigonometric functions and its graph with different examples
CLO 4	Illustrate the concepts of complex numbers by using examples
CLO 5	Apply limit to functions by using examples
CLO 6	Apply derivative to different functions with examples

g) **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**1**	**0**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) **Course Content:**

Sr. No.	Content	Weightage	Teaching Hours
1	**Logarithms:** Definition, Logarithm as a transformation, Antilogarithm, Rules of Logarithms and examples, use logarithmic functions for simplifying arithmetic computations. **Partial fractions:** Definition of partial fractions. Types of partial fraction (Denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors).	**17%**	**4**
2	**Trigonometry:** Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Trigonometric identities, Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of all trigonometric functions	**23%**	**7**
3	**Permutations and Combinations:** Value of nPr and nCr with related examples, First principal of Mathematical Induction (without proof) **Binomial theorem:** Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for rational index (expansion without proof) first and second binomial approximation with applications to engineering problems	**9%**	**3**
4	**Complex Numbers:** Definition of a complex number, real and imaginary parts of a complex number, Polar and Cartesian representation of complex number, Conjugate of complex number, Geometric representation of complex numbers and their operations, Modules and Amplitude form, De Moivre's Theorem, Root of Complex Number, Use of De Moivre's Theorem to simplify mathematical expressions.	**17%**	**4**
5	**Calculus:** Definition of function; Concept of limits and standard forms of limits $\frac{x^n-a^n}{x-a}$, $\frac{sinx}{x}$, $\frac{a^x-1}{x}$, $(1+x)^{\frac{1}{x}}$ And Definition of continuous function and examples. Definition of derivative, differentiation of standard function by first principle, Rule of Differentiation, Differentiation of algebraic, trigonometric, Exponential, Logarithmic, Implicit	**34%**	**10**

	functions and Composite functions, Higher order derivatives.		

i) Text Book and Reference Book:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics (Diploma Stream), H.K. Dass, S. Chand Publishing
3. Mathematics for Polytechnic, S.P. Deshpande, Pune Vidyarthi Griha Prakashan.
4. Polytechnic Mathematics (Made Easy) (Applied Mathematics), Manjeet Singh

(7)

a) Course Name: Basic Physics Lab

b) Course Code: 03692154

c) Prerequisite: The ability to think critically, identify potential sources of error, and troubleshoot experimental setups is crucial in a physics lab.

d) Rationale: Physics involves quantitative analysis and mathematical modeling to describe physical phenomena. Basic physics education helps students develop quantitative and analytical skills that are valuable in a wide range of academic and professional settings.

e) Course Learning Objective:

CLOBJ 1	Students will demonstrate an gaining knowledge of basic electrical circuits, including Ohm's law, resistances in series and parallel combinations, and Kirchhoff's laws.
CLOBJ 2	Students will develop practical laboratory skills through hands-on experimentation, including the use of equipment such as galvanometers, voltmeters, ammeters, and Vernier calipers.
CLOBJ 3	Students will gain knowledge of semiconductor devices and their characteristics, including the V-I characteristics of semiconductor diodes made of different materials (e.g., Ge, Si).
CLOBJ 4	Students will apply physics principles to real-world situations, such as measuring AC frequency with a sonometer, determining energy and power in electrical circuits, and extracting nanotechnology concepts through SA/V ratio calculations.
CLOBJ 5	Students will learn to make accurate measurements using precision instruments such as Vernier calipers and screw gauges, and apply

	mathematical concepts to calculate physical quantities such as volume and diameter.

f) Course Learning Outcomes:

CLO 1	Students will demonstrate of basic electrical circuits, including Ohm's law, resistances in series and parallel combinations, and Kirchhoff's laws.
CLO 2	Students will develop practical laboratory skills through hands-on experimentation, including the use of equipment such as galvanometers, voltmeters, ammeters, and Vernier calipers.
CLO 3	Students will gain a knowledge of semiconductor devices and their characteristics, including the V-I characteristics of semiconductor diodes made of different materials (e.g., Ge, Si).
CLO 4	Students will apply physics principles to real-world situations, such as measuring AC frequency with a sonometer, determining energy and power in electrical circuits, and extracting nanotechnology concepts through SA/V ratio calculations.
CLO 5	Students will learn to make accurate measurements using precision instruments such as Vernier calipers and screw gauges, and apply mathematical concepts to calculate physical quantities such as volume and diameter.

h) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

i) Text Book/Reference Book

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.
5. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
6. A Textbook of Optics, N Subramanyam, Brij Lal, MN Avahanulu, S Chand and Company Ltd.
7. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University Press India Pvt. Ltd, New Delhi.

8. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. New Delhi.
9. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing House Pvt. Ltd, New Delhi.

j) Experiment List with Course

Exp. No.	Name of the Experiment
1	To verify Ohm's law by plotting graph between current and potential difference.
2	To verify laws of resistances in series and parallel combination
3	To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage
4	To convert a galvanometer into an ammeter.
5	To convert a galvanometer into a voltmeter.
6	To verify Kirchhoff's law using electric circuits.
7	To determine A.C. frequency with the help of sonometer
8	Measurement of Energy
9	To Measure A.C. Power using resistive load
10	To calculate SA/V ratio of simple objects to understand nanotechnology
11	To determine focal length and magnifying power of convex lens.
12	To verify inverse square law of radiations using a photo-electric cell.
13	To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object
14	To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge

(8)

a) Course Name: Basic Physics
b) Course Code: 03692155
c) Prerequisite: Basic knowledge of scientific notation and units of measurement.
d) Rationale: It provides the fundamental principles necessary for further scientific exploration, interdisciplinary connections, and practical applications in various fields,

ultimately empowering individuals to navigate and contribute to an increasingly complex world.

e) Course Learning Objective:

CLOBJ 1	Students will demonstrate an gaining knowledge of basic electrical circuits, including Ohm's law, resistances in series and parallel combinations, and Kirchhoff's laws.
CLOBJ 2	Students will develop practical laboratory skills through hands-on experimentation, including the use of equipment such as galvanometers, voltmeters, ammeters, and Vernier calipers.
CLOBJ 3	Students will gain knowledge of semiconductor devices and their characteristics, including the V-I characteristics of semiconductor diodes made of different materials (e.g., Ge, Si).
CLOBJ 4	Students will apply physics principles to real-world situations, such as measuring AC frequency with a sonometer, determining energy and power in electrical circuits, and extracting nanotechnology concepts through SA/V ratio calculations.
CLOBJ 5	Students will learn to make accurate measurements using precision instruments such as Vernier calipers and screw gauges, and apply mathematical concepts to calculate physical quantities such as volume and diameter.

f) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

g) Course Content:

Sr. No	**Content**	**Weightage**	**Teaching Hours**
1	**Unit 1: Physical world, Units and Measurements** Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI		

	units),Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis. Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.	15 %	6
2	**UNIT - 2: Electrostatics Current Electricity** Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law. Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down. Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and color coding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electro motive force (EMF) Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.	25 %	10

3.	**UNIT - 3: Electromagnetism and Magnetic materials** Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization. Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field. Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter. .	20%	8
4.	**UNIT - 4: Semiconductor Physics** Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (center taped). Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications.	20%	10
5.	**UNIT - 5: Modern Physics** Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor, laser characteristics, engineering and medical applications of lasers. Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, applications in; telecommunication, medical and sensors. Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology, and nanotechnology based devices and applications.	20%	8

References:

1. TextBook of Physics for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi

2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.
5. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
6. A Textbook of Optics, N Subramanyam, Brij Lal, MN Avadhanulu, S Chand and Company Ltd.
7. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University Press India Pvt. Ltd, New Delhi.
8. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. New Delhi.
9. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing House Pvt. Ltd, New Delhi.

(9)

a) **Course Name:** Communication skills - I
b) **Course Code:** 03693103
c) **Prerequisite:** Basic Knowledge of English
d) **Rationale:** Communication confidence laced with knowledge of English grammar is essential for all engineers.

e) **Course Learning Objective:**

CLOBJ 1	Encourage students to analyze information, evaluate arguments, and develop reasoned conclusions.
CLOBJ 2	Foster the ability to identify and solve complex problems through logical reasoning and creativity.
CLOBJ 3	Develop effective written, verbal, and non-verbal communication skills to express ideas clearly and persuasively.
CLOBJ 4	Teach students to work effectively in teams, valuing diverse perspectives and contributing positively to group efforts.
CLOBJ 5	Cultivate imaginative thinking and the ability to generate original ideas and solutions.
CLOBJ 6	Equip students with the skills to locate, evaluate, and ethically use information from various sources.

f) Course Learning Outcomes:

CLO 1	Analyze complex issues, evaluate evidence, and develop reasoned arguments to support their conclusions.
CLO 2	Identify problems, explore potential solutions, and implement strategies to address challenges effectively.
CLO 3	Articulate ideas clearly and persuasively in written, verbal, and non-verbal forms, adapting their communication style to different audiences and purposes.
CLO 4	Locate and critically evaluate information from various sources, demonstrating information literacy skills to support their learning and decision-making.

g) Teaching & Examination Scheme:

Teaching Scheme				**Examination Scheme**					**Total**
L	**T**	**P**	**C**	**Internal Evaluation**		**ESE**			**L**
				MSE	**CE**	**T**	**CE**	**P**	
1	0	-	1	-	-	-	100	-	100

Lect. - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** – Continuous Evaluation

Note: 15 Hours of additional sessions will be taken (within the semester) to match up 30 hours' content.

h) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Ice breaker + Introducing your friend**: • This is one activity which will build the bond between the students i the class and work as a team in the task given to them. The students will be asked to introduce their new best friend in the class. This will ensure that the bond being created here will stay strong and also breaks the ice between them.	05%	01
2	**Picture connector**: • In this class the students will be trained to form a logical connection between a set of pictures which will be shared with them. • This geared towards building creativity and	05%	01

	presentation skills.		
3	**Crazy Scientist**: • The students will be taught the importance of invention and innovation using some examples that changed the world the way it worked.	05%	01
4	**Shopping role play**: • This activity topic gears towards making students do role play based on shopping scenarios. • It involves giving them a scenario and asking them to further develop the idea in a very interesting manner, then going on to enact it.	05%	01
5	**Grammar** • Parts of speech, Active and Passive voice, Tenses	20%	10
6	**Communication: Theory & Practice** Basics of communication: Introduction ,meaning, definition , Process of communication Types of communication: Formal, Informal , Verbal / Non verbal and Written barriers to effective communication 7 Cs of effective communication: (considerate ,concrete concise , clear, complete , correct and courteous) Technical Communication :	12%	05
7	**Soft Skills** for Professional excellence I**ntroduction** :Soft skills and hard skills , Inportance of Soft Skills	12%	02
8	**Debate**: • Students are trained to let go of inhibitions and come forward and speak openly on passionate topics. • The students will be divided into teams and made to share their ideas and views on the topics.	05%	01
9	**Extempore**: • To change the average speakers in the class to some of the best Orator. • This will be done by making the students give variety of impromptu speeches in front of the class.	05%	01
10	**Letter Writing** • Types of letters-Inquiry letter, Order letter, Complaint letter, Adjustment, Request letter,	12%	02

	Recommendation letter • Format of letters		
11	**Reading Comprehension**: • Dabbawalahs • A Snake in the grass • Internet – Dr. Jagdish Joshi	14%	05
	Total	**100**	**60**

***Continuous Evaluation:**

It consists of

1. Phase I Exam-35 Marks(Hybrid or Offline Mode)
2. Phase II Exam -35 Marks (Hybrid or Offline Mode)
3. Activities – (Listening and Speaking) -10+10=20 Marks
4. Attendance -10 Marks

The passing marks for Continous Evaluation will be 40 out of 100.There will not be any re-test.

i) Text Book and Reference Books:

1. Active English –Almas Juneja and Vaseem Qureshi-Macmillan Publishers India Ltd
2. English- Prof. Pradyuman Raj, Prof. Rakhi Moghe, Ms. Anisha Modi
3. Technical Communication –Principles & Practice-IInd Edition by Meenakshi Raman & Sangeeta Sharma.
4. Effective Technical Communication by Dr.Bharti Kukreja & Dr. Anupama Jain
5. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
6. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London:Wilson & Sons, 1908.
7. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Re-vised Edition 2018)
8. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
9. M.Ashraf Rizvi. Effective Communication. Mc-Graw Hill: Delhi, 2002.
10. A Ready Reckoner –Dineshbhai J. Shah, Dr.Janakbhai I. Shah,Bhartiben P. Shah.
11. Oxford Dictionary
12. Roget's Theasaurus of English Words and Phrases.

Semester 2

(1)

a) **Course Name:** Applied Chemistry
b) **Course Code:** 03602107
c) **Prerequisite:** Knowledge of Basic knowledge of Science for the application.
d) **Rationale:** Science is fundamental to technician courses, aiming to cultivate scientific inquiry and cause-and-effect reasoning in students. Chemistry, as applied science, plays

a crucial role. Studying chemical concepts like bonding, corrosion, and organic chemistry, along with engineering materials such as polymers and lubricants, enhances knowledge of engineering subjects. Chemistry focuses on the changes in matter's structure and properties, forming the basis of engineering processes. Teaching should foster aptitude and predictive skills. A strong science foundation aids students' self-development and adaptability to evolving innovations.

e) Course Learning Objective:

CLOBJ 1	Explain the concept of existence of material in nature
CLOBJ 2	Acquaint with the various mechanisms of natural phenomena.
CLOBJ 3	Explain the characteristics of materials, substances, and compounds.
CLOBJ 4	Develop skills to conduct experiments.
CLOBJ 5	Apply analytical techniques to solve engineering problems and perform material performance analysis.

f) Course Learning Outcomes:

CLO 1	Classify that matter, in various forms, comprises the physical substance of the universe.
CLO 2	Familiarity with the mechanisms of natural phenomena for scientific inquiry, technological progress, environmental stewardship, and a deeper extracting of the ecosystem.
CLO 3	Learning about materials, substances & compounds provides insight in to the vast variety of nature.
CLO 4	Empowers individuals to engage in scientific inquiry, contribute to knowledge generation, and address real-world problems across diverse fields of study.
CLO 5	Equips individuals with the skills and knowledge needed to address complex challenges, drive innovation, and contribute to the advancement of science and technology for the betterment of society.

g) Teaching and Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**		**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr No	Topic	Weightage	Teaching Hrs.
1	**Chemical Bandings and Catalysis**: 1. Rutherford model of atom, Bohr's theory, Heisenberg uncertainty principle, Quantum numbers – orbital concept. 2. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration. 3. Theory of Valency 4. Electronic Configuration 5. Types of chemical bonds i. Electrovalent bond, & its characteristics ii. Covalent bond & its characteristics iii. Co- ordinate bond iv. Hydrogen bond, its types and Significance v. Metallic bond, Explanation of Metallic properties. vi. Electron Sea Model 6. Intermolecular force of attraction 7. Vander Waals force of attraction 8. Catalysis, i. Types of catalysis ii. Theory of Catalysis iii. Characteristics of Catalyst 9. Types of Catalyst i. Positive Catalyst ii. Negative Catalyst iii. Auto-catalyst Catalytic Promoter and Catalytic inhibitor Industrial Application of Catalyst	10	**6**
2	**Concepts of Electrochemistry**: 1. Introduction 2. Arrhenius theory of ionization. 3. Degree of ionization i. Factors affecting the degree of ionization 4. Definition of pH i. pH of acid, base and neutral solution ii. pH calculations of acid, base and salt solution at different concentration iii. Importance of pH in various fields. 5. Definition of buffer solution.	**20**	**8**

	i. Buffer Action & Types of buffer Solution. ii. Application of buffer solutions. 6. Electrolytes and Non-electrolytes i. Types of electrolytes Definition the term ` Electrode ' the Types of Electrodes Inert electrode, Working electrode & Reference electrode; with suitable Illustrations. Construction & Working of reference electrode: 1. Hydrogen electrode 2. Calomel electrode 3. Quinhydrone electrode 4. Glass electrode 5. Ag/ Agcl/ Kcl electrode • Kohlrausch Law of independent Migration of ions. 7. Construction and working of electrochemical cell 8. Standard conditions 9. Standard hydrogen electrodes 10. Nernst theory of single electrode potential & Nernstequation 11. Electrochemical series, galvanic series 12. Electrolysis, Faradays laws of electrolysis 13. Industrial application of Electrolysis 14. conductance of solution (a) Conductivity (b)Specific Conductivity (c) Equivalent conductivity (d) Molar conductivity		
3	**Corrosion of metals & its prevention**: Definition of corrosion 1. Types of corrosion i. Dry corrosion: Oxidation corrosion mechanism corrosion-mechanism, Nature of oxidefilm ii. Wet corrosion-mechanism iii. Concentration cell corrosion 2. Pitting corrosion 3. Waterline corrosion 4. Crevice corrosion 5. Stress Corrosion 6. Erosion Corrosion 7. Factors affecting the rate of corrosion, - Nature of film, Nature of Environment,PH of Solution, Area of cathode anode and, Temperature,Moisture,Purity of metal 8. Methods of prevention of corrosion- 9. Modification of environment,	**10**	**5**

	10. Modification of the properties of metal, 11. Use of protective coatings. 12. Anodic and cathodic protection, Modification in design and choice of material		
4	**Water Treatment**: Graphical presentation of water distribution on Earth (pie or bar diagram) . Hard water and soft water. 1. Types of hardness of water i. Salts producing hardness of water. ii. Method to express the hardness of water. 2. Estimation of total hardness by EDTA Method i. Examples to calculate the hardness 3. Effect of hard water in Boiler operation i. Scale and sludge formation and it'sPrevention ii. Priming and foaming and it's prevention. 4.4.3. Caustic embrittlement and it's prevention. Corrosion and it's prevention. 1. Softening of Water i. Soda-Lime process ii. Permutit process iii. Ion Exchange process iv. Reverse Osmosis process 2. Treatment of Drinking water i. Sedimentation ii. Coagulation iii. Filtration iv. Sterilization of water by chlorination Break-point chlorination-Graph v. enlist Indian standard specification of drinking water	**20**	**7**
5	**Lubricants**: 1. Introduction and definition of lubricants and lubrication 2. function of lubricants 3. Types of lubrication i. Fluid film lubrication. ii. Boundary lubrication 4. Classification of lubricants i. Solid lubricants ii. Semi-solid lubricants iii. Liquid lubricants iv. Synthetic oils	**10**	**5**

	5. Physical Properties of lubricants and their significance like i. Viscosity and viscosity index ii. Flash point and fire point iii. Pour point and cloud point iv. oiliness 6. Chemical Properties of lubricants like i. Soaponification value ii. Neutralization number iii. Emulsification number 7. Selection of lubricants for i. Gears ii. Cutting tools iii. Steam turbine		
6	**Polymer, Elastomers & Adhesives**: Introduction and Definition of Polymer andMonomer Classification of Polymer on basis of Molecular structure as Linear, Branch and Cross-linked polymers Classification on basis of monomers homopolymer andcopolymer) Classification of Polymers on of Thermal behaviour (Thermoplastics& Thermosetting) Types polymerization Reaction i. Addition Polymerization ii. Condensation Polymerization Synthesis, properties and application of i. Polyethylene ii. Polypropylene iii. Polyvinyl chloride iv. Teflon v. Polystyrene vi. Phenol formaldehyde vii. Acrylonitrile viii. Epoxy Resin Define the term: - elastomers Natural rubber and its properties vulcanization of rubber Synthetic rubber, Synthesis, properties and uses i. Buna-S Rubber ii. Buna-N Rubber iii. Neoprene Rubber Definition of adhesives and Examples i. Characteristics of adhesives ication of adhesives and their uses.	**20**	**6**
7	**Chemistry of Fuels:**	**10**	**5**

	7.1 Definition of fuel and combustion of fuel, 7.2 classification of fuels, calorific values (HCV and LCV), Bomb Calorimeter 7.3 calculation of HCV and LCV using Dulong's formula. 7.4 Proximate analysis of coal and Ultimate Analysis of coal 7.5 solid fuel petrol and diesel - fuel rating (octane and cetane numbers), Chemical composition, calorific values and 7.6 applications of LPG, CNG, water gas, coal gas, producer gas and biogas.		

i) Reference Books:

1. ENGINEERING CHEMISTRY by JAIN & JAIN; DHANPAT RAI
2. A Text Book of Polytechnic Chemistry V.P. Mehta; Jain Brothers
3. A Text Book of Applied Chemistry. J. Rajaram
4. Engineering Chemistry S S. Dara

(2)

a) Course Name: Applied Chemistry Lab

b) Course Code: 03602108

c) Prerequisite: Understanding of Basic knowledge of Science for the application.

d) Rationale: Science is fundamental to technician courses, aiming to cultivate scientific inquiry and cause-and-effect reasoning in students. Chemistry, as applied science, plays a crucial role. Studying chemical concepts like bonding, corrosion, and organic chemistry, along with engineering materials such as polymers and lubricants, enhances understanding of engineering subjects. Chemistry focuses on the changes in matter's structure and properties, forming the basis of engineering processes. Teaching should foster aptitude and predictive skills. A strong science foundation aids students' self-development and adaptability to evolving innovations.

e) Course Learning Objective:

CLOBJ 1	Explain the concept of existence of material in nature
CLOBJ 2	Acquaint with the various mechanisms of natural phenomena.
CLOBJ 3	Explain the characteristics of materials, substances, and compounds.
CLOBJ 4	Develop skills to conduct experiments.

CLOBJ 5	Apply analytical techniques to solve engineering problems and perform material performance analysis.

f) Course Learning Outcomes:

CLO 1	Discriminate knowledge of different Chemical reactions.
CLO 2	Classify the different types of titration.
CLO 3	Identify industrially important chemical reactions.
CLO 4	Explain the effects of temperature on lubricating oils.
CLO 5	Calculate the hardness in water.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Text Book and Reference Book:

1. ENGINEERING CHEMISTRY by JAIN & JAIN; DHANPAT RAI
2. A Text Book of Polytechnic Chemistry V.P. Mehta; Jain Brothers
3. A Text Book ofApplied Chemistry. J. Rajaram
4. Engineering Chemistry S S. Dara
5. A Lab guide for Applied chemistry – S Raghuram

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	**Name of the Experiment**
1	Determine the strength of given acidic solution using standard solution of base
2	Standardize KMnO4 solution by preparing standard oxalic acid and to estimate ferrous ions.
3	Standardize Na2S2O3 solution by preparing standard potassium dichromate and to estimate percentage of copper from brass.
4	Determine the viscosity of given lubricating oil by using Red-wood Viscometer
5	Determine PH-Values of given samples of Solution by using Universal Indicator and PH-meter

Exp. No.	Name of the Experiment
6	To Determine molecular weight of a polymer using Ostwald viscometer.
7	Preparation of (any one) polystyrene, urea formaldehyde, phenol formaldehyde and its Characterisation.
8	To Determine Acid Value of given lubricating Oil.
9	Determine of the percentage of moisture in a given sample of coal by proximate analysis.
10	To Determine of saponification value of an lubricating oil.
11	Study of corrosion of metals in medium of different pH.
12	To Determine the COD of given water sample.
13	Determine Flash & Fire point of given lubricating oil.

List of Practical/Activities: (To perform minimum 10 Practical)

1. Determine the strength of given acidic solution using standard solution of base
2. Standardize KMnO4 solution by preparing standard oxalic acid and to estimate ferrous ions.
3. Standardize Na2S2O3 solution by preparing standard potassium dichromate and to estimate percentage of copper from brass.
4. Determine the viscosity of given lubricating oil by using Red-wood Viscometer
5. Determine PH-Values of given samples of Solution by using Universal Indicator and PH-meter
6. To Determine molecular weight of a polymer using Ostwald viscometer
7. Preparation of (any one) polystyrene, urea formaldehyde, phenol formaldehyde and its Characterisation.
8. To Determine Acid Value of given lubricating Oil
9. Determine of the percentage of moisture in a given sample of coal by proximate analysis
10. To Determine of saponification value of an lubricating oil
11. Study of corrosion of metals in medium of different Ph
12. To Determine the COD of given water sample
13. Determine Flash & Fire point of given lubricating oil.
14. Study of Corrosion of Metals in the different Mediums.

(3)

a) **Course Name:** Introduction to IT Systems Lab
b) **Course Code:** 03606102

c) **Prerequisite:** Basic knowledge of Computer.

d) **Rationale:** This course aims to teach students basics of computer including hardware and software.

e) **Course Learning Objective:**

CLOBJ 1	Illustrate functional units and components of computer
CLOBJ 2	Familiarize the students with basic functions Internet applications.
CLOBJ 3	Enable the students in preparing documents and presentations.
CLOBJ 4	Students can create HTML pages

f) **Course Learning Outcomes:**

CLO 1	Know about different computer components& different types of memory.
CLO 2	Create excel sheet, power point, word, access database etc.
CLO 3	Use internet effectively.
CLO 4	Create dynamic webpages including style sheet.
CLO 5	Comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/attacks

g) **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
0	**-**	**4**	**2**	**-**	**-**	**100**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) **Text Book and Reference Book:**

1. "Basic Computer Course Made Simple", by Satish Jain | BPB Publication
2. "Basic Computer Engineering" By Sanjay Silakari and Rajesh K Shukla | Wiley India Pvt. Limited, Pub. Year 2011
3. "Computer Fundamentals", By P.K. Sinha | BPB Publications.
4. "HTML & CSS: The Complete Reference", By Thomas A. Powell | McGraw Hill

i) **Mapping of Experiment List with Course Learning Outcomes:**

Exp. No.	Name of the Experiment
1	Study practical of computer components.
2	Study practical of different OS installation (Windows, Linux, Ubuntu).
3	Write a script for basic OS commands.
4	Write a script for basic operators in OS.
5	Study practical of Internal structure and components of storage devices(Hard disk components).
6	Study practical of input working devices (Keyboard, Mouse, scanner).
7	Study practical of output working devices (Monitor, Printer).
8	Write a HTML code to display hello world
9	Write a HTML code to create a table for student marksheet.
10	Write a HTML code to create a simple registration form.
11	Write a CSS to create user define tag.
12	Write an HTML code to create static website using CSS
13	Study practical of evolution and working of internet.
14	Study practical of surfing techniques in internet
15	Create your Gmail account and use different services provided by Google like Google drive, sharable sheet etc.
16	Perform various DOS commands
17	Develop an excel sheet which has record of 50 students result of 5 subjects and make following analysis 1) Fetch the data of the student who has distinction 2) Fetch the data of students with minimum marks in each subject. 3) Sort the data based on percentage
18	Create a presentation of your favorite movie using animation
19	Create a word file for your resume
20	Create a library management database in access with a minimum of 5 tables in it.

(5)

a) **Course Name:** Electronics Devices and Circuit
b) **Course Code:** 03608151
c) **Prerequisite:** Knowledge of Basic Physics
d) **Rationale:** This course has been designed to provide the needful inputs to handle simple electronic components and circuits. Students after studying this course will be able to understand the basics of analog electronics, various electronics components and develop skills to use simple electronic components.

e) **Course Learning Objective:**

CLOBJ 1	- Define semiconductors and diodes, and distinguish between intrinsic and extrinsic semiconductors. - extract the concepts of N-type and P-type doping in semiconductors and the formation of PN junction diodes. - Analyze the forward and reverse bias characteristics of PN junction diodes.- Explore the principles, characteristics, construction, and working of Zener diodes. - Learn about diode rectifiers including half-wave and full-wave rectifiers, and different types of filters such as C, LC, and PI.
CLOBJ 2	- Describe the operation and characteristics of NPN and PNP transistors. - Explore the common base, common emitter, and common collector configurations of BJTs and their characteristics. - Illustrate the high-frequency model of BJTs and their classification. - Analyze the concept and effects of negative feedback in amplifiers.
CLOBJ 3	- Explain the working principle and classification of Field Effect Transistors (FETs). - interpret the small-signal model of Metal-Oxide-Semiconductor FETs (MOSFETs). - Describe the characteristics of N-Channel and P-Channel MOSFETs in enhancement and depletion modes. - Explore the application of MOSFETs as switches and common-source amplifiers.
CLOBJ 4	- Illustrate the construction, operation, working principles, and characteristics of Silicon-Controlled Rectifiers (SCRs).- Describe the construction, operation, working principles, and characteristics of DIACs and TRIACs. - Compare SCR, DIAC, TRIAC, and MOSFET as switches based on their properties and applications.
CLOBJ 5	- Analyze the properties of negative feedback in feedback amplifiers. - Explore basic feedback amplifier topologies including voltage series, voltage shunt, current series, and current shunt. - Interpret the basic principles and types of oscillators including crystal oscillators and non-linear/pulse oscillators.

f) **Course Learning Outcomes:**

CLO 1	Extract basic principle and operation of electronic circuits.

CLO 2	Apply the basic electronic skills as required in the field of computers and information technology
CLO 3	Familiarize the working of diodes, transistors, FET and integrated circuits.
CLO 4	Illustrate the working of rectifiers, amplifiers and oscillators.
CLO 5	Get a basic idea about measuring instruments.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	-	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Semiconductor and Diodes :** Definition, Extrinsic/Intrinsic, N-type & p-type PN Junction Diode – Forward and Reverse Bias Characteristics Zener Diode – Principle, characteristics, construction, working Diode Rectifiers – Half Wave and Full Wave Filters – C, LC and PI Filters	15	10
2	**Bipolar Junction Transistor (BJT)** : NPN and PNP Transistor – Operation and characteristics Common Base Configuration – characteristics and working Common Emitter Configuration – characteristics and working Common Base Configuration – characteristics and working High frequency model of BJT Classification of amplifiers, negative feedback	20	8
3	**Field Effect Transistors :** FET – Working Principle, Classification MOSFET Small Signal model N- Channel/ P-Channel MOSFETs – characteristics, enhancement and depletion mode, MOSFET as a Switch Common Source Amplifiers Uni- Junction Transistor – equivalent circuit and operation	20	10
4	**SCR DIAC & TRIAC :** SCR – Construction, operation, working, characteristics DIAC - Construction, operation, working, characteristics TRIAC - Construction, operation, working, characteristics SCR and MOSFET as a Switch, DIAC as bidirectional switch Comparison of SCR, DIAC,TRIAC, MOSFET	15	8
5	**Amplifiers and Oscillators** : Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt	30	15

	Current Series, Current Shunt Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator		

i) Text Book and Reference Book:

1. Electronics Devices and circuit theory (TextBook) By Boyestad & Nashelsky | Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
2. Electronics Devices & Circuits By Jacob Millman | McGraw Hill Education; 4 edition (2015) ISBN: 978-9339219543
3. Electronic Principles By Albert Malvino & David Bates | Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
4. Electronic Devices and Circuits By S. Salivahanan and N. Suresh Kumar | McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
5. Analog Circuits By A.K. Maini | Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)

(6)

a) Course Name: Electronics Devices and Circuit Lab

b) Course Code: 03608152

c) Prerequisite: Knowledge of Basic Physics

d) Rationale: This course has been designed to provide the needful inputs to handle simple electronic components and circuits. Students after studying this course will be able to understand the basics of analog electronics, various electronics components and develop skills to use simple electronic components.

e) Course Learning Objective:

CLOBJ 1	- Define semiconductors and diodes, and distinguish between intrinsic and extrinsic semiconductors. - extract the concepts of N-type and P-type doping in semiconductors and the formation of PN junction diodes. - Analyze the forward and reverse bias characteristics of PN junction diodes.- Explore the principles, characteristics, construction, and working of Zener diodes. - Learn about diode rectifiers including half-wave and full-wave rectifiers, and different types of filters such as C, LC, and PI.
CLOBJ 2	- Describe the operation and characteristics of NPN and PNP transistors. - Explore the common base, common emitter, and common collector configurations of BJTs and their characteristics. - Illustrate the high-frequency model of BJTs and their classification. - Analyze the concept and effects of negative feedback in amplifiers.
CLOBJ 3	- Explain the working principle and classification of Field Effect Transistors (FETs). - interpret the small-signal model of Metal-Oxide-Semiconductor FETs (MOSFETs). - Describe the characteristics of N-Channel and P-Channel MOSFETs in enhancement and depletion modes. - Explore the application of MOSFETs as switches and common-source amplifiers.

CLOBJ 4	- Illustrate the construction, operation, working principles, and characteristics of Silicon-Controlled Rectifiers (SCRs).- Describe the construction, operation, working principles, and characteristics of DIACs and TRIACs. - Compare SCR, DIAC, TRIAC, and MOSFET as switches based on their properties and applications.
CLOBJ 5	- Analyze the properties of negative feedback in feedback amplifiers. - Explore basic feedback amplifier topologies including voltage series, voltage shunt, current series, and current shunt. - Interpret the basic principles and types of oscillators including crystal oscillators and non-linear/pulse oscillators.

j) Course Learning Outcomes:

CLO 1	Extract basic principle and operation of electronic circuits.
CLO 2	Apply the basic electronic skills as required in the field of computers and information technology
CLO 3	Familiarize the working of diodes, transistors, FET and integrated circuits.
CLO 4	Illustrate the working of rectifiers, amplifiers and oscillators.
CLO 5	Get a basic idea about measuring instruments.

f) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
0	**-**	**4**	**2**	**-**	**-**	**100**	**-**	**0**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

g) Text Book and Reference Book:

1. Electronics Devices and circuit theory (TextBook) By Boyestad & Nashelsky | Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
2. Electronics Devices & Circuits By Jacob Millman | McGraw Hill Education; 4 edition (2015) ISBN: 978-9339219543
3. Electronic Principles By Albert Malvino & David Bates | Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
4. Electronic Devices and Circuits By S. Salivahanan and N. Suresh Kumar | McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
5. Analog Circuits By A.K. Maini | Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)

h) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Construct the circuit and plot the VI characteristics of the PN Junction Diode , find the cut in voltage
2	Construct the circuit and plot the characteristics of a Zener Diode. Find the breakdown voltage
3	Construct a Half Wave Rectifier and obtain regulation characteristics – Without Filters and with Filters Compare the results
4	Construct a Full Wave Rectifier and obtain regulation characteristics – Without Filters and with Filters Compare the results
5	Construct a Bridge Rectifier and obtain regulation characteristics – Without Filters and with Filters
6	Obtain the characteristics of DIAC and TRIAC
7	Simulate half wave, full wave and bridge rectifier using simulation tool like PSpice/ Orcad/ Multisim
8	Develop a simulation model for Voltage Series and Voltage Shunt Feedback Amplifiers.
9	Develop circuits for Voltage Series and Voltage Shunt Feedback Amplifiers and obtain output plots. Compare the results with the simulation model.
10	Develop a simulation model for Current Series and Current Shunt Feedback Amplifiers.
11	Develop circuits for Current Series and Current Shunt Feedback Amplifiers and obtain output plots. Compare the results with the simulation model.

a. **Course Name:** Engineering Graphics
b. **Course Code:** 03609101
c. **Prerequisite:** Drawing basic knowledge
d. **Rationale:** Engineering drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. It is the transmitting link between ideas and realization. It is an attempt to develop fundamental Understanding and application of engineering drawing. It covers knowledge &

application of drawing instruments & also familiarizes the learner about Bureau of Indian standards.

e. Course Learning Objective:

CLOBJ 1	The course is aimed at developing Basic Graphic skills.
CLOBJ 2	Develop Skills in Preparation of Basic Drawings.
CLOBJ 3	Skills in Reading and Interpretation of Engineering Drawings.

f. Course Learning Outcomes:

CLO 1	Engineering drawing is an effective language of engineers.
CLO 2	It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.
CLO 3	It is an attempt to develop fundamental knowledge and application of engineering drawing.
CLO 4	It covers Knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian Standards.
CLO 5	The curriculum aims at developing the ability to draw and read various drawings, curves & Projections.
CLO 6	Select and construct appropriate drawing scales, use drawing equipment's, and interpret Indian Standards of engineering drawing.
CLO 7	Draw views of given object and components
CLO 8	Sketch orthographic projections into isometric Projections and vice versa.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
1	**-**	**0**	**1**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

k) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Drawing equipment's, instruments and materials.** Equipment's-types, specifications, method to use them,	**4**	**1**

	applications. Instruments-types, specifications, methods to use them and applications. Pencils-grades, applications, types of points and applications. Other materials-types and applications.		
2	**Planning, Layout and Scaling Of Drawing** Follow and apply standard practice as per bureau of I.S. for planning and layout, Choose appropriate scale factor for the drawing as per given situation	**4**	**0**
3	**Lines, Lettering and dimensioning:** Different types of lines. Vertical capital and lower-case letters. Inclined capital and lower-case letters. Numerals and Greek alphabets. Dimensioning methods. Aligned method. Unilateral with chain, parallel, progressive and combined dimensioning.	**4**	**0**
4	**Geometric Construction:** Geometric construction related with line like bisecting a line, to draw perpendicular with a given line, divide a line, etc. Geometric construction related with angle like bisect an angle, trisect an angle, etc. To construct polygon. Triangle, Square / Rectangle, Pentagon with special method. d: Hexagon with special method. To draw tangents. Geometric construction related with circle & arc.	**7**	**2**
5	**Engineering Curves:** Conic sections: Concept and knowledge of focus, directory, vertex and eccentricity and drawing of conic sections. Using various methods, understand construction of: Ellipse. Parabola. Hyperbola. Cycloidal Curves (Cycloid, Epicycloid, Hypocycloid) Involutes. Involutes of a circle, Involutes of a polygon, Spiral (Archimedean spiral only).	**22**	**3**
6	Projection Of Points, Lines and Planes Reference planes, orthographic projections. Concept of quadrant.1st angle and 3rd angle projection and their symbols. Projection of points. Projection of lines – determination of true length and inclinations for following cases. Line parallel to one or both the plane. Line perpendicular to one of the planes. Line inclined to one plane and parallel to another. Line inclined to both the planes. Projection of Planes: Types of planes, Projection of planes parallel to one of the reference planes, Projection of plane inclined to one reference plane and perpendicular to another, Projection of planes inclined to both reference planes.	**25**	**2**
7	**Orthographic Projections:** Types of projections-orthographic, perspective, isometric and oblique: concept and applications. Various term associated with orthographic projections. Theory of projection, Methods of projection, Orthographic projection, Planes of projection. Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection B.I.S. code of practice	**22**	**3**
8	**Isometric Projections:** Isometric axis, lines and planes. Isometric scales. Isometric view and isometric drawing. Difference between	**12**	**3**

	isometric projection and isometric drawing. Illustrative problems limited to objects containing lines, circles and arcs shape only.		

j. Text Book and Reference Book:

1. "ENGINEERING GRAPHICS" By P. J. Shah | S. Chand & Co., New Delhi Publications.
2. "A Text Book of Engineering Graphics" By P.J. Shah | S. Chand & Company Ltd., New Delhi
3. "Engineering Drawing" By P.J. Shah. | S. Chand, New Delhi

(8)

a) **Course Name:** Engineering Graphics Lab
b) **Course Code:** 03609102
c) **Prerequisite:** Zeal to learn the subject
d) **Rationale:** Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

e) Course Learning Objective:

CLOBJ 1	Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
CLOBJ 2	Train the usage of 2D and 3D modeling.
CLOBJ 3	Instruct graphical representation of machine components.

f) Course Learning Outcomes:

CLO 1	Select and construct appropriate drawing scales, use drawing equipment's, and extract Indian Standards of engineering drawing.
CLO 2	Draw views of given object and components.
CLO 3	Sketch orthographic projections into isometric projections and vice versa.
CLO 4	Apply computer aided drafting tools to create 2D engineering drawings.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**		
L	**T**	**P**	**C**	**Internal Evaluation**	**ESE**	**Total**

				MSE	CE	P	Theory	P	
0	**-**	**4**	**2**	**-**	**-**	**100**	**-**	**0**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

6. Engineering Drawing Practice for Schools and Colleges By Bureau of Indian Standards | Government of India, Pub. Year 1998
7. Engineering Drawing By N. D. Bhatt | Charotar Publishing House, Pub. Year 2010
8. Engineering Graphics & Design By Jain & Gautam | Khanna Publishing House
9. Engineering Drawing By D. A. Jolhe | Tata McGraw Hill Edu
10. Engineering Drawing By R. K. Dhawan | S. Chand and Company

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	USE OF DRAWING INSTRUMENTS
2	GEOMETRIC CONSTRUCTION
3	ENGINEERING CURVES – I
4	ENGINEERING CURVES – II
5	PROJECTIONS OF POINTS AND LINE
6	PROJECTIONS OF PLANE
7	ORTHOGRAPHIC PROJECTIONS
8	ISOMETRIC DRAWINGS

(9)

a) Course Name: Mathematics II
b) Course Code: 03691151
c) Prerequisite: Knowledge of Basic concept of mathematics studied till first semester
d) Rationale: This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, Integral Calculus coordinate geometry, Basic elements of vector algebra and First Order Differential Equations.

e) Course Learning Objective:

CLOBJ 1	Extract concept of determinant and matrix in engineering
CLOBJ 2	Extract concept of vector algebra in engineering
CLOBJ 3	Learn geometry of lines and circle
CLOBJ 4	illustrate the integral calculus in engineering
CLOBJ 5	Apply integral calculus in differential equation
CLOBJ 6	Use of MATLAB software to solve engineering problems

f) Course Learning Outcomes:

CLO 1	To illustrate concept of determinant and matrix in engineering
CLO 2	To extract concept of vector algebra in engineering
CLO 3	To Learn geometry of lines and circle
CLO 4	To illustrate the integral calculus in engineering
CLO 5	To Apply integral calculus in differential equation
CLO 6	To Use of MATLAB software to solve engineering problems

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**1**	**0**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Determinants and Matrices:** Elementary properties of determinants up to 3rd order, consistency of equations, Crammer s rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.	**22%**	**8**

2	**Vector Algebra:** Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of two vectors. Simple problems related to work, moment and angular velocity.	**13%**	**5**
3	**Co-Ordinate Geometry:** Straight line Inclination and slope of a line, different forms of equations to a straight line, Slope-intercept form, Point slope form ,Two-point form , Intercept form. General equation of a Straight line, Family of lines. Conditions for concurrency of lines. Circle Definition, Equation of a circle with given center and radius, General form of equation of circle, Equation of a circle when intercepts are given, circle passing through three points, Equation of chord, Equations of tangents and normal at a point on a circle.	**15%**	**7**
4	**Integral Calculus:** Integration as inverse operation of differentiation, Integration of simple functions, Integration by substitution, by parts and by partial fractions (for linear factors only). Definite integral: Definition, Properties of Definite integral, Odd and Even functions, Use of formulas, and for solving problems Where m and n are positive integers. Applications of integration for i. Simple problem on evaluation of area bounded by a curve and axes. ii. Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems)	**37%**	**14**
5	**Differential Equations:** Solution of first order and first degree differential equation by variable separation method (simple problems), Exact differential equations(simple problems), Linear differential equations(simple problems), MATLAB Simple Introduction.	**13%**	**5**

i) Text Book and Reference Book:

1. Higher Engineering Mathematics B. S. Grewal; Khanna Publications
2. Polytechnic Mathematics S P Deshpande; Pune Vidyarthi Gruh Prakashan

(10)

a) Course Name: COMMUNICATION SKILLS-II

b) Course Code: 03693153

c) Prerequisite: Inclination to improve speaking & listening skills. Basic speaking & writing skills

d) Rationale: Communication skills are essential for all Diploma Engineers

e) Course Learning Objective:

CLOBJ 1	Develop learning & establish a platform for the students that they can easily learn through various life skills required in the organization for becoming an asset for the organization.
CLOBJ 2	Make them classify how new words are formed, role of syllable, vowel , consonant in pronunciation of word.
CLOBJ 3	Enables students to engage in formal communication as well as to participate in events like debate, extempore etc, and to introduce them to various international Language testing systems
CLOBJ 4	Co-relating of sentence through para jumble concepts.
CLOBJ 5	Encourage students to overcome stage fear through classroom activities.
CLOBJ 6	Make learning fun through the usage of comprehension units.

f) Course Learning Outcomes:

CLO 1	Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
CLO 2	Apply and analyses the right kind of pronunciation with regards to speech sounds and able to get different types of pronunciations.
CLO 3	Able to read, and interpret a text intrinsically as well as extrinsically. The learner can browse a text quickly to come-up with a gist and personal interpretation. One is able to create a healthy work-environment and prove to be an asset or one of the most reliable resources to the Organization. As a professional, one is mature to bridge the gulf between the existing behavior/ lifestyle and the expected corporate behaviour cum lifestyle with the help of learning life skills.
CLO 4	Apply the concepts of grammar, various strategies and the usage of formal language in written expression. By using synonyms rewrite the same text in the same format and meaning. Write the gist of the given text.

g) Teaching & Examination Scheme:

Evaluation Scheme									**Total**
Teaching Scheme				**Teaching Scheme**					
L	**T**	**L**	**C**	**L**		**T**			
				T	**P**	**T**	**CE**	**P**	
1	0	-	1	-	-	-	100	-	100

Lect. - Lecture, **Tut.** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** – Continuous Evaluation

Note: 15 Hours of additional sessions will be taken (within the semester) to match up 30 hours content.

h) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Listening skills:** **Listening Process and Practice:** Introduction, importance of good Listening skills, difference between listening and hearing, types of listening, Barriers to effective listening, traits of a good listener.	10%	6
2	**Listening Skills – Questions**: With audio aids, students will be able to listen to dialogues, improve in gathering information and to summarize the content. To listen and interpret day-to-day conversations and to solve questions based on audio files.	2%	1
3	**Building Vocabulary** Synonyms, Antonyms, Homophones, Homonyms, Homographs, Phrasal verbs, idioms & phrases, One word substitution	2%	1
4	**Introduction to Phonetics** **Sounds:** Consonant, Vowel, Diphthongs, transcription of words (IPA) weak forms, syllable division, word stress, intonation and voice	10%	6
5	**Speaking Skill Building Introduction**: To enable students to eliminate stage fright and engage in conversation with others.	3%	2
6	**Speaking Skill Building Activity:** Enables students to engage in formal communication as well as to participate in events like debate, extempore etc, and to introduce them to various international Language testing systems	2%	1
7	**Tourism Pitch:** Classroom activity which helps students to express their feelings and experiences in English. Encouraging students to overcome stage fear.	2%	1
8	**Lifeboat:** Classroom Activity to encourage Communication and	5%	1

	Convincing Skills		
9	**Reporter:** Classroom Activity to encourage Communication and Convincing Skills**.**	5%	1
10	**Paragraph jumble:** Enhance the skill of writing by completing the paragraph in appropriate and sensible form	5%	4
11	**Life skills:** Self-Awareness, Empathy, Sympathy, Emotional Intelligence	5%	4
12	**Reading Comprehension:** A Day's Wait – Ernest Hemingway, My Lost Dollar- Stephen Leacock	10%	2

****Continuous Evaluation:**

It consists of

1. Phase I Exam-35 Marks(Hybrid or Offline Mode)
2. Phase II Exam -35 Marks (Hybrid or Offline Mode)
3. Activities – (Listening and Speaking) -10+10=20 Marks
4. Attendance -10 Marks
5. The passing marks for Continous Evaluation will be 40 out of 100.There will not be any re-test.

i) Text Book and Reference Book:

1. Technical Communication –Principles & Practice-IInd Edition by Meenakshi Raman & Sangeeta Sharma.
2. Effective Technical Communication by Dr. Bharti Kukreja & Dr. Anupama Jain
3. Daniel Johns : The Pronunciation of English. Cambridge: Cambridge University Press, 1956
4. James Hartman & et al. Ed. English Pronouncing Dictionary .Cambridge University Press,2006.
5. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi 00(Revised Ed.2018)
6. Active English –Almas Juneja and Vaseem Qureshi-Macmillan Publishers India Ltd
7. English- Prof. Pradyuman Raj, Prof. Rakhi Moghe, Ms. Anisha Modi

i. 8.J.D.O's Connor. Better English Pronunciation0 Cambridge University Press,1980

8. Lindley Murry .An English Grammar: Comprehending Principles and Rules. London: Wison and sons,1908.
9. Margaret M. Maison. Examine your English Orient Longman:New Delhi,1964

10. J.Sethi & et al.A Practice Course in English Pronunciation, New Delhi: Prentice Hall, 2004
11. Pfeiffer, William Sanborn and T.V.S. Padmaja. Technical Communication: A Practical Approach 6th ed Delhi: Pearson, 2007.

Semester 3

(1)

a) **Course Name:** Entrepreneurship and Start ΄Ups
b) **Course Code:** 03600201
c) **Prerequisite:** : Zeal to learn Subject
d) **Rationale:** : The main objective of this course is to understand the concept and process of entrepreneurship - its contribution and role in the growth and development of individuals and the nation and learning the process and skills of creation. This subject provides detailed information about Acquiring Entrepreneurial spirit and resourcefulness, Familiarization with various uses of human resource for earning dignified means of living, Acquiring entrepreneurial quality, competency, and motivation and management of entrepreneurial ventures.

e) **Course Learning Objective:**

CLOBJ 1	Recognize and adopt the entrepreneurial mindset characterized by creativity, resilience, adaptability, and risk-taking.
CLOBJ 2	Develop the ability to identify, evaluate, and exploit entrepreneurial opportunities in various industries and market segments.
CLOBJ 3	Learn to develop comprehensive business plans that encompass market analysis, product/service development, marketing strategies, financial projections, and operational plans.
CLOBJ 4	Acquire practical skills necessary for entrepreneurship, including leadership, decision-making, problem-solving, negotiation, and time management.
CLOBJ 5	Develop strategies for market positioning, branding, customer acquisition, and sales promotion tailored to the startup's target market and competitive landscape.

CLOBJ 6	Develop strategies for identifying, mitigating, and managing risks inherent in startup ventures, including financial risks, market risks, and operational risks.
CLOBJ 7	Illustrate the challenges and strategies involved in scaling a startup, including expanding into new markets, diversifying product lines, and managing rapid growth.

f) Course Learning Outcomes:

CLO 1	Gaining knowledge of the dynamic role of entrepreneurship and small businesses
CLO 2	Organizing and Managing a Small Business
CLO 3	Financial Planning and Control
CLO 4	Forms of Ownership for Small Business
CLO 5	Strategic Marketing Planning
CLO 6	New Product or Service Development
CLO 7	Business Plan Creation

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
1	**-**	**0**	**1**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	Introduction to Entrepreneurship and Start 'Ups Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation, Types of Business Structures, Similarities/differences between entrepreneurs and managers	**15%**	**8**
2	Business Ideas and their implementation Discovering ideas and visualizing the business , Activity map , Business Plan	**15%**	**8**

3	**Idea to Start-up** Market Analysis ׳Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting, Risk analysis	**20%**	**10**
4	**Management Company׳s** Organization Structure: Recruitment and management of talent	**20%**	**8**
5	**Financing and Protection of Ideas** Financing methods available for start-ups in India , Communication of Ideas to potential investors ׳Investor Pitch, Patenting and Licenses	**20%**	**7**
6	**Exit strategies for entrepreneurs** Exit strategies for entrepreneurs, bankruptcy , succession and harvesting strategy	**10%**	**7**

i) Text Book and Reference Book:

1. Entrepreneurial Development By Srinivasan. N.P | New Delhi: S.Chand 1999
2. ENTREPRENEURIAL DEVELOPMENT By Vasant Desai | Himalaya Publication
3. Entrepreneurial Development By David Holt

(2)

a) Course Name: Principles of Electronic Communication

b) Course Code: 03608201

c) Prerequisite: Knowledge of Basic Mathematics

d) Rationale: Wireless communication plays vital role in the field of electronic communication systems which includes radio, mobile and satellite communication systems. This requires that an electronic engineering diploma holder will have to maintain electronic communication equipment and circuits related to this area. This course is intended to lay the foundation for understanding the advanced communication courses in the subsequent semesters. Hence this course describes fundamentals of wireless communication covering analogue and digital modulation techniques. Since it is a basic core course, students should develop in depth understanding of all concepts and principles so that they may learn advance courses easily and effectively.

e) Course Learning Objective:

CLOBJ 1	Define the need of modulation and frequency conversion for communication systems
CLOBJ 2	Explain the different analog and digital modulation schemes for transmission of information.
CLOBJ 3	interpret and apply the concepts telecommunication, networking and switching technologies.
CLOBJ 4	Illustrate the different concepts used in a satellite communication system and summarize the basic elements of optical fiber transmission link and structures.

f) Course Learning Outcomes:

CLO 1	Use of different modulation and demodulation techniques used in analog communication.
CLO 2	Identify and solve basic communication problems.
CLO 3	Analyze transmitter and receiver circuits.
CLO 4	Compare and contrast design issues, advantages, disadvantages and limitations of analog communication systems.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**1**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Analog Modulation** Concept of frequency translation. Amplitude Modulation: Description of full AM, DSBSC, SSB and VSB in time and frequency domains, methods of generation & demodulation, descriptions of FM signal in time and frequency domains.	**20%**	**10**

2	**Pulse Analog Modulation** Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains, Pulse Modulation techniques: PAM,PWM, PPM.	**15%**	**8**
3	**PCM & Delta Modulation Systems** Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation.	**15%**	**8**
4	**Digital Modulation** Baseband transmission: Line coding (RZ, NRZ), inter symbol interference (ISI), pulse shaping, Nyquist criterion for distortion free base band transmission, raised cosine spectrum. Pass band transmission: Geometric interpretation of signals, orthogonalization	**30%**	**12**
5	**Spread-Spectrum Modulation** Introduction, Pseudo-Noise sequences, direct sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA.	**20%**	**10**

i) Text Book and Reference Book:

1. Electronic Communication system By G. Kennedy | Tata M. Graw Hill
2. Electronics communication system By Kennedy George | Tata McGraw hill, New Delhi
3. Fundamentals of Communication Systems By J. G. Proakis and M. Salehi | Pearson Education | 4
4. Communication Systems: Analog and digital By Singh and Sapre | TataMcGraw Hill

(3)

a) Course Name: Principles of Electronic Communication Lab

b) Course Code: 03608202

c) Prerequisite: Knowledge of Basic Mathematics

d) Rationale: Wireless communication plays a vital role in the field of electronic communication systems which includes radio, mobile and satellite communication systems. This requires that an electronic engineering diploma holder will have to maintain electronic communication equipment and circuits related to this area. This course is intended to lay the foundation for understanding the advanced communication courses in the subsequent semesters. Hence this course describes fundamentals of wireless communication covering analogue and digital modulation techniques. Since it is a basic core course, students should develop in depth understanding of all concepts and principles so that they may learn advance courses easily and effectively.

e) Course Learning Objective:

CLOBJ 1	Gain familiarity with electronic communication equipment: Students will become acquainted with essential tools and equipment used in electronic communication, including signal generators, oscilloscopes, frequency counters, spectrum analyzers, and various types of transmitters and receivers.
CLOBJ 2	Learn modulation and demodulation techniques: Students will explore practical implementations of modulation techniques, including amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM). They will also study demodulation techniques used to recover the original signal from modulated carriers.
CLOBJ 3	Design and analyze communication systems: Through hands-on experiments, students will design and build basic communication systems, such as AM and FM radio transmitters and receivers. They will analyze the performance of these systems in terms of signal quality, noise, bandwidth, and efficiency.
CLOBJ 4	Troubleshoot and debug communication systems: Through troubleshooting exercises, students will develop practical problem-solving skills essential for identifying and resolving issues in communication systems. They will learn how to diagnose common problems related to circuit design, component failure, and signal interference.

f) Course Learning Outcomes:

CLO 1	Use of different modulation and demodulation techniques used in analog communication.
CLO 2	Identify and solve basic communication problems.
CLO 3	Analyze transmitter and receiver circuits.
CLO 4	Compare and contrast design issues, advantages, disadvantages and limitations of analog communication systems.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**50**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. Electronic Communication system By G. Kennedy | Tata M. Graw Hill
2. Electronics communication system By Kennedy George | Tata McGraw hill, New Delhi
3. Fundamentals of Communication Systems By J. G. Proakis and M. Salehi | Pearson Education | 4
4. Communication Systems: Analog and digital By Singh and Sapre | TataMcGraw Hill

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Measure amplitude of different sinusoidal frequency signals in frequency domain using Spectrum Analyzers.
2	Harmonic analysis of a square wave of modulated waveform: measures modulation index.
3	To modulate a high frequency carrier with sinusoidal signal to obtain FM signal.
4	To study and observe the operation of a super heterodyne receiver.
5	To modulate a pulse carrier with sinusoidal signal to obtain PWM signal and demodulate it.
6	To modulate a pulse carrier with sinusoidal signal to obtain PPM signal and demodulate it
7	To observe pulse amplitude modulated(PAM) waveform and its demodulation
8	To observe the operation of a PCM encoder and decoder. To consider reason for using digital signal x-missions of analog signals.
9	To study & observe the amplitude response of automatic gain controller (AGC).
10	Check the response of BPSK modulator and Demodulator.

a) Course Name: Digital Electronics

b) Course Code: 03608203

c) **Prerequisite:** Basic Electronics and Number Systems

d) **Rationale:** The students need to learn basic concepts of digital circuits and systems which leads to design of complex digital systems 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.

e) **Course Learning Objective:**

CLOBJ 1	Classify different number systems (Binary, Octal, Decimal, Hexadecimal) - Perform conversions between different number systems -Classify logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) - Analyze truth tables
CLOBJ 2	Implement Boolean expressions using logic gates - Simplify Boolean expressions using Boolean algebraic laws - Apply De-Morgan's theorem - Utilize Karnaugh maps for expression simplification
CLOBJ 3	Design and analyze arithmetic circuits (Addition, Subtraction, 1's & 2's Complement)- Illustrate basic logic circuits (Half Adder, Full Adder, Half Subtractor, Full Subtractor) - Implement Multiplexers and Demultiplexers
CLOBJ 4	Extract the working principles of Flip-Flops (SR, JK, T, D) - Design and analyze various types of counters (Up-Down Counters, Asynchronous/Ripple Counter, etc.) - Implement Shift Registers and Registers
CLOBJ 5	Classify different types of memories (RAM, ROM, etc.) - extract RAM organization and memory size calculation - Learn about different types of RAM (Static RAM, Dynamic RAM, etc.) - Understand ROM organization and types (PROM, EPROM, etc.)

f) **Course Learning Outcomes:**

CLO 1	Learn about Number systems and binary codes.
CLO 2	Learn to Convert Number systems and its complements.
CLO 3	Classify Logic gates and implementation of Universal gates,.
CLO 4	Learn Boolean function Implementation and simplification, Students.
CLO 5	able to design Combinational Logic Circuit and code conversion.
CLO 6	Get a basic idea about Logic Families and Parameter of Digital IC.

g) **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. Digital Principles and Applications By Albert Paul Malvino , Donald P. Leach and Saha | Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Fundamentals of Digital Electronics By A. Anandkumar | PHI Publication
3. Modern Digital Electronics By R. P. Jain | Tata McGraw-Hill Education

i) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Number Systems and Logic gates Introduction to different number systems ′Binary, Octal, Decimal, Hexadecimal, Conversion from one number system to another, Logic Gates ′AND, OR, NOT, NAND, NOR , XOR, XNOR: Symbolic representation and truth table	**15%**	**6**
2	Boolean Algebra Implementation of Boolean expressions and Logic Functions using gates, Simplification of expressions, Boolean variables ′Rules and laws of Boolean Algebra, De-Morgan′s Theorem, Karnaugh Maps and their use for simplification of Boolean expressions	**20%**	**6**
3	Combinational Logic Circuits Arithmetic Circuits ′Addition, Subtraction, 1′s 2′s Complement, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel and Series Adders Encoder, Decoder, Multiplexer ′2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX, Applications , Demultiplexer ′1 to 2 DEMUX, 1- 4 DEMUX, 1- 8 DEMUX	**25%**	**10**
4	Sequential Logic Circuits Flip Flops ′SR,JK, T, D, FF, JK-MS, Triggering, Counters ′4 bit Up ′Down Counters, Asynchronous/ Ripple Counter, Decade Counter- Mod 3, Mod 7 Counter, Johnson Counter, Ring Counter, Registers ′4bit Shift Register: Serial In Serial Out, Serial in Parallel Out, Parallel In Serial Out, Parallel In Parallel Out	**20%**	**10**
5	Memory Devices Classification of Memories ′RAM Organization, Address Lines and Memory Size, Static RAM, Bipolar RAM, cell Dynamic RAM, D RAM, DDR RAM, Read Only memory ′ROM organization, Expanding memory, PROM, EPROM, EEPROM, Flash memory, Data Converters ′Digital to Analog converters, Analog to Digital Converters	**20%**	**10**

(5)

a) **Course Name:** Digital Electronics Lab
b) **Course Code:** 03608204
c) **Prerequisite:** Basic Electronics and Number Systems
d) **Rationale:** 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.

e) **Course Learning Objective:**

CLOBJ 1	Interpret the constructional features of a DC generator. Explain the working principles of a DC generator. Describe the phenomena of armature reaction in DC generators. Explain the concept of commutation in DC machines.
CLOBJ 2	Gain a knowledge of the working principles of various types of DC motors. Perform routine maintenance tasks on DC motors. Identify and troubleshoot common issues in DC motors.
CLOBJ 3	Illustrate the construction and working principles of a single-phase transformer. Perform routine maintenance and inspection of single-phase transformers. Identify and rectify common issues in single-phase transformers.
CLOBJ 4	Illustrate the construction and working principles of three-phase transformers. Perform routine maintenance and inspection of three-phase transformers. Identify and rectify common issues in three-phase transformers.
CLOBJ 5	Identify various types of special purpose transformers used in specific applications. Extract the unique features and working principles of special purpose transformers. Perform maintenance and inspection tasks specific to special purpose transformers.

f) **Course Learning Outcomes:**

CLO 1	Distinguish between analog and digital systems.
CLO 2	Identify the various digital ICs and explain their operation.
CLO 3	Apply Boolean laws to simplify the digital circuits, Design simple logic circuits

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	2	1	-	-	-	-	50	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. Digital Principles and Applications By Albert Paul Malvino , Donald P. Leach and Saha | Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Fundamentals of Digital Electronics By A. Anandkumar | PHI Publication
3. Modern Digital Electronics By R. P. Jain | Tata McGraw-Hill Education

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	To verify the truth tables for all logic fates ′NOT OR AND NAND NOR XOR XNOR using CMOS Logic gates and TTL Logic Gates
2	Implement and realize Boolean Expressions with Logic Gates
3	Implement Half Adder, Full Adder, Half Subtractor, Full subtractor using ICs
4	Implement parallel and serial full-adder using ICs
5	Design and development of Multiplexer and De-multiplexer using multiplexer IC
6	Verification of the function of SR,D, JK and T Flip Flops
7	Design controlled shift registers
8	Construct a Single digit Decade Counter (0-9) with 7 segment display
9	To design a programmable Up-Down Counter with a 7 segment display.
10	Study of different memory ICs
11	Study Digital- to ′Analog and Analog to Digital Converters
12	Simulate in Software (such as PSpice) an Analog to Digital Converter

Exp. No.	Name of the Experiment
13	Simulate in Software (such as PSpice) an Analog to Digital Converter

(6)

a) **Course Name:** Electronic Measurements and Instrumentation
b) **Course Code:** 03608205
c) **Prerequisite:** Knowledge of Basic Physics and Mathematics.
d) **Rationale:** Troubleshooting of electronic equipment is an essential requirement of Service sector industry. This course will help to develop skills to become professional technician with capability to measure electrical parameters using various instruments. By learning this course students will able to know basics of various Instruments, transducers and working of electronic circuits used in electronic test and measuring instruments.

e) **Course Learning Objective:**

CLOBJ 1	Descibe the concepts of accuracy, precision, resolution, and types of errors. Explain the principles and operation of DC bridges such as Wheatstone and Kelvin Double Bridge. Describe the operation and applications of AC bridges including Maxwell's Bridge, Hay's Bridge, Anderson Bridge, and De-Sauty's Bridge.
CLOBJ 2	Explain the principles and operation of DC slide wire Potentiometer and Crompton's DC Potentiometer. Discuss the applications of DC and AC Potentiometers.
CLOBJ 3	Explain the principles and operation of Permanent Magnet Moving Coil Instruments (PMMC) and Moving Iron type Instruments (MI). Describe the principles and operation of Electro Dynamo Type Instruments and Single Phase Energy Meter.
CLOBJ 4	Explain the principles and operation of Electronic Voltmeter, Digital Voltmeter, Electronic Multimeters, Q-Meter, Vector Impedance Meter, and Digital Energy Meter.
CLOBJ 5	Describe the construction, operation, and components of Cathode ray tube (CRT) and its applications. Explain the operation of the vertical and horizontal deflection systems in an oscilloscope. Explain the measurement

	of frequency, time delay, phase angle, and modulation index using an oscilloscope. Illustrate the concept of multiple trace CRO and its applications.
CLOBJ 6	Classify transducers and discuss selection criteria. Describe the characteristics, construction, working principles, and applications of RTD, Thermocouple, Thermistor, LVDT, Strain Gauge, Load Cell, and Piezoelectric Transducers.

f) Course Learning Outcomes:

CLO 1	Test and troubleshoot electronic circuits using various measuring instruments.
CLO 2	Select appropriate passive or active transducers for measurement of physical phenomenon.
CLO 3	Use AC and DC bridges for relevant parameter measurement.
CLO 4	Use Signal Generator, frequency counter, CRO and digital IC tester for appropriate measurement

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. Electronic Instrumentation By Kalsi H. S | Tata McGraw-Hill Education

2.Electrical and Electronics Measurement and Instrumentation By A. K. Shawney | Dhanpatrai & sons publications

i) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	Basics of Measurements and Bridges Accuracy & precision, Resolution, Types of Errors, DC Bridges ‘Wheatstone and Kelvin Double Bridge, AC Bridges - Maxwell̓s Bridge, Hay̓s Bridge, Anderson Bridge, De-Saut̓y̓s Bridge	**20%**	**10**

2	Potentiometer Basic DC slide wire Potentiometer, Cromptoṅs DC Potentiometer, Applications of DC Potentiometer, AC Potentiometers, Applications of AC Potentiometers	**15%**	**8**
3	Measuring Instruments Permanent Magnet Moving Coil Instruments (PMMC), Moving Iron type Instruments (MI) Electro Dynamo Type Instruments Single Phase Energy Meter	**15%**	**8**
4	Electronic Instruments Electronic Voltmeter and Digital Voltmeter, Electronic Multimeters , Q ′Meter, Vector Impedance Meter ,Digital Energy Meter	**30%**	**12**
5	Oscilloscopes Cathode ray tube: construction, operation, screens, graticules, Vertical deflection system, Horizontal deflection system, Delay line, Measurement of frequency, time delay, phase angle and modulation index (trapezoidal method), Oscilloscope probe: Structure of 1:1 and 10:1 probe , Multiple Trace CRO	**20%**	**10**
6	Transducers Classification, Selection Criteria, Characteristics, Construction, Working Principles and Application of following Transducers: RTD, Thermocouple, Thermistor LVDT, Strain Gauge Load Cell Piezoelectric Transducers		

(7)

a) **Course Name:** Electronic Measurements and Instrumentation Lab
b) **Course Code:** 03608206
c) **Prerequisite:** Knowledge of Basic Physics and Mathematics.
d) **Rationale:** Troubleshooting of electronic equipment is an essential requirement of the Service sector industry. This course will help to develop skills to become a professional technician with capability to measure electrical parameters using various instruments. By learning this course students will be able to know the basics of various Instruments, transducers and working of electronic circuits used in electronic test and measuring instruments.

e) **Course Learning Objective:**

CLOBJ 1	Contrast the concepts of accuracy, precision, resolution, and types of errors. Explain the principles and operation of DC bridges such as Wheatstone and Kelvin Double Bridge. Describe the operation and applications of AC bridges

	including Maxwell's Bridge, Hay's Bridge, Anderson Bridge, and De-Sauty's Bridge.
CLOBJ 2	Explain the principles and operation of DC slide wire Potentiometer and Crompton's DC Potentiometer. Discuss the applications of DC and AC Potentiometers.
CLOBJ 3	Explain the principles and operation of Permanent Magnet Moving Coil Instruments (PMMC) and Moving Iron type Instruments (MI). Describe the principles and operation of Electro Dynamo Type Instruments and Single Phase Energy Meter.
CLOBJ 4	Explain the principles and operation of Electronic Voltmeter, Digital Voltmeter, Electronic Multimeters, Q-Meter, Vector Impedance Meter, and Digital Energy Meter.
CLOBJ 5	Describe the construction, operation, and components of Cathode ray tube (CRT) and its applications. Describe the operation of the vertical and horizontal deflection systems in an oscilloscope. Explain the measurement of frequency, time delay, phase angle, and modulation index using an oscilloscope. Interpret the concept of multiple trace CRO and its applications.
CLOBJ 6	Classify transducers and discuss selection criteria. Describe the characteristics, construction, working principles, and applications of RTD, Thermocouple, Thermistor, LVDT, Strain Gauge, Load Cell, and Piezoelectric Transducers.

f) Course Learning Outcomes:

CLO 1	Test and troubleshoot electronic circuits using various measuring instruments.
CLO 2	Select appropriate passive or active transducers for measurement of physical phenomenon.
CLO 3	Use AC and DC bridges for relevant parameter measurement.
CLO 4	Use Signal Generator, frequency counter, CRO and digital IC tester for appropriate measurement
CLO 5	Test and troubleshoot electronic circuits using various measuring instruments.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

i) Text Book and Reference Book:

1. Electronic Instrumentation By Kalsi H. S | Tata McGraw-Hill Education
2.Electrical and Electronics Measurement and Instrumentation By A. K. Shawney | Dhanpatrai & sons publications

j) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Measure unknown inductance using following bridges (a) Anderson Bridge (b) Maxwell Bridge
2	Measure Low resistance by Kelvin's Double Bridge
3	Calibrate an ammeter using DC slide wire potentiometer
4	Calibrate a voltmeter using Crompton potentiometer
5	Measure low resistance by Crompton potentiometer
6	Calibrate a single-phase energy meter by phantom loading
7	Study the working of Q-meter and measure Q of coils
8	Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes
9	Measurement of displacement with the help of LVDT
10	Draw the characteristics of the following temperature transducers (a) RTD (Pt-100) (b) Thermistor.
11	Measurement of strain/force with the help of strain gauge load cell

a) **Course Name:** Electronic Circuits and Network
b) **Course Code:** 03608207
c) **Prerequisite:** Knowledge of Basic Mathematics

d) Rationale: Electronic Circuits and networks is a core area, the knowledge of which is essential for electronic engineering diploma holders and they need to assimilate it in order to succeed in the Industry. In this regard, the basic knowledge of various theorems, resonance, filtering and attenuation related to passive electronic components is essential. Understanding of these concepts will be useful to determine the various parameters required to solve various problems and applications. This course has been designed to achieve these aims.

e) Course Learning Objective:

CLOBJ 1	Contrast Node and Mesh Analysis techniques. Explain the Superposition Theorem and its application. Describe Thevenin Theorem and Norton Theorem and their applications in simplifying network analysis. Explain the Maximum Power Transfer Theorem and its significance. Explain Reciprocity Theorem and its application in network analysis.
CLOBJ 2	Solve first and second-order differential equations for Series and parallel R-L, R-C, R-L-C circuits. Determine Initial and Final conditions in network elements. Analyze Forced and Free response, time constants, and Steady State and Transient State Response. Perform analysis of electrical circuits using Laplace Transform for standard inputs (unit, Ramp, Step).
CLOBJ 3	Illustrate Discrete spectra and symmetry of waveform. Analyze Steady-state response of a network to non-sinusoidal periodic inputs, power factor, effective values. Describe Fourier transform and continuous spectra.
CLOBJ 4	Explain the concept of Two Port Network. Analyze Open Circuit Impedance Parameters, Short Circuit Admittance Parameters, Transmission Parameters, and Hybrid Parameters of a Two Port Network. Describe the interrelationship and interconnection of Two Port Network components.

f) Course Learning Outcomes:

CLO 1	To analyze behavior of passive circuits such as RC, RL and RLC
CLO 2	To apply Laplace Transform for circuit analysis
CLO 3	To apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity, Maximum Power Transfer etc
CLO 4	Ability to apply graph theory in solving networks

h) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	

3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

i) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Basics of Network and Network Theorem** Node and Mesh Analysis, Superposition Theorem, Thevenin Theorem, Norton Theorem, Maximum Power transfer theorem, Reciprocity Theorem	**20%**	**10**
2	**Time Domain and Frequency Domain Analysis** Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits , Initial and Final conditions in network elements, Forced and Free response, time constants, Steady State and Transient State Response, Analysis of electrical circuits using Laplace Transform for standard inputs (unit, Ramp, Step)	**30%**	**12**
3	**Trigonometric and exponential Fourier series** Discrete spectra and symmetry of waveform Steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values Fourier transform and continuous spectra	**25%**	**10**
5	**Two Port Network** Two Port Network, Open Circuit Impedance Parameters, Short Circuit Admittance Parameters, Transmission Parameters, Hybrid Parameters, Interrelationship of Two Port Network, Inter Connection of Two Port Network	**25%**	**10**

j) Text Book and Reference Book:

1. Engineering Circuit Analysis By W H Hayt, S M Durbin | Tata McGraw-Hill Education
2. Network Analysis By M. E. Van Valkenburg | PHI Learning

a) Course Name: Electronic Circuits and Network Lab
b) Course Code: 03608208
c) Prerequisite: Knowledge of Basic maths.

d) Rationale: Electronic Circuits and networks is a core area, the knowledge of which is essential for electronic engineering diploma holders and they need to assimilate it in order to succeed in the Industry. In this regard, the basic knowledge of various theorems, resonance, filtering and attenuation related to passive electronic components is essential. Extractinging of these concepts will be useful to determine the various parameters required to solve various problems and applications. This course has been designed to achieve these aims.

e) Course Learning Objective:

CLOBJ 1	Contrast Node and Mesh Analysis techniques. Explain the Superposition Theorem and its application. Describe Thevenin Theorem and Norton Theorem and their applications in simplifying network analysis. Explain the Maximum Power Transfer Theorem and its significance. Explain Reciprocity Theorem and its application in network analysis.
CLOBJ 2	Solve first and second-order differential equations for Series and parallel R-L, R-C, R-L-C circuits. Determine Initial and Final conditions in network elements. Analyze Forced and Free response, time constants, and Steady State and Transient State Response. Perform analysis of electrical circuits using Laplace Transform for standard inputs (unit, Ramp, Step).
CLOBJ 3	Illustrate Discrete spectra and symmetry of waveform. Analyze Steady-state response of a network to non-sinusoidal periodic inputs, power factor, effective values. Describe Fourier transform and continuous spectra.
CLOBJ 4	Explain the concept of Two Port Network. Analyze Open Circuit Impedance Parameters, Short Circuit Admittance Parameters, Transmission Parameters, and Hybrid Parameters of a Two Port Network. Describe the interrelationship and interconnection of Two Port Network components.

f) Course Learning Outcomes:

CLO 1	To analyze behavior of passive circuits such as RC, RL and RLC
CLO 2	To apply Laplace Transform for circuit analysis
CLO 3	To apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity, Maximum Power Transfer etc
CLO 4	Ability to apply graph theory in solving networks

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**		
L	**T**	**P**	**C**	**Internal Evaluation**	**ESE**	**Total**

				MSE	CE	P	Theory	P	
0	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. Engineering Circuit Analysis By W H Hayt, S M Durbin | Tata McGraw-Hill Educatio
2. Network Analysis By M. E. Van Valkenburg | PHI Learning

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	For a given multisource network, determine the output impedance and voltage and verify it using Thevinin̓s Theorem.
2	For a given multisource network, determine the value of current in the specified branch and verify it using Superposition theorem.
3	For a given multisource network, determine the output impedance and voltage and verify it using Norton̓s Theorem.
4	For a given multisource network, determine the output impedance and voltage and verify it using Maximum power transfer theorem.
5	For series resonance circuit, determine the frequency response curve to obtain the resonant frequency, resonant impedance, Bandwidth (BW) and Quality factor for series resonance circuit
6	For a parallel resonance circuit, determine the frequency response curve to obtain the resonant frequency, resonant impedance, Bandwidth (BW) and Quality factor.
7	Measure Transfer Impedance, Driving point Impedance, Image Impedance and Terminating Impedance, Input and Output Impedances for given two-port network
8	For the given parameters, build constant k-low pass filter (T and υsections).
9	For the given parameters, build constant k-high pass filter (T and υsections).
10	Obtain the frequency response curve for the given m -derived low pass and high pass filter

(10)

a) **Course Name:** Electronics Equipment and Maintenance
b) **Course Code:** 03608209
c) **Prerequisite:** Knowledge of Basic Electronics Equipment
d) **Rationale:** Equipment with electronic circuitry are increasingly being used in all the Industry and maintenance of them is the essential work for the proper functioning of the complete system. This course will enable the students to develop skills to maintain the basic electronic circuitry used in these equipment, which are employed in Industry and in consumer goods segments. This course will also enable them to fulfill the basic prerequisite for the advance maintenance issues which they will face in the Industry. After learning this course students can also start their own electronic repair workshop as a self-employer

e) **Course Learning Objective:**

CLOBJ 1	Interpret reading and interpreting drawings and diagrams such as Block Diagrams, Circuit Diagrams, and Wiring Diagrams. Demonstrate dis-assembly and re-assembly techniques for electronic equipment. Identify equipment failures and their causes including poor design, production deficiencies, careless storage and transport, and inappropriate operating conditions. Describe the nature of faults and the fault location procedure, utilizing service and maintenance manuals, instruction manuals, and test and measuring instruments. Explain troubleshooting techniques, approaches to component testing, and ground systems in electronic equipment. Recognize situations where repairs should not be attempted due to safety or other concerns.
CLOBJ 2	Identify passive components such as Resistors, Capacitors, and Inductors. Describe failures in fixed resistors, testing procedures for resistors, and servicing of variable resistors and potentiometers. Classify types of capacitors, failures, testing procedures, and precautions. Explain the types of inductors, inductance measurement, and testing procedures.
CLOBJ 3	Recognize different types of semiconductor devices and their causes of failure. Demonstrate test procedures for Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors, and Operational Amplifiers.
CLOBJ 4	Identify packages in Digital ICs and handle ICs properly. Explain digital troubleshooting methods, including typical faults and testing digital ICs using various tools like Logic Clip, Probe, Pulser, Current Tracer, and Comparator. Explain special considerations for fault diagnosis in digital circuits and handling precautions for ICs sensitive to static electricity. Demonstrate testing procedures for flip-flops, counters, registers, multiplexers, de-multiplexers, encoders, decoders, and tri-state logic.

CLOBJ 5	Explain Surface Mount Technology and devices, including various semiconductor packages. Identify and repair Surface Mount PCBs using rework stations.

f) Course Learning Outcomes:

CLO 1	Identify and test various active and passive components.
CLO 2	Handle different types of Electronic measuring Instruments.
CLO 3	Diagnose faults in electronics equipment.
CLO 4	Troubleshoot computer hardware and networking.
CLO 5	Maintain SMPS, UPS, Inverter, solar power system, various analog and digital circuits, internal section of computer system, LED/ LCD TV, Cell phone (Mobile)/ microwave oven etc.

h) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

i) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Fundamentals Troubleshooting Procedures** Inside An Electronic Equipment Reading Drawings And Diagrams ‘Block Diagram, Circuit Diagram, Wiring Diagram; Dis-assembly and re-assembly of equipment, Equipment Failures and causes such as poor design, production deficiencies, careless storage and transport, inappropriate operating conditions, Nature of faults, Fault location procedure, Fault finding aids ‘Service and maintenance manuals and instruction manuals, Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, Ground- 421 Electronics and Communication Engineering Curriculum Structure ing systems in Electronic Equipment,	**25%**	**9**

	Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted		
2	**Passive Component and Their Testing** Passive Components Resistors, Capacitors, Inductors Failures in fixed resistors, testing of resistors, variable resistors, variable resistors as potentiometers, failures in potentiometers, testing of potentiometers, servicing potentiometers, LDRs and Thermistors Types of capacitors and their performance, Failures in capacitors, testing of capacitors and precautions therein, variable capacitor types, Testing of inductors and inductance measurement	**20%**	**8**
3	**Testing Testing of Semiconductor Devices** Types of semiconductor devices, Causes of failure in Semiconductor Devices, Types of failure Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, Fault diagnosis in op-amp	**20%**	**8**
4	**Logic IC Family Packages in Digital ICs**, IC identification, IC pin-outs, Handling ICs, Digital troubleshooting methods ′typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator Special consideration for fault diagnosis in digital circuits Handling precautions for ICs sensitive to static electricity Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; Tri-state logic	**20%**	**8**
5	**Home/Office** Rework and Repair of Surface Mount Assemblies Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages ′SOIC, SOT, LCCC, LGA, BGA, COB, Flatpacks and Quad Packs, Cylindrical Diode Packages, Packaging of Passive Components as SMDs Repairing Surface Mount PCBs, Rework Stations	**15%**	**7**

j) Text Book and Reference Book:

1. Engineering Circuit Analysis By W H Hayt, S M Durbin | Tata McGraw-Hill Education
2. Network Analysis By M. E. Van Valkenburg | PHI Learning

(11)

a) **Course Name:** Professional Communication and Critical Thinking
b) **Course Code:** 03693203
c) **Prerequisite:** Knowledge of English Language.
d) **Rationale:** Advance level of communication and personality development is crucial for and after placement,

e) **Course Learning Objective:**

CLOBJ 1	Encourage students to speak on topics they are knowledgeable about - Boost confidence in students by giving them opportunities to share their expertise
CLOBJ 2	Describe proper usage of determiners and articles - Enhance conversational and communication skills - Prepare for the verbal section of company aptitude exams
CLOBJ 3	Interpret the rules of subject-verb agreement in sentence formation
CLOBJ 4	Learn different types of reading for various purposes - Enhance reading skills through practice - extract the importance of reading
CLOBJ 5	- Learn strategies to solve reading comprehension questions efficiently - Practice to improve comprehension skills
CLOBJ 6	Improve observation and convincing skills through team activities – Illustrate the importance of teamwork in achieving goals
CLOBJ 7	Relate the proper usage of direct and indirect speech in narration
CLOBJ 8	Illustrate the expectations and challenges of the industry post-college Prepare for the competitive world through awareness and readiness
CLOBJ 8	Explain the reflection of objects in mirrors and water - Learn the principles of inversion in mirrors and water
CLOBJ 9	Enhance daily speaking and communication skills - Prepare for the verbal section of company aptitude exams through practice
CLOBJ 10	Encourage students to speak on topics they are knowledgeable about - Boost confidence through sharing expertise
CLOBJ 11	Develop skills in writing professional emails and reports
CLOBJ 12	Engage in systematic exchange of information, views, and opinions - Learn effective communication and collaboration skills through group discussions

f) Course Learning Outcomes:

CLO 1	Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers
CLO 2	Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication
CLO 3	Also develop skills of group presentation and communication in team
CLO 4	Develop non-verbal communication such as proper use of body language and gestures

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
1	**-**	**-**	**1**	**-**	**-**	**-**	**100**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	Story Mason Classroom activity to encourage students to speak on topics they are good at, hence boosting confidence of students.	**5**	**1**
2	Determiners, Articles, and Interrogatives This session will enable students to relate proper usage of Determiners and Articles. It will also enhance their daily speaking conversational/ communication skills. Preparation of verbal section in company's aptitude exam.	**10**	**6**
3	Subject-Verb Agreement This will enable students to interpret the formation of sentence with the usage of subject-verb agreement	**10**	**3**
4	Reading-Skill BuildingTypes of Reading – reading for different purposes An Astrologer's Day-Malgudi Days Enhance reading skills by collecting information, know the importance of reading.	**10**	**2**
5	Reading Comprehension Learn to solve the reading comprehension questions in an easy manner and also in	**10**	**2**

	less amount of time Introduction, Factual & Inferential comprehension, Reasons for Poor Comprehension Able to solve reading comprehension in less amount of Time by practicing.		
6	Mafia the art of Observation and Convincing The interesting activity is targeted toward improving observation and convincing skills. A team activity in which every single Individual is a very important person of his team to win.	**5**	**1**
7	Direct and Indirect Speech This session will enable students to understand proper usage of narration.	**10**	**3**
8	Industry Expectation In this class the students will be made to understand what will be the world after their college life will be, how they should prepare themselves from that competitive world with full of challenges for them.	**5**	**1**
9	Mirror & Water Images Reflection of an object into a mirror and water. It is obtained by inverting an object laterally (mirror) & vertically (water).	**10**	**3**
10	Sentence Correction It will also enhance their daily speaking conversational/communication skills. Preparation of verbal section in company's aptitude exam.	**5**	**2**
11	Play Teacher Classroom activity to encourage students to speak on topics they are good at, hence boosting confidence of students.	**5**	**1**
12	Professional WritingEmail and report.	**5**	**3**
13	Group Discussion It is a systematic exchange of information, views and opinions about a topic, problem, issue or situation among the members of a group who share some common objectives	**10**	**2**

i) Text Book and Reference Book:

1. Active English By Juneja & Qureshi | Macmillan
2. Verbal and Non-verbal reasoning By B.S.Sijvali and Indu Sijvali | Arihant Publication
3. Competitive English By Azhar Siddiqui | Macmillan

Semester 4

(1)

a) **Course Name:** Essence of Indian Knowledge and Tradition

b) **Course Code:** 03600251

c) **Prerequisite:** Zeal to learn Subject

d) **Rationale:** The course aims at imparting basic principles of thought process, reasoning and inference. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature is also important in modern society with rapid technological advancements and societal disruptions. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

e) Course Learning Objective:

CLOBJ 1	Classify the structure and content of each Veda. Analyze the significance of Vedic hymns and rituals. Explore the principles of Ayurveda and its relevance to modern medicine. Summerize the basics of Dhanurveda. Study the role of Vedangas in Vedic texts. Learn about Jyotisha and its applications. Examine the principles of Dharma Shastra. Relate the philosophical discussions in Mimamsa and Nyaya.
CLOBJ 2	Compare and contrast modern scientific principles with traditional Indian knowledge. Identify areas of synergy.
CLOBJ 3	Contrast the philosophy and practice of yoga. Analyze the benefits of yoga on holistic health care.
CLOBJ 4	Analyze specific case studies to interpret the practical applications of IKS. Evaluate the impact of IKS in modern contexts.

f) Course Learning Outcomes:

CLO 1	Illustrate the role of Modern Science.
CLO 2	Ability to interpret, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.
CLO 3	Ability to illustrate the philosophy and the benefits of yoga on holistic health care.
CLO 4	Summarize the practical applications of IKS

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**		
L	**T**	**P**	**C**	**Internal Evaluation**	**ESE**	**Total**

				MSE	CE	P	Theory	P	
2	-	-	0.00		20	-	-	-	40

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Course Content:

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Basic Structure of Indian Knowledge System** i) Vedas, (ii) Unveda (Ayurveda, Dhanuveda, Gandhveda, Sthanya etc.) (iii) Vedanga (Education, Kalna, Nanrut, Grammar, Jyotish verses), (iv) Upaayaga (Dharma level, Vivamsa, Purana, Takma level)	**60**	**12**
2	**Modern Science and Indian Knowledge System**	**15**	**5**
3	**Yoga and Holistic Health care**	**15**	**5**
4	**Case Studies**	**10**	**4**

(2)

a) Course Name: Micro Controller and Application
b) Course Code: 03608251
c) Prerequisite: Basic Knowledge about Micro Controller and Application
d) Rationale: Microcontroller is the sole of all embedded electronic equipment and is used in most of the areas of electronics. They include product ranges from tiny consumer electronic products to complex industrial process controllers. A diploma engineer needs to maintain such systems. Programming practices will further help the students to develop indigenous microcontroller based applications. Hence this course is designed to achieve the above.

e) Course Learning Objective:

CLOBJ 1	Contrast the basics of microprocessors and microcontrollers - Learn about the architectures of Intel 8085, 8086 and the MCS-51 family, focusing on the features of 8051- summarize the organization and architecture of the 8051 microcontroller
CLOBJ 2	- Learn the instruction set of 8051 - classify various addressing modes and conditional instructions- Gain proficiency in I/O programming, arithmetic

	logic instructions, and single bit instructions- Learn interrupt handling and programming techniques for counters, timers, and the stack
CLOBJ 3	Illustrate interfacing of MCS51 microcontrollers with external devices - Learn how to interface with user interfaces such as keyboards, LCDs, LEDs - Gain knowledge about interfacing with real-world devices like ADCs, DACs, and sensors - Learn communication interfaces for data transfer
CLOBJ 4	- Apply C programming concepts to 8051 microcontroller programming - Gain proficiency in I/O programming, timers/counters, serial communication, and interrupt handling - Learn how to interface user interfaces like LCDs, keypads, LEDs, and communication interfaces such as RS232
CLOBJ 5	Describe the basics of ARM processors- Learn about the block diagram and pin diagram of ARM processors

f) Course Learning Outcomes:

CLO 1	Identify features of various microcontroller
CLO 2	Select appropriate microcontroller for different application
CLO 3	Interface microcontroller with hardware for given application
CLO 4	Write and execute assembly language programs(software) for given application
CLO 5	Develop small microcontroller based applications.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Course Content:

Sr.	**Topics**	**Weightage (%)**	**Teaching hours**
1.	**Introduction to Microprocessors and Microcontrollers** Introduction to Microprocessors and Microcontrollers, Architectures [8085,8086] Intel MCS- 51 family features – 8051 -organization and Architecture	**20%**	**10**

2.	**Programming with 8051** 8051 instruction set, addressing modes, conditional instructions, I/O Programming, Arithmetic logic instructions, single bit instructions, interrupt handling, programming counters, timers and Stack	**25%**	**12**
3.	**8051 Interfacing** MCS51 and external Interfaces 8 User interface – keyboard, LCD, LED, Real world interface - ADC, DAC, SENSORS Communication interface.	**25%**	**14**
4.	**C programming with 8051** I/O Programming, Timers/counters, Serial Communication, Interrupt, User Interfaces- LCD, Keypad, LED and communication interfaces [RS232].	**20%**	**12**
5.	**ARM processor** Introduction of ARM processor, Block Diagram ARM processor, Pin Diagram of ARM processor.	**10%**	**06**

i) Text Book and Reference Book:

1 MSP430 Microcontrollers Basics By John H Devis | Newnes Publishers | 1st Edition
2 The 8051 Microcontroller and Embedded Systems Using Assembly And C By M A Mazidi, Janice Mazidi, Rolin Kinlay | Pearson Publication | -
3 The 8051 Microcontroller: Architecture By Kenneth Ayala | Delmar Cengage Learning

(3)

a) Course Name: Micro Controller and Application Lab

b) Course Code: 03608252

c) Prerequisite: Basic Knowledge about Micro Controller and Application

d) Rationale: Microcontroller is the sole of all embedded electronic equipment and is used in most of the areas of electronics. They include product ranges from tiny consumer electronic products to complex industrial process controllers. A diploma engineer needs to maintain such systems. Programming practices will further help the students to develop indigenous microcontroller based applications. Hence this course is designed to achieve the above.

e) Course Learning Objective:

CLOBJ 1	Contrast the basics of microprocessors and microcontrollers - Learn about the architectures of Intel 8085, 8086 and the MCS-51 family, focusing on the features of 8051- summarize the organization and architecture of the 8051 microcontroller

CLOBJ 2	- Learn the instruction set of 8051 - Classify various addressing modes and conditional instructions- Gain proficiency in I/O programming, arithmetic logic instructions, and single bit instructions- Learn interrupt handling and programming techniques for counters, timers, and the stack
CLOBJ 3	Illustrate interfacing of MCS51 microcontrollers with external devices - Learn how to interface with user interfaces such as keyboards, LCDs, LEDs - Gain knowledge about interfacing with real-world devices like ADCs, DACs, and sensors - Learn communication interfaces for data transfer
CLOBJ 4	- Apply C programming concepts to 8051 microcontroller programming - Gain proficiency in I/O programming, timers/counters, serial communication, and interrupt handling - Learn how to interface user interfaces like LCDs, keypads, LEDs, and communication interfaces such as RS232
CLOBJ 5	Describe the basics of ARM processors- Learn about the block diagram and pin diagram of ARM processors

f) Course Learning Outcomes:

CLO 1	Identify features of various microcontroller
CLO 2	Select appropriate microcontroller for different application
CLO 3	Interface microcontroller with hardware for given application
CLO 4	Write and execute assembly language programs(software) for given application
CLO 5	Develop small microcontroller based applications.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. Microcontrollers : Principles And Applications Pal Ajit EEE, PHI ,New Delhi,(Latest edition)
2. The 8051 Microcontrollers: Architecture, Programming and Applications Rao Dr. K Uma Pearson Education India, New Delhi,(Latest edition)
3. The 8051 microcontroller and embedded systems Mazidi Ali, Muhammad Mazidi Gillispie Janice PHI, New Delhi,(Latest edition)

4 The 8051 Microcontroller: Architecture, Programming, and Applications Kenneth Ayala J. Thomson Delmar learning,(latest Edition)

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Programming 8051 Micro controller using ASM and C, and implementation in flash 8051 microcontroller.
2	Programming with Arithmetic logic instructions [Assembly]
3	Program using constructs (Sorting an array) [Assembly]
4	Programming using Ports [Assembly and C]
5	Delay generation using Timer [Assembly and C]
6	Programming Interrupts [Assembly and C]
7	Implementation of standard UART communication (using hyper terminal) [Assembly and C].
8	Interfacing LCD Display. [Assembly and C]
9	Interfacing with Keypad [Assembly and C]
10	Programming ADC/DAC [Assembly and C]

(4)

a) Course Name: Digital Communication Systems

b) Course Code: 03608255

c) Prerequisite: Knowledge of Fundamental of Digital and Analog Signal

d) Rationale: Digital communication plays vital role in the field of electronic communication systems which includes wired and wireless communications viz. telecommunication, radio, mobile and satellite communication systems. This course will enable Electronics and communication engineering diploma engineers to maintain digital communication and networking equipment and circuits used in the practical field. This course also lay the foundation to illustrate the advanced communication courses in the subsequent semesters.

e) Course Learning Objective:

CLOBJ 1	Illustrate the block diagram and subsystems of a digital communication system - Learn about sampling techniques for low-pass and band-pass signals - Gain knowledge about Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), and signal to quantization noise ratio analysis - describe line codes, PCM TDM hierarchies, frame synchronization, and bit stuffing
CLOBJ 2	Analyze quantization noise in Delta Modulation (DM) and Adaptive Delta Modulation (ADM) - Learn about Differential Pulse Code Modulation (DPCM) and Adaptive DPCM (ADPCM)- Gain knowledge of low-bit-rate coding of speech and video signals - extract baseband transmission, matched filters, and performance analysis in noise
CLOBJ 3	- Learn geometric representation of signals and maximum likelihood decoding - illustrate correlation receiver and its equivalence with matched filter - Gain knowledge of various digital modulation techniques like OOK, BPSK, FSK, QPSK, DPSK, QAM, MSK, and multicarrier modulation -Compare bandwidth and bit rate of digital modulation schemes
CLOBJ 4	- Introduction to Information Theory and Coding Theory - Illustrate information measures, entropy, mutual information, and capacity theorem - Learn about linear block codes, convolutional codes, Turbo codes, and LDPC codes -Gain knowledge of decoding algorithms such as the Viterbi and BCJR algorithms

f) Course Learning Outcomes:

CLO 1	Compare different types of pulse code modulations technique.
CLO 2	Select the relevant digital modulation technique for specific application.
CLO 3	Choose the coding technique for minimum errors in transmitting information.
CLO 4	Choose the relevant data transfer technique for various types of data transfer.
CLO 5	Use the relevant applications of digital communication.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Course Content:

Unit No.	Topic	Weightage	Teaching Hrs.
1.	**Introduction Digital Communication** Block diagram and sub-system description of a digital communication system. Sampling of low-pass and band-pass signals, PAM , PCM, signal to quantization noise ratio analysis of linear and nonlinear quantizers, Line codes and bandwidth considerations; PCM TDM hierarchies, frame structures, frame synchronization and bit stuffing.	25%	08
2.	**Digital Technique** Quantization noise analysis of DM and ADM; DPCM and ADPCM; Low bit rate coding of speech and video signals. Baseband transmission, matched filter, performance in additive Gaussian noise; Inter symbol interference (ISI), Nyquist criterion for zero ISI, sinusoidal roll-off filtering, correlative coding, equalizers and adaptive equalizers; Digital subscriber lines.	20%	10
3.	**Data-Communication** Geometric representation of signals, maximum likelihood decoding; Correlation receiver, equivalence with matched filter. Generation, detection and probability of error analysis of OOK, BPSK, coherent and non-coherent FSK, QPSK and DPSK; QAM, MSK and multicarrier modulation; Comparison of bandwidth and bit rate of digital modulation schemes.	25%	10
4.	**Advanced Applications and Coding Theory** Introduction to Information and Coding Theories: Information Theory: information measures, Shannon entropy, differential entropy, mutual information, capacity theorem for point-to-point channels with discrete and continuous alphabets. Coding Theory: linear block codes – definitions, properties, bounds on minimum distance (singleton, Hamming, GV, MRRW), soft versus hard decision decoding, some specific codes (Hamming, RS, Concatenated); Convolutional codes – structure, decoding (the Viterbi and BCJR algorithms); Turbo codes, LDPC codes.	30%	14

i) Text Book and Reference Book:

1 Digital Communication (2nd Edition) by R.N. Mutagi Oxford University Press, New Delhi, Latest edition

2 Analog and Digital Communication by T. L. Singal Tata McGraw Hill, India Latest edition

3 Modern Digital and Analog Communications Systems (3rd Edition) by B.P. Lathi Oxford University Press, New Delhi, Latest edition

4 Electronic Communications Modulation and Transmission by Robert J. Schoenbeck PHI Learning, New Delhi, 2nd Edition

(5)

a) **Course Name:** Digital Communication Systems Lab
b) **Course Code:** 03608256
c) **Prerequisite:** Basic knowledge of illumination of light and various kinds of lamps
d) **Rationale:** Digital communication plays vital role in the field of electronic communication systems which includes wired and wireless communications viz. telecommunication, radio, mobile and satellite communication systems. This course will enable Electronics and communication engineering diploma engineers to maintain digital communication and networking equipment and circuits used in the practical field. This course also lay the foundation to understand the advanced communication courses in the subsequent semesters.

e) Course Learning Objective:

CLOBJ 1	Illustrate the block diagram and subsystems of a digital communication system - Learn about sampling techniques for low-pass and band-pass signals - Gain knowledge about Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), and signal to quantization noise ratio analysis - describe line codes, PCM TDM hierarchies, frame synchronization, and bit stuffing
CLOBJ 2	Analyze quantization noise in Delta Modulation (DM) and Adaptive Delta Modulation (ADM) - Learn about Differential Pulse Code Modulation (DPCM) and Adaptive DPCM (ADPCM)- Gain knowledge of low-bit-rate coding of speech and video signals - extract baseband transmission, matched filters, and performance analysis in noise
CLOBJ 3	- Learn geometric representation of signals and maximum likelihood decoding - illustrate correlation receiver and its equivalence with matched filter - Gain knowledge of various digital modulation techniques like OOK, BPSK, FSK, QPSK, DPSK, QAM, MSK, and multicarrier modulation -Compare bandwidth and bit rate of digital modulation schemes
CLOBJ 4	- Introduction to Information Theory and Coding Theory - Illustrate information measures, entropy, mutual information, and capacity theorem - Learn about linear block codes, convolutional codes, Turbo codes, and LDPC codes -Gain knowledge of decoding algorithms such as the Viterbi and BCJR algorithms

f) Course Learning Outcomes:

CLO 1	Compare different types of pulse code modulations technique.
CLO 2	Select the relevant digital modulation technique for specific application.
CLO 3	Choose the coding technique for minimum errors in transmitting information.

CLO 4	Choose the relevant data transfer technique for various types of data transfer.
CLO 5	Use the relevant applications of digital communication.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
0	-	2	1	-	-	50	-	-	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1 Digital Communication (2nd Edition) by R.N. Mutagi Oxford University Press, New Delhi, Latest edition

2 Analog and Digital Communication by T. L. Singal Tata McGraw Hill, India Latest edition

3 Modern Digital and Analog Communications Systems (3rd Edition) by B.P. Lathi Oxford University Press, New Delhi, Latest edition

4 Electronic Communications Modulation and Transmission by Robert J. Schoenbeck PHI Learning, New Delhi, 2nd Edition

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Pulse Code Modulation and Differential Pulse Code Modulation.
2	Delta Modulation and Adaptive Delta modulation.
3	Simulation of Band Pass Signal Transmission and Reception • Amplitude Shift Keying • Frequency Shift Keying • Phase Shift Keying
4	Performance Analysis of Band Pass Signal Transmission and Reception • Amplitude Shift Keying • Frequency Shift Keying • Phase Shift Keying.
5	Implementation of Amplitude Shift Keying
6	Implementation of Frequency Shift Keying
7	Implementation of Phase Shift Keying.
8	Time Division Multiplexing: PLL (CD 4046) based synch, clock and data extraction

Exp. No.	Name of the Experiment
9	Based on the sampling frequency, reconstruct the signal.
10	Introduction to Information Theory · Entropy, Mutual Information.

(6)

a) **Course Name:** Linear Integrated Circuit
b) **Course Code:** 03608259
c) **Prerequisite:** Knowledge of Basic Electronics Circuits
d) **Rationale:** To introduce the basic building blocks of linear integrated circuits and learn the linear and non-linear applications of operational amplifiers. To introduce the theory and applications of analog multipliers and PL and also learn the theory of ADC and DAC to introduce the concepts of waveform generation and introduce some special function ICs.

e) **Course Learning Objective:**

CLOBJ 1	Summarize the advantages of integrated circuits (ICs) over discrete components - Learn about the manufacturing process of monolithic ICs - Interpret the construction of monolithic bipolar transistors, diodes, resistors, capacitors, and inductors - Gain knowledge about current mirrors, current sources, voltage sources, voltage references, and BJT differential amplifiers with active loads - Illustrate the internal circuit diagrams and performance characteristics of operational amplifiers (e.g., IC 741) - Learn about open and closed loop configurations of operational amplifiers
CLOBJ 2	summarize various applications of operational amplifiers (Op-Amps) such as sign changer, scale changer, phase shift circuits, voltage follower, converters (V-to-I and I-to-V), adder, subtractor, instrumentation amplifier, integrator, differentiator, logarithmic amplifier, antilogarithmic amplifier, comparators, Schmitt trigger, precision rectifier, peak detector, clipper, clamper, and filters (low-pass, high-pass, and band-pass)
CLOBJ 3	Learn about analog multiplier circuits using emitter-coupled transistor pairs and Gilbert multiplier cells - illustrate the operation of a basic phase-locked loop (PLL), closed-loop analysis, voltage-controlled oscillator (VCO), and monolithic PLL IC 565 - Gain knowledge about applications of PLL in AM detection, FM detection, FSK modulation and demodulation, and frequency synthesizing

CLOBJ 4	Classify analog and digital data conversions - Learn about the specifications and types of digital-to-analog (D/A) converters such as weighted resistor type, R-2R ladder type, voltage mode, and current mode R2R ladder types switches - Gain knowledge about high-speed sample-and-hold circuits and various types of analog-to-digital (A/D) converters including Flash type, Successive Approximation type, Single Slope type, Dual Slope type, Voltage-to-Time Conversion, and Over-sampling A/D converters
CLOBJ 5	Illustrate the principles of sine-wave generators, multivibrators, triangular wave generators, saw-tooth wave generators, and function generators (e.g., ICL8038) - Learn about timer IC 555, IC voltage regulators (three-terminal fixed and adjustable voltage regulators, IC 723 general-purpose regulator, monolithic switching regulator), switched capacitor filter IC MF10, frequency to voltage and voltage to frequency converters, audio power amplifier, video amplifier, isolation amplifier, opto-couplers, and fiber optic ICs

f) Course Learning Outcomes:

CLO 1	Design linear and non linear applications of op – amps.
CLO 2	Design applications using analog multiplier and PLL.
CLO 3	Design ADC and DAC using op – amps.
CLO 4	Generate waveforms using op – amp circuits.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	1	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Course Content:

Unit No.	Topic	Teaching Hrs.	Weightage
1.	**IC Fabrication and Circuit Configuration for Linear IC** Advantages of ICs over discrete components ′Manufacturing process of monolithic Ics Construction of monolithic bipolar transistor ′Monolithic diodes ′Integrated Resistors Monolithic Capacitors ′Inductors. Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC	10	20%

	performance characteristics, slew rate, Open and closed loop configurations		
2.	**Applications Of Operational Amplifiers** Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.	12	25%
3.	**Analog Multiplier and PLL** Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing	12	25%
4.	**Analog to digital and digital to analog converters** Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current- Mode R2R Ladder types switches for D/A converters, high speed sample-and-hold circuits, A/D Converters specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.	07	15%
5.	**Waveform generators and special function ICs** Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.	07	15%

i) Text Book and Reference Book:

1 Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall / Pearson Education, 2001.

2 Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.

3 B.S.Sonde, “System design using Integrated Circuits” , 2nd Edition, New Age Pub, 2001

4 Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley International, 2005.

5 Michael Jacob, “Applications and Design with Analog Integrated Circuits”, Prentice Hall of India,1996.

6 William D.Stanley, “Operational Amplifiers with Linear Integrated Circuits”, Pearson

Education,2004.
7 S.Salivahanan & V.S. Kanchana Bhaskaran, “Linear Integrated Circuits”, TMH, 2008.

(7)

a) **Course Name:** Linear Integrated Circuit Lab
b) **Course Code:** 03608260
c) **Prerequisite:** Knowledge of Basic Electronics Circuits
d) **Rationale:** To introduce the basic building blocks of linear integrated circuits and learn the linear and non-linear applications of operational amplifiers. To introduce the theory and applications of analog multipliers and PL and also learn the theory of ADC and DAC to Introduce the concepts of waveform generation and introduce some special function ICs.

e) **Course Learning Objective:**

CLOBJ 1	Summarize the advantages of integrated circuits (ICs) over discrete components - Learn about the manufacturing process of monolithic ICs - Interpret the construction of monolithic bipolar transistors, diodes, resistors, capacitors, and inductors - Gain knowledge about current mirrors, current sources, voltage sources, voltage references, and BJT differential amplifiers with active loads - Illustrate the internal circuit diagrams and performance characteristics of operational amplifiers (e.g., IC 741) - Learn about open and closed loop configurations of operational amplifiers
CLOBJ 2	summarize various applications of operational amplifiers (Op-Amps) such as sign changer, scale changer, phase shift circuits, voltage follower, converters (V-to-I and I-to-V), adder, subtractor, instrumentation amplifier, integrator, differentiator, logarithmic amplifier, antilogarithmic amplifier, comparators, Schmitt trigger, precision rectifier, peak detector, clipper, clamper, and filters (low-pass, high-pass, and band-pass)
CLOBJ 3	Learn about analog multiplier circuits using emitter-coupled transistor pairs and Gilbert multiplier cells - illustrate the operation of a basic phase-locked loop (PLL), closed-loop analysis, voltage-controlled oscillator (VCO), and monolithic PLL IC 565 - Gain knowledge about applications of PLL in AM detection, FM detection, FSK modulation and demodulation, and frequency synthesizing
CLOBJ 4	Classify analog and digital data conversions - Learn about the specifications and types of digital-to-analog (D/A) converters such as weighted resistor type, R-2R ladder type, voltage mode, and current mode R2R ladder types switches - Gain knowledge about high-speed sample-and-hold circuits and

	various types of analog-to-digital (A/D) converters including Flash type, Successive Approximation type, Single Slope type, Dual Slope type, Voltage-to-Time Conversion, and Over-sampling A/D converters
CLOBJ 5	Illustrate the principles of sine-wave generators, multivibrators, triangular wave generators, saw-tooth wave generators, and function generators (e.g., ICL8038) - Learn about timer IC 555, IC voltage regulators (three-terminal fixed and adjustable voltage regulators, IC 723 general-purpose regulator, monolithic switching regulator), switched capacitor filter IC MF10, frequency to voltage and voltage to frequency converters, audio power amplifier, video amplifier, isolation amplifier, opto-couplers, and fiber optic ICs

f) Course Learning Outcomes:

CLO 1	Design linear and non linear applications of op – amps.
CLO 2	Design applications using analog multiplier and PLL.
CLO 3	Design ADC and DAC using op – amps.
CLO 4	Generate waveforms using op – amp circuits.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1 Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall / Pearson Education, 2001.
2 Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth
   i. Edition, PHI, 2001.
3 B.S.Sonde, “System design using Integrated Circuits” , 2nd Edition, New Age Pub, 2001
4 Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley International, 2005.
5 Michael Jacob, “Applications and Design with Analog Integrated Circuits”, Prentice Hall of India,1996.
6 William D.Stanley, “Operational Amplifiers with Linear Integrated Circuits”, Pearson Education,2004.
7 S.Salivahanan & V.S. Kanchana Bhaskaran, “Linear Integrated Circuits”, TMH, 2008.

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Operational Amplifiers (IC741)-Characteristics and Application.
2	Waveform Generation using Op-Amp (IC741).
3	Applications of Timer IC555.
4	Design of Active filters.
5	Study and application of PLL IC's
6	Design of binary adder and subtractor.
7	Design of counters
8	Study of multiplexer and demultiplexer /decoders.
9	Implementation of combinational logic circuits.
10	Study of DAC and ADC

(8)

a) Course Name: Power Electronics
b) Course Code: 03608265
c) Prerequisite: Basic Knowledge of Fundamental Basic Electronics
d) Rationale: Power electronics deals with high power solid state switching devices. It combines power, electronics and control. It is the application of the solid-state electronics for the control and conversion of electric power. The function of power electronics is to process and control the electric power by supplying voltage and current in a form that is optimally suited to the load.

e) Course Learning Objective:

CLOBJ 1	Classify the construction and operating principle of the SCR (Silicon Controlled Rectifier) including its two-transistor analogy - Learn about the V-I characteristics of SCR, latching current (IL), and holding current (Ih) - Explore various applications of SCR - Gain knowledge about other thyristor family devices such as LASCR, SCS, GTO, TRIAC, power MOSFET, and IGBT including their construction, operating principle, V-I characteristics, and

	applications - interpret the construction, operating principle, and applications of triggering devices like UJT, PUT, SUS, SBS, and DIAC - Learn about various turn-on and turn-off methods of thyristors including gate triggering, thermal triggering, illumination triggering, dv/dt triggering, and commutation circuits
CLOBJ 2	Learn about various turn-on and turn-off methods of thyristors including gate triggering, thermal triggering, illumination triggering, dv/dt triggering, and commutation circuits
CLOBJ 3	Relate phase control including firing angle and conduction angle - Learn about single-phase half-controlled, full-controlled, and midpoint-controlled rectifiers with R, RL loads including circuit diagrams, working principles, input-output waveforms, equations for DC output, and the effect of freewheeling diode- Explore different configurations of bridge-controlled rectifiers such as full bridge, half bridge with common anode, common cathode, SCRs in one arm and diodes in another arm
CLOBJ 4	Classify different types of converters- Learn about step-up and step-down choppers using power MOSFET including block diagrams and working principles - Explore circuit diagrams and working principles of series and parallel inverters
CLOBJ 5	Explore various applications of thyristor-based circuits in industrial control systems including burglar alarm systems, battery chargers, emergency light systems, temperature controllers, and illumination/fan speed control using TRIAC - Learn about SMPS (Switched Mode Power Supplies), UPS (Uninterruptible Power Supplies), SCR-based AC and DC circuit breakers, and introduction to AC and DC drives

f) Course Learning Outcomes:

CLO 1	Identify power electronic devices in circuits.
CLO 2	Maintain triggering and commutation circuits.
CLO 3	Use phase-controlled rectifiers in different applications.
CLO 4	Use choppers and inverters in different applications.
CLO 5	Maintain control circuits consisting of power electronic devices.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Course Content:

Unit No.	Topic	Teaching Hrs.	% Weightage
1.	**Thyristor Family Devices:** SCR: Construction, operating Principle with Two transistor analogy, V-I characteristics, latching current (IL) and holding current(Ih), applications of SCR. Thyristor family devices: LASCR, SCS, GTO and TRIAC, power MOSFET, IGBT: Construction, operating principle, V-I characteristics and applications. Triggering devices – UJT, PUT, SUS, SBS and DIAC: Construction, operating Principle, V-I characteristics and applications.	8	18 %
2.	**Turn-on and Turn-off Methods of Thyristors:** SCR Turn-On methods: High Voltage thermal triggering, Illumination triggering, dv/dt triggering, Gate triggering. Gate trigger circuits – Resistance and Resistance-Capacitance circuits. SCR triggering using UJT, PUT: Relaxation Oscillator and Synchronized UJT circuit. Pulse transformer and opto-coupler based triggering. SCR Turn-Off methods: Class A- Series resonant commutation circuit, Class B-Shunt Resonant commutation circuit, Class C-Complimentary Symmetry commutation circuit, Class D –Auxiliary commutation, Class E- External pulse commutation, Class F- Line or natural commutation.	10	24 %
3.	**Phase Controlled Rectifiers** Phase control: firing angle, conduction angle. Single phase half controlled, full controlled and midpoint controlled rectifier with R, RL load: Circuit diagram, working, input- output waveforms, equations for DC output and effect of freewheeling diode. Different configurations of bridge controlled rectifiers: Full bridge, half bridge with common anode, common cathode, SCRs in one arm and diodes in another arm.	10	24 %
4.	**Choppers and Inverters:** Convertors and its types Block diagram and working of step up and step down choppers using power MOSFET Inverters: circuit diagram, working of series inverter, parallel	7	17 %

	inverter		
5.	**Industrial Control Circuits:** Applications: Burglar's alarm system, Battery charger using SCR, Emergency light system, Temperature controller using SCR and; Illumination control / fan speed control TRIAC. SMPS, UPS: Offline and Online , SCR based AC and DC circuit breakers, Introduction of AC and DC Drive	7	17 %

i) Text Book and Reference Book:

1. Solar Photovoltaics: Fundamentals, Technologies and Applications By Solanki, Chetan Singh
2. Renewable Energy Technologies By Solanki, Chetan Singh | PHI Learning, New Delhi, 2010
3. Renewable Energy Sources and Emerging Technologies By Kothari, D.P | PHI
4. Energy Technology By O.P. Gupta | Khanna Publishing House

(9)

a) Course Name: Power Electronics Lab
b) Course Code: 03608266
c) Prerequisite: Basic Knowledge of Fundamental Basic Electronics
d) Rationale: Power electronics deals with high power solid state switching devices. It combines power, electronics and control. It is the application of the solid-state electronics for the control and conversion of electric power. The function of power electronics is to process and control the electric power by supplying voltage and current in a form that is optimally suited to the load.
e) Course Learning Objective:

CLOBJ 1	Classify the construction and operating principle of the SCR (Silicon Controlled Rectifier) including its two-transistor analogy - Learn about the V-I characteristics of SCR, latching current (IL), and holding current (Ih) - Explore various applications of SCR - Gain knowledge about other thyristor family devices such as LASCR, SCS, GTO, TRIAC, power MOSFET, and IGBT including their construction, operating principle, V-I characteristics, and applications - interpret the construction, operating principle, and applications of triggering devices like UJT, PUT, SUS, SBS, and DIAC - Learn about various turn-on and turn-off methods of thyristors including gate triggering, thermal triggering, illumination triggering, dv/dt triggering, and commutation circuits

CLOBJ 2	Learn about various turn-on and turn-off methods of thyristors including gate triggering, thermal triggering, illumination triggering, dv/dt triggering, and commutation circuits
CLOBJ 3	Relate phase control including firing angle and conduction angle - Learn about single-phase half-controlled, full-controlled, and midpoint-controlled rectifiers with R, RL loads including circuit diagrams, working principles, input-output waveforms, equations for DC output, and the effect of freewheeling diode- Explore different configurations of bridge-controlled rectifiers such as full bridge, half bridge with common anode, common cathode, SCRs in one arm and diodes in another arm
CLOBJ 4	Classify different types of converters- Learn about step-up and step-down choppers using power MOSFET including block diagrams and working principles - Explore circuit diagrams and working principles of series and parallel inverters
CLOBJ 5	Explore various applications of thyristor-based circuits in industrial control systems including burglar alarm systems, battery chargers, emergency light systems, temperature controllers, and illumination/fan speed control using TRIAC - Learn about SMPS (Switched Mode Power Supplies), UPS (Uninterruptible Power Supplies), SCR-based AC and DC circuit breakers, and introduction to AC and DC drives

f) Course Learning Outcomes:

CLO 1	Identify power electronic devices in circuits.
CLO 2	Maintain triggering and commutation circuits.
CLO 3	Use phase-controlled rectifiers in different applications.
CLO 4	Use choppers and inverters in different applications.
CLO 5	Maintain control circuits consisting of power electronic devices.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**-**	**-**	**50**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Text Book and Reference Book:

1. Solar Photovoltaics: Fundamentals, Technologies and Applications by Solanki,

Chetan Singh
2. Renewable Energy Technologies by Solanki, Chetan Singh | PHI Learning, New Delhi, 2010
3. Renewable Energy Sources and Emerging Technologies by Kothari, D.P | PHI
4. Energy Technology by O.P. Gupta | Khanna Publishing House

i) Mapping of Experiment List with Course Learning Outcomes:

Exp. No.	Name of the Experiment
1	Test the proper functioning of power transistor and IGBT
2	Test the proper functioning of DIAC to determine the break over voltage
3	Determine the latching current and holding current using V-I characteristics of SCR.
4	Test the variation of R, C in R and RC triggering circuits on firing angle of SCR.
5	Test the effect of variation of R, C in UJT triggering technique.
6	Perform the operation of Class – A, B, C, and turn off circuits.
7	Perform the operation of Class –D, E, F turn off circuits.
8	Use CRO to observe the output waveform of half wave controlled rectifier with resistive load and determine the load voltage.
9	Draw the output waveform of Full wave controlled rectifier with R load, RL load, and freewheeling diode and determine the load voltage.
10	Determine the firing angle using DIAC and TRIAC phase controlled circuit on output power under different loads such as lamp, motor or heater

(10)

a) Course Name: Employability Skills
b) Course Code: 03693251
c) Prerequisite: Inclination to learn the importance of critical thinking & Interview Skills.
d) Rationale: Cracking aptitude is the first step towards cracking placements and competitive exams

e) Course Learning Objective:

CLOBJ 1	Improve their critical thinking
CLOBJ 2	Prepares them for Campus Placement & Competitive Exams.
CLOBJ 3	Builds up their confidence level
CLOBJ 4	Illustrating ways to present the points in Group Discussions & how it plays an important role in cracking interviews.(selection process)
CLOBJ 5	Learning Entrepreneur skills which promotes them to learn selling techniques.
CLOBJ 6	Grasping the knowledge for preparing resume.

f) Course Learning Outcomes:

CLO 1	Application of the knowledge learnt in resume building
CLO 2	Building confidence & cracking interviews.
CLO 3	Improve competency in Competitive exams through various topics learnt
CLO 4	Selling skills are focused helping them to become an entrepreneur in future.

g) Teaching & Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
				External		Internal			
Lect. Hrs/ Week	Tut Hrs/ Week	Lab Hrs/		T	P	T	CE	P	
2	0	-	0	-	-	-	100	-	100

Lect- Lecture, Tut - Tutorial, Lab - Lab, T - Theory, P - Practical, CE – Continuous Evaluation

Note: 15 Hours of additional sessions will be taken (within the semester) to match up 30 hours content.

h) Course Content:

Sr.	Topic	Weightage	Teaching Hrs.

1	Critical Thinking -Case Studies: Critical thinking is based on pure logical thinking. Solving a critical reasoning question requires nothing but reasoning ability of the candidate. This session deals with the basic logic involved in critical reasoning questions and covers all the type of questions in CT. Worksheets would be provided to students for further practice.	10%	6
2	Coding & decoding, Alphabetical Series Understand various types of questions which they can come across in the given topic. Tips and tricks to solve questions on the above mentioned topics.	8%	4
3	Analogy and odd man out Understand various types of questions which they can come across in the given topic. Tips and tricks to solve questions on the above mentioned topics.	8%	4
4	Direction sense : Able to solve all the direction sense question in competitive exams and aptitude exams of different companies	8%	4
5	Blood relations: Able to solve all the Blood Relation questions in competitive exams and aptitude exams of different companies	8%	4
6	Paper Folding In this section of non verbal reasoning a figure is obtained by folding a piece of paper containing same design along the dotted line.	4%	2
7	Seating Arrangement Candidates are required to arrange the objects either in a row or circle on the basis of information given Questions are presented in distorted form to create confusion and to taste the candidate's ability to analyze the information step by step in order to answer the question	3%	2
8	Completion of Figure		

	In each of the following figure, a part of figure is missing. Find out from the given options, the right figure to fit in the missing figure	3%	2
9	Completion of Series In these questions a series of figures is given as problem figure & the candidate are asked to select one of the figurefrom the set of answer figure which will continue the given sequence.	8%	4
10	Entrepreneurship skills (SELLING THE CONCEPT): This topic will help students develop the skills necessary to develop into Self- Sufficient business leaders through Entrepreneurshipstudies.	4%	2
11	Resume Building The students will have a proper understanding of the content and how it is to be presented in resume	8%	4
12	Group Discussion It is a systematic exchange of information, views and opinions about a topic, problem, issue or situation among the members of a group who share some common objectives.	14%	8
13	Interview Skills Students are prepared for their interviews, question and answers, how to react on some unique questions, body language & grooming is taken into account.	14%	8
	Total	100	60

Continuous Evaluation:

It consists of

1. Phase I Exam-35 Marks(Hybrid or Offline Mode)
2. Phase II Exam -35 Marks (Hybrid or Offline Mode)
3. Activities – (Listening and Speaking) -10+10=20 Marks
4. Attendance -10 Marks
5. The passing marks for Continous Evaluation will be 40 out of 100.There will not be any re-test.

i) Text Book and Reference Book:

6. Verbal & Non-Verbal Reasoning, Indu Sijwali & B.S. Sijwali
7. Contributor Personality Development by i-become
8. Critical Thinking Skills for Engineers

Semester 5

(1)

a) **Course Name:** Fundamental of Internet of Things
b) **Course Code:** 03606287
c) **Prerequisite:** Basic knowledge of computer networks.
d) **Rationale:** Fundamental of Internet of Things (FIoT) is presently an important technology with wide ranging interest from Government, academia and industry. IoT cuts across different application domain verticals ranging from civilian to defence sectors which includes agriculture, space, health care, manufacturing, construction, water, mining, etc.

e) **Course Learning Objective:**

CLOBJ 1	Define the term "Internet of Things" State the technological trends which have led to IoT. Describe the impact of IoT on society, IoT Protocols, IoT Communication Models
CLOBJ 2	Enumerate and describe the components of an embedded system. Describe the interactions of embedded systems with the physical world. Name the core hardware components most commonly used in IoT devices. Communication Protocols. Sensor Networks
CLOBJ 3	Describe the interaction between software and hardware in an IoT device. Explain the use of networking and basic networking hardware. Describe the structure of the Internet. Application of IoT. Introduction of Raspberry Pi. Introduction of Arduino
CLOBJ 4	Characterizing the IoT, Importance of IoT privacy, Security, Environment – Physical thing, Electronics, Internet service

f) **Course Learning Outcomes:**

CLO 1	Interpret basics of internet of things.
CLO 2	Analyze communication protocol and network sensors.
CLO 3	Apply different IOT techniques.
CLO 4	Evaluate new trends and technologies in IOT

g) Teaching & Examination Scheme:

Teaching and Examination Scheme										
Teaching Scheme					**Examination Scheme**					**Total**
Lecture Hrs/Week	**Tutorial Hrs/Week**	**Lab Hrs/Week**	**Hrs/Week**	**Credit**	**Internal Marks**			**External Marks**		
					T	**CE**	**P**	**T**	**P**	
3	-	-	-	3	20	20	-	60	-	100

SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h) Course Content:

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	**Topics**	**W**	**T**
1	**Introduction to Internet of Things:** Define the term "Internet of Things", State the technological trends which have led to IoT, Describe the impact of IoT on society, IoT Protocols, IoT communication Models	**15**	**6**
2	**Design consideration of IoT:** Enumerate and describe the components of an embedded system, Describe the interactions of embedded systems with the physical world, Name the core hardware components most commonly used in IoT devices, Communication Protocols, Sensor networks	**30**	**14**
3	**Interfacing by IoT devices:** Describe the interaction between software and hardware in an IoT device, Explain the use of networking and basic networking hardware, Describe the structure of the Internet, Application of IoT, Introduction of Raspberry pi, Introduction of Arduino	**30**	**14**
4	**Ethics in IoT:** Characterizing the IoT, Importance of IoT privacy, Security, Environment – Physical thing, Electronics, Internet service;	**25**	**8**

i) Text Book and Reference Book:

1. "Internet of Things (A Hands-on-Approach)", By Vijay Madisetti and Arshdeep Bahga, | VPT

2. Internet of things- from research and innovation to market deployment , By Dr. ovidiu vermason , | river publishers.

(2)

a) Course Name: Mobile and Wireless Communication Lab

b) Course Code: 03608302

c) Prerequisite: knowledge of cellular mobile communication

d) Rationale: The course will provide fundamentals about many theoretical & practical concepts that form the basis for wireless communication systems and Networks. Also the emphasis is given for creating foundation of cellular concepts which will be useful for the fundamentals of cellular mobile communication systems design. The students will learn Mobile Radio Propagation models and various wireless channel effects. Student will interpret Multiple Access techniques.

e) Course Learning Objective:

CLOBJ 1	Summarize the evolution of cellular communication technologies including 1G, 2G, and 3G. Explain the basic concepts and systems of cellular communication, including macro, micro, and Pico cells. Identify different types of cells such as selective and umbrella cells. Describe cluster concept and frequency reuse in cellular systems. Analyze GSM capacity and channel assignment strategies. Discuss methods for enhancing coverage and capacity of cellular systems, such as cell splitting and cell sectoring. Differentiate between soft and hard handoff, inter and intra system handoffs. Explain multiple access techniques including FDMA, TDMA, CDMA, and SDMA.
CLOBJ 2	Outline the GSM architecture, system specifications, and channel types. Evaluate wireless propagation factors like link budget, path loss, noise figure, multipath fading, and shadowing.
CLOBJ 3	Explore the fundamentals of LTE technology and its advancements in wireless communication. Analyze wireless propagation characteristics such as link budget, path loss, noise figure, and fading effects Extract the importance of antenna diversity in improving signal quality and reliability Explain the concept of wireless channel capacity and factors influencing it
CLOBJ 4	Extract the basics of Code Division Multiple Access. Explore the block diagram of GPRS and its applications. Discuss the evolution of data rates in mobile communication. Examine High-Speed Downlink Packet Access technology. Learn about Orthogonal Frequency Division Multiplexing and Multiple Input Multiple Output. Interpret the principles and advantages of Long-Term Evolution technology.
CLOBJ 5	Explore the basics of Wireless Fidelity networks and their applications. Interpret the fundamentals of Worldwide Interoperability for Microwave Access. Examine the characteristics and applications of ZigBee networks. Learn about the concept and benefits of Software Defined Radio technology. Explore Ultra-Wideband Radio technology and its uses. Extract the concept and functioning of Wireless Adhoc Networks. Discuss

	the challenges and solutions related to mobile number portability. Examine the various security threats and solutions in wireless communication systems.

f) Course Learning Outcomes:

CLO 1	Explain the basics of propagation of radio signals
CLO 2	Extract the basic concepts of basic Cellular System and the design requirements
CLO 3	Have a knowledge of the basic principles behind radio resource management techniques such as power control, channel allocation and handoffs
CLO 4	Gain knowledge and awareness of the technologies for how to effectively share spectrum through multiple access techniques i.e. TDMA, CDMA, FDMA etc.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**1**	**-**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation- Continuous Evaluation, **ESE-** End Semester Examination.

h) Mapping of Experiment List with Course Learning Outcomes:

Sr. NO.	**Experiment List**
1	To illustrate the cellular frequency reuse concept to find the co-channel cells for a particular cell.
2	To explore various blocks and working of GSM mobile phone
3	To illustrate the path loss
4	Illustrate the path loss with shadowing
5	Extracting the Flat fading
6	Understanding the Frequency selective fading
7	Understanding the Multipath channel for the following objectives 1. No Fading 2. Flat Fading 3. Dispersive Fading
8	To simulate a dipole antenna for a particular frequency using 4NEC2

9	Perform following experiments using CDMA trainer kit 1. PSK modulation and demodulation experiment 2. Bit synchronization extraction experiment 3. Error correction encoding experiment

(2)

a) **Course Name:** Embedded Systems
b) **Course Code:** 03608303
c) **Prerequisite:** Fundamental knowledge of Basic C- Language and embedded system
d) **Rationale:** To add luxury to any product requires fully automation and for that we need embedded system, where we don̓t need user intervention. By learning this course student can develop their own embedded system which is application specific to solve given real time problem by using open source platform. Thus this course is an important course for students who want to work in the automation sector of electronic industry.

e) **Course Learning Objective:**

CLOBJ 1	- Classify the characteristics of embedded systems - Explore examples of embedded systems such as washing machines, chocolate vending machines, room temperature controllers - Learn about types of operating systems (OS) and their characteristics - Classify different types of microcontrollers including PIC, AVR, and ARM, along with their features and applications
CLOBJ 2	Familiarize with the Arduino IDE - Learn about sketch designing for Arduino - interpret communication interfaces using serial ports - Gain basic knowledge of Embedded C code including operators, boolean operations, pointer access operations, bitwise operations, and compounded operations
CLOBJ 3	- Learn decision-making statements in Embedded C - Classify looping mechanisms using for, do, and while loops- Learn branching operations based on conditional expressions
CLOBJ 4	- Determine Arduino Mega specifications including power ratings, digital and analog peripherals - Differentiate between the C language and Embedded C language - Learn about Arduino Mega ports, pins, digital and analog peripherals
CLOBJ 5	Explore different communication modules available with real-life applications Learn about communication interface initialization for serial ports and its code - Interface various components with Arduino such as DC motors, LCDs, accelerometers, relay drivers, temperature sensors, seven segments, keypads, etc., and write corresponding codes

f) Course Learning Outcomes:

CLO 1	Interpret the concepts of Embedded Systems
CLO 2	Extract interfacing of IO devices and other peripherals.
CLO 3	Device driver programming & interrupt service mechanisms
CLO 4	Classify Inter-Process Communication and Synchronization of processes.
CLO 5	Learn OS functions and Real Time Operating System
CLO 6	Able to use MSP430 along with analog and digital peripherals.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Overview of Embedded System Embedded system:** Embedded System Characteristics, Examples: Washing Machine, Chocolate Vending Machine, Room Temperature Controller, Operating System(OS): Types of OS, Types of Mobile OS, Characteristics of Real Time Operating System, Microcontroller Types: PIC, AVR, ARM: features and applications, AVR microcontroller: Types , Architecture	15%	12
2	**Embedded C basics operators for Arduino** Familiarizing with the Arduino IDE, Sketch designing for Arduino Communication interface using serial port Basic understanding of the code with Boolean operations, pointer access operations, bitwise operations, compounded operations	25%	12
3	**Embedded C control structure blocks** Decision making statement, Looping mechanism ′for, do and while. The branching operations based on conditions expression	10%	8
4	**Introduction to Arduino Mega Arduino** Mega specifications including power ratings, digital and analog peripherals, Difference between the C language and Embedded C language Arduino Mega Ports, Pins, Digital and Analog Peripherals	25%	10

5	**Communication with Arduino** Different communication modules available with their real-life application Communication interface: Initialization for serial port and code for it, Interfacing DC motor and its Code, Interfacing 16x2 LCD and its code, Interfacing Accelerometer with Arduino, Interfacing of Relay Driver ULN2803 with Arduino, Interfacing of USB-UART, Interface LM35 temperature senso , Interfacing of Seven segment, Interfacing keypad and Code for it.	**25%**	**14**

i) Text Book and Reference Book:

a. Beginning Arduino By Michael Patterson | Technology in Action Publication
b. Exploring Arduino By Jeremy Blum | Wiley Publication

(3)

a. Course Name: Embedded Systems Lab
b. Course Code: 03608304
c. Prerequisite:
d. Rationale:
e. Course Learning Objective:

CLOBJ 1	- Classify the characteristics of embedded systems - Explore examples of embedded systems such as washing machines, chocolate vending machines, room temperature controllers - Learn about types of operating systems (OS) and their characteristics - Classify different types of microcontrollers including PIC, AVR, and ARM, along with their features and applications
CLOBJ 2	Familiarize with the Arduino IDE - Learn about sketch designing for Arduino - interpret communication interfaces using serial ports - Gain basic knowledge of Embedded C code including operators, boolean operations, pointer access operations, bitwise operations, and compounded operations
CLOBJ 3	- Learn decision-making statements in Embedded C - Classify looping mechanisms using for, do, and while loops- Learn branching operations based on conditional expressions
CLOBJ 4	- Determine Arduino Mega specifications including power ratings, digital and analog peripherals - Differentiate between the C language and Embedded C language - Learn about Arduino Mega ports, pins, digital and analog peripherals

CLOBJ 5	Explore different communication modules available with real-life applications Learn about communication interface initialization for serial ports and its code - Interface various components with Arduino such as DC motors, LCDs, accelerometers, relay drivers, temperature sensors, seven segments, keypads, etc., and write corresponding codes

f. Course Learning Outcomes:

CLO 1	Interpret the concepts of Embedded Systems
CLO 2	Extract interfacing of IO devices and other peripherals.
CLO 3	Device driver programming & interrupt service mechanisms
CLO 4	Classify Inter-Process Communication and Synchronization of processes.
CLO 5	Learn OS functions and Real Time Operating System
	Able to use MSP430 along with analog and digital peripherals.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

j) Mapping of Experiment List with Course Learning Outcomes:

Sr. NO.	**Experiment List**
1	Install Arduino IDE and its development tool.
2	Develop a program to Blink LED for 1 second.
3	Develop a program to interface Input Switches and output LEDs with development board (Arduino).
4	Interface 16x2 LCD and Display “HELLO WORLD”
5	Interface 7 seg display with development board(Arduino) and Write a program to count and display 0 to 9 on i
6	Interfacing keypad with Arduino Boar

7	Interface LM35 temperature sensor with Arduino and monitor temp. on serial monitor.
8	Interface DC motor using L293D Motor Driver.
9	Build Digital thermometer using LM35 and LCD 16x2
10	Interfacing of Relay Driver ULN2803 with Arduino
11	Interfacing keypad and Code for it
12	Looping mechanism to check the state of pin and if change print its status on serial port
13	Controlling multiple LEDs with a loop and an arrays

(4)

a. **Course Name:** Mobile and Wireless Communication
b. **Course Code:** 03608305
c. **Prerequisite:** knowledge of cellular mobile communication
d. **Rationale:** The course will provide fundamentals about many theoretical & practical concepts that form the basis for wireless communication systems and Networks. Also the emphasis is given for creating foundation of cellular concepts which will be useful for illustrating the fundamentals of cellular mobile communication systems design. The students will learn Mobile Radio Propagation models and various wireless channel effects. Student will understand Multiple Access techniques.

e. **Course Learning Objective:**

CLOBJ 1	Summarize the evolution of cellular communication technologies including 1G, 2G, and 3G. Explain the basic concepts and systems of cellular communication, including macro, micro, and Pico cells. Identify different types of cells such as selective and umbrella cells. Describe cluster concept and frequency reuse in cellular systems. Analyze GSM capacity and channel assignment strategies. Discuss methods for enhancing coverage and capacity of cellular systems, such as cell splitting and cell sectoring. Differentiate between soft and hard handoff, inter and intra system handoffs. Explain multiple access techniques including FDMA, TDMA, CDMA, and SDMA.
CLOBJ 2	Outline the GSM architecture, system specifications, and channel types. Evaluate wireless propagation factors like link budget, path loss, noise figure, multipath fading, and shadowing.

CLOBJ 3	Explore the fundamentals of LTE technology and its advancements in wireless communication. Analyze wireless propagation characteristics such as link budget, path loss, noise figure, and fading effects Extract the importance of antenna diversity in improving signal quality and reliability Explain the concept of wireless channel capacity and factors influencing it
CLOBJ 4	Extract the basics of Code Division Multiple Access. Explore the block diagram of GPRS and its applications. Discuss the evolution of data rates in mobile communication. Examine High-Speed Downlink Packet Access technology. Learn about Orthogonal Frequency Division Multiplexing and Multiple Input Multiple Output. Interpret the principles and advantages of Long-Term Evolution technology.
CLOBJ 5	Explore the basics of Wireless Fidelity networks and their applications. Interpret the fundamentals of Worldwide Interoperability for Microwave Access. Examine the characteristics and applications of ZigBee networks. Learn about the concept and benefits of Software Defined Radio technology. Explore Ultra-Wideband Radio technology and its uses. Extract the concept and functioning of Wireless Adhoc Networks. Discuss the challenges and solutions related to mobile number portability. Examine the various security threats and solutions in wireless communication systems.

f. Course Learning Outcomes:

CLO 1	Explain the basics of propagation of radio signals
CLO 2	Extract the basic concepts of basic Cellular System and the design requirements
CLO 3	Have a knowledge of the basic principles behind radio resource management techniques such as power control, channel allocation and handoffs
CLO 4	Gain knowledge and awareness of the technologies for how to effectively share spectrum through multiple access techniques i.e. TDMA, CDMA, FDMA etc.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Fundamental of Cellular Communication :** Cellular communication Standards-1G, 2G and 3G, Basic cellular concept and cellular system, Type of Cell: macro, micro, and Pico, Selective and umbrella cell, Cluster concept and frequency reuse, GSM capacity, Co-channel and adjacent channel interference, Channel assignment strategies, Enhancing coverage and capacity of cellular system: cell splitting and cell sectoring, Handoff : soft and hard, inter and intra system, Multiple access techniques: FDMA,TDMA and CDMA Space Division Multiple Access (SDMA)	**25**	**12**
2	**GSM**- Global System for Mobile communication GSM architecture, GSM 900 system specification, GSM channel types: Traffic, control, GSM burst and frame structures, GSM call Procedure	**15**	**10**
3	**Wireless propagation** Link budget, Free-space path loss, Noise figure of receiver Multipath fading, Shadowing, Fading margin, Shadowing margin, Antenna diversity, wireless channel capacity	**10**	**10**
4	**WCDMA and 4G aspects** Overview of CDMA , GPRS- General Packet Radio Service: Block diagram, applications , EDGE- Enhanced Data rate for Global Evolution, HSDPA, 4 th Generation technology: OFDM and MIMO, LTE	**25**	**12**
5	**Recent Trends -** Introduction to Wi-Fi, WiMAX, ZigBee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network.	**25**	**12**

J. Text Book and Reference Book:

Wireless Communications Principles and Practice By T.S.Rappaport | PHI | 2nd edition, Pub. Year 2002

(5)

a. **Course Name:** Major Project - I
b. **Course Code:** 03608306
c. **Prerequisite:**Zeal to learn the Subject.
d. **Rationale:**The main aim of this subject is to transform theoretical knowledge into practical.
e. **Course Learning Objective:**

CLOBJ 1	**Practical Application Mastery** Apply theoretical knowledge to real-world scenarios, equipping students with the skills to transform abstract concepts into practical applications, showcasing a nuanced interpreting of implementation across diverse contexts.
CLOBJ 2	**Innovation and Creative Problem-Solving** Generate innovative solutions by fostering creative thinking and problem-solving skills, empowering students to approach challenges with inventive strategies, thus contributing to advancements and ingenuity in their field.
CLOBJ 3	**Instilling a Lifelong Learning Mindset** Cultivate a sense of curiosity and enthusiasm for learning, encouraging intrinsic motivation that propels continuous exploration and discovery. This objective aims to nurture a sustained passion for acquiring new knowledge throughout the students' careers.
CLOBJ 4	**Leadership and Collaborative Problem-Solving Proficiency** Demonstrate effective leadership and problem-solving skills within collaborative environments. This objective guides students in leading teams, navigating challenges, and devising strategic solutions through critical thinking and analytical prowess.

f. Course Learning Outcomes:

CLO 1	Makes Transformation of Theoretical Knowledge and its Applications.
CLO 2	Improves Innovative Spirit.
CLO 3	Boosts Curiosity and Liking for Studies
CLO 4	Improves Team Leading and Problem-Solving Skills

i. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**12**	**6**	**-**	**-**	**60**	**-**	**40**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

(6)

a. **Course Name:** Summer Internship
b. **Course Code:** 03608312
c. **Prerequisite:** Zeal to learn the Subject.
d. **Rationale:** Students will they do internship in social sector/ Govt. initiated social schemes/NGOs etc. The aim of this Internship program is to develop social emotions, awareness, and values.
e. **Course Learning Objective:**

CLOBJ 1	**Ethical Transformation and Community Engagement** Develop a deep understanding of ethical values and community engagement through education, aiming to transform students into responsible citizens capable of positively influencing and inspiring others.
CLOBJ 2	**Economic Awareness and Societal Contribution** Gain a comprehensive knowledge of the economic landscape and the role of work in contributing to societal progress and economic stability, fostering an awareness of the broader implications of individual contributions.
CLOBJ 3	**Social Skills and Effective Communication** Cultivate essential social skills through participation in collaborative projects and interpersonal interactions, aiming to shape individuals with adaptable attitudes and effective communication abilities crucial for success in diverse life situations.
CLOBJ 4	**Real-world Responsibility and Professional Attributes** Engage in internships to expose students to real-world responsibilities, with a focus on enhancing attributes such as accountability, time management, and professional ethics, essential for building a successful and responsible career.
CLOBJ 5	**Building a Robust Professional Profile** Develop skills and experiences that contribute to a well-rounded professional profile, recognizing that education not only imparts knowledge but also serves as a tangible asset, making resumes more appealing to prospective employers.

f. **Course Learning Outcomes:**

CLO 1	Turns students into role models for society
CLO 2	Learn to appreciate work and its function in the economy.
CLO 3	Develop social habits and attitudes necessary in life.
CLO 4	Internship experience makes you more responsible.
CLO 5	Adds value to the resume

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	-	2	-	-	100	-	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

(7)

a. Course Name: Control System and Plc
b. Course Code: 03608335
c. Prerequisite: Knowledge of Linear differential equations, Differential equations and its solution.
d. Rationale: To develop comprehensive knowledge and understanding of classical and modern control theory, industrial automation, and systems analysis. Control engineering is a diverse and rapidly expanding discipline which has become increasingly important in a wide range of industries.

e. Course Learning Objective:

CLOBJ 1	- Interpret the concept of control systems and their historical development - Identify examples of control systems in everyday life - Explore the future evolution of control systems - Differentiate between open-loop and closed-loop systems -Learn about the benefits of feedback in control systems - Illustrate block diagram algebra and reduction techniques
CLOBJ 2	- Learn to formulate differential equations for physical systems - Illustrate linear approximations of physical systems - Gain proficiency in using the Laplace Transform to analyze linear systems- Learn about transfer functions, block diagram models, and signal-flow graph models
CLOBJ 3	- Extract transient and steady-state responses of control systems - Learn about standard test inputs such as step, ramp, parabolic, and impulse functions - Analyze first-order control systems for unit step inputs- Gain an interpreting of the concept of time constant
CLOBJ 4	Analyze error signals in feedback control systems - Interpret the sensitivity of control systems to parameter variations -Learn to handle disturbance signals in

	feedback control systems - Control transient responses effectively - Analyze steady-state errors and their effects
CLOBJ 5	- Introduction to Programmable Logic Controllers (PLCs) - Classify the differences between PLCs and digital computers - Learn about the history and development of PLCs - Differentiate between relay panels and PLCs - Interpret the architecture and basic block diagram of PLCs - Familiarize with PLC inputs/outputs and related terms - Learn programming concepts for PLCs - Analyze advantages, disadvantages, and applications of PLCs - Gain knowledge about selecting and types of PLCs

f. Course Learning Outcomes:

CLO 1	Apply systems theory to complex real-world problems in order to obtain models that are expressed using differential equations, transfer functions, and state space equations
CLO 2	Predict system behavior based on the mathematical model of that system where the model may be expressed in time or frequency domain
CLO 3	Analyze the behavior of closed loop systems using tools such as root locus, Routh Hurwitz, Bode, Nyquist, and Matlab
CLO 4	Design controllers using classical PID methods, root locus methods, and frequency domain methods.
CLO 5	Devise a safe and effective method of investigating a system identification problem in the lab
CLO 6	Write a report that effectively communicates the results of an analysis or design.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction to Control Systems** Introduction, Brief History of Automatic Control, Examples of Control Systems, The Future Evolution of Control Systems, Feedback Control- Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra, Block diagram reduction technique- reduction rules	**15%**	**10**

2	**Mathematical Models of Systems** Differential Equations of Physical Systems, Linear Approximations of Physical Systems, The Laplace Transform, The Transfer Function of Linear Systems, Block Diagram Models, Signal-Flow Graph Models	**25%**	**10**
3	**Time Response Analysis** Time domain analysis: Transient and steady state response, Standard test inputs: Step, Ramp, Parabolic and Impulse, First order control system: Analysis for unit step input, Concept of time constant.	**20%**	**8**
4	**Feedback Control System Characteristics** Error Signal Analysis, Sensitivity of Control Systems to Parameter Variations, Disturbance Signals in a Feedback Control System, Control of the Transient Response, Steady-State Error, The Cost of Feedback	**20%**	**8**
5	**PLC BASICS Programmable Logic Controllers (PLCs):** Introduction to PLC, basic difference between PLC and Digital Computers, History and development of PLC, Difference between relay panel and PLC, Simple block diagram and Archicture of PLC, Inputs/Outputs, Terms regarding PLC, Programming of PLC, Advantages and disadvantages, Applications, , Selecting a PLC ,Types of PLC.	**10%**	**8**

i. Text Book and Reference Book:

1. Control System Engineering, By Nagrath & Gopal, | New Age International Publication.
2. CONTROL SYSTEMS ENGINEERING By I J Nagrath, M Gopal | New Age International Publishers Ltd..
3. Modern Control Engineering By Katsuhiko Ogata | Prentice Hall of India
4. Programmable Logic Controllers By Frank D. Petruzella | McGraw-Hill Book Company

(8)

a) Course Name: Control System and Plc Lab

b) Course Code: 03608336

c) Prerequisite: Knowledge of Linear differential equations, Differential equations and its solution.

d) Rationale: To develop comprehensive knowledge and understanding of classical and modern control theory, industrial automation, and systems analysis. Control

engineering is a diverse and rapidly expanding discipline which has become increasingly important in a wide range of industries.

e) Course Learning Objective:

CLOBJ 1	- Interpret the concept of control systems and their historical development - Identify examples of control systems in everyday life - Explore the future evolution of control systems - Differentiate between open-loop and closed-loop systems -Learn about the benefits of feedback in control systems - Illustrate block diagram algebra and reduction techniques
CLOBJ 2	- Learn to formulate differential equations for physical systems - Illustrate linear approximations of physical systems - Gain proficiency in using the Laplace Transform to analyze linear systems- Learn about transfer functions, block diagram models, and signal-flow graph models
CLOBJ 3	- Extract transient and steady-state responses of control systems - Learn about standard test inputs such as step, ramp, parabolic, and impulse functions - Analyze first-order control systems for unit step inputs- Gain an interpreting of the concept of time constant
CLOBJ 4	Analyze error signals in feedback control systems - Interpret the sensitivity of control systems to parameter variations -Learn to handle disturbance signals in feedback control systems - Control transient responses effectively - Analyze steady-state errors and their effects
CLOBJ 5	- Introduction to Programmable Logic Controllers (PLCs) - Classify the differences between PLCs and digital computers - Learn about the history and development of PLCs - Differentiate between relay panels and PLCs - Interpret the architecture and basic block diagram of PLCs - Familiarize with PLC inputs/outputs and related terms - Learn programming concepts for PLCs - Analyze advantages, disadvantages, and applications of PLCs - Gain knowledge about selecting and types of PLCs

f) Course Learning Outcomes:

CLO 1	Apply systems theory to complex real-world problems in order to obtain models that are expressed using differential equations, transfer functions, and state space equations
CLO 2	Predict system behavior based on the mathematical model of that system where the model may be expressed in time or frequency domain
CLO 3	Analyze the behavior of closed loop systems using tools such as root locus, Routh Hurwitz, Bode, Nyquist, and Matlab
CLO 4	Design controllers using classical PID methods, root locus methods, and frequency domain methods.

CLO 5	Devise a safe and effective method of investigating a system identification problem in the lab
CLO 6	Write a report that effectively communicates the results of an analysis or design.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	2	1	-	-	30	-	20	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation- Continuous Evaluation, **ESE-** End Semester Examination.

h) Mapping of Experiment List with Course Learning Outcomes:

Sr. NO.	Experiment List
1	Unity and non-unity feedback system using MATLAB Generating standard test signals i.e., step, ramp, unit impulse on a simulator.
2	Block diagram reduction technique using MATLAB
3	Simulation of dc motor characteristics using MATLAB.
4	Simulation of triangular wave and ramp wave using MATLAB
5	Simulation of saw tooth wave and sine wave using MATLAB
6	State model for classical transfer function & vice versa using MATLAB
7	To study PLC Hardware in detail.
8	To study effect of feedback on DC servo motor.
9	Simulation of OP ′AMP based integrator and differentiator.
10	To study AC servo motor

(9)

a. **Course Name:** Optical Communication Networking
b. **Course Code:** 03608337
c. **Prerequisite:** Knowledge of communication and Laser

d. **Rationale:** To introduce the students to various optical fiber modes, configurations and various signal degradation factors associated with optical fiber and to study about various optical sources and optical detectors and their use in the optical communication system, optical amplifiers, fiber network elements, basic optical components, and techniques of fiber optic measurement

e. **Course Learning Objective:**

CLOBJ 1	- explore the basics of light propagation in optical fibers - Learn about the general optical fiber communication system - Explore the advantages of optical fiber communications - Gain knowledge about fundamental laws of optics including refraction, Snell's law, critical angle, and total internal reflection - Illustrate ray propagation in step index fiber - Learn about numerical aperture, acceptance angle, skew rays, meridional rays, phase velocity, and group velocity - Gain insight into modes in optical fibers- Explore different types of losses in optical fibers including attenuation, absorption, scattering, and linear scattering losses
CLOBJ 2	- Learn about different types of optical fibers - Examine modal analysis of a step index fiber - Explore the need for cabling in fiber optic communication systems - Gain knowledge about fiber optic cable types such as slotted core, loose tube, and multi-fiber ribbon - differentiate fiber modes and the differences between step index fibers and graded index fibers - Learn about single mode fibers including cut-off wavelength, absorption, scattering, and bending losses - Explore core and cladding losses in optical fibers
CLOBJ 3	- Analyze basic concepts of absorption and emission in semiconductors - Learn about the construction and operating principles of Light Emitting Diodes (LEDs) - Gain knowledge about the construction and operating principles of Semiconductor LASER Diodes - extract photo-detectors such as pin-diodes and optical receivers - Learn about optical link design and Bit Error Rate (BER) calculation - Gain an Knowledge of the quantum limit in optical communication systems
CLOBJ 4	- Learn about optical couplers, isolators, switches, beam splitters, multiplexers, and demultiplexers - Explore the functions and types of optical amplifiers, including Semiconductor Optical Amplifiers (SOAs)
CLOBJ 5	- Gain knowledge about fiber parameters measurement including attenuation, intermodal dispersion, and optical power -Extract the use of optical power meters - Learn about Wavelength Division Multiplexing (WDM) and Dense Wavelength Division Multiplexing (DWDM) systems - Explore fiber sensors and applications of different types of lasers in various fields

f. Course Learning Outcomes:

CLO 1	Interpret the principles of fiber-optic communication, the components and the bandwidth advantages.
CLO 2	Classify the properties of the optical fibers and optical components.
CLO 3	extract operation of lasers, LEDs, and detectors
CLO 4	Analyze system performance of optical communication systems
CLO 5	Design optical networks and gain knowledge about non-linear effects in optical fibers

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	-	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Light propagation in Optical Fiber** Introduction, The general Optical Fiber communication system, advantages of optical fiber communications, Fundamental laws of optics: refraction, Snell̀s law, critical angle, total internal reflection, Ray propagation in step index fiber, propagation of light, Numerical Aperture and acceptance angel, Definition of Skew rays and Meridional rays, wave model- Phase velocity and group velocity, Modes in optical fiber, Attenuation-Absorption losses: intrinsic and extrinsic, Linear scattering losses: Rayleigh and mie	25%	10
2	**Optical Fiber Cables & waveguide** Different types of optical fibers, Modal analysis of a step index fiber, Fiber optic cables-Need of cabling, Fiber Cables: Slotted core, loose tube and multi-fiber ribbon, Fiber Modes, Step Index fibers Vs Graded Index, fibers, Single Mode Fibers- Cut off wavelength, Absorption, Scattering and Bending losses, Core and Cladding losses	20%	08
3	**Optical Sources and Detector** Basic concepts of Absorption and Emission in semiconductor, Construction and Operating Principle of LED, Construction and	20%	10

	Operating Principles of Semiconductor LASER Diode, Photo-detectors - pin-diodes, optical receivers. Optical link design - BER calculation, quantum limit		
4	**Optical Components and Optical Amplifier** Optical couplers and isolators: types and functions, Optical switches, Beam splitter, Optical multiplexer and demultiplexer, Optical Amplifiers-Semiconductor optical amplifier	**20%**	**8**
5	**Characterization & Applications** fiber parameters measurement: attenuation, inter modal dispersion, Optical power meter, WDM and DWDM systems, Fiber Sensors, Application of Different Lasers	**15%**	**6**

i. Text Book and Reference Book:

1. Optical fiber communications., . By ,by Keiser G | McGraw-Hill
2. Optical fibres telecommunications By S.E. Miller and A.G. Chynoweth
3. Optical fiber communications By Senior J | Principles and Practice, PHI

(10)

a) Course Name: Optical Communication Networking Lab
b) Course Code: 03608338
C) prerequisite: Knowledge of communication and Laser
d) rationale: To introduce the students to various optical fiber modes, configurations and various signal degradation factors associated with optical fiber and to study about various optical sources and optical detectors and their use in the optical communication system, optical amplifiers, fiber network elements, basic optical components, and techniques of fiber optic measurement

e) course Learning Objective:

CLOBJ 1	- explore the basics of light propagation in optical fibers - Learn about the general optical fiber communication system - Explore the advantages of optical fiber communications - Gain knowledge about fundamental laws of optics including refraction, Snell's law, critical angle, and total internal reflection - Illustrate ray propagation in step index fiber - Learn about numerical aperture, acceptance angle, skew rays, meridional rays, phase velocity, and group velocity - Gain insight into modes in optical fibers- Explore different types of losses in optical fibers including attenuation, absorption, scattering, and linear scattering losses

CLOBJ 2	- Learn about different types of optical fibers - Examine modal analysis of a step index fiber - Explore the need for cabling in fiber optic communication systems - Gain knowledge about fiber optic cable types such as slotted core, loose tube, and multi-fiber ribbon - differentiate fiber modes and the differences between step index fibers and graded index fibers - Learn about single mode fibers including cut-off wavelength, absorption, scattering, and bending losses - Explore core and cladding losses in optical fibers
CLOBJ 3	- Analyze basic concepts of absorption and emission in semiconductors - Learn about the construction and operating principles of Light Emitting Diodes (LEDs) - Gain knowledge about the construction and operating principles of Semiconductor LASER Diodes - extract photo-detectors such as pin-diodes and optical receivers - Learn about optical link design and Bit Error Rate (BER) calculation - Gain an Knowledge of the quantum limit in optical communication systems
CLOBJ 4	- Learn about optical couplers, isolators, switches, beam splitters, multiplexers, and demultiplexers - Explore the functions and types of optical amplifiers, including Semiconductor Optical Amplifiers (SOAs)
CLOBJ 5	- Gain knowledge about fiber parameters measurement including attenuation, intermodal dispersion, and optical power -Extract the use of optical power meters - Learn about Wavelength Division Multiplexing (WDM) and Dense Wavelength Division Multiplexing (DWDM) systems - Explore fiber sensors and applications of different types of lasers in various fields

f) course Learning Outcome:

CLO 1	Interpret the principles of fiber-optic communication, the components and the bandwidth advantages.
CLO 2	Classify the properties of the optical fibers and optical components.
CLO 3	extract operation of lasers, LEDs, and detectors
CLO 4	Analyze system performance of optical communication systems
CLO 5	Design optical networks and gain knowledge about non-linear effects in optical fibers

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**30**	**-**	**20**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Mapping of Experiment List with Course Learning Outcomes

Exp. No.	Name of the Experiment
1	To establish analog link using Optical Fiber
2	To establish voice link using optical fiber.
3	To measure Propagation Loss in Optical Fiber.
4	To measure Bending Loss in Optical Fiber.
5	To measure Numerical Aperture in Optical Fiber.
6	To study Time Division Multiplexing of signals using Optical Fiber
7	To study Framing in Time Division Multiplexing using optical fiber link.
8	To study the characteristics of Optical Source and Photo Detector
9	To study splicing & connecterization
10	To Study eye pattern measurement

Semester 6

(1)

a. **Course Name:** Indian Constitution
b. **Course Code:** 03600351
c. **Prerequisite:** Zeal to learn Subject
d. **Rationale:** The course aims to give brief knowledge of Indian Constitution and administration of different bodies of India. To make governance better an engineer must conduce to E-governance through computers and knowledge of cyber laws. An engineer must know the limits of state action and regulations by acquainting himself with the laws that applied by the bureaucrats. Since an engineer works at different places and sights, he must have the basic knowledge of centre -state relations with reference to policy of financing the key projects. The knowledge of Constitution is necessary for him in order to ensure that the rules and regulations under which public and private sector works, do not violate the provisions of the Constitution. Knowledge of corporate culture is necessary for him. He must understand the compulsions of the public private partnership and philosophy of state ownership of key industries.

e. Course Learning Objective:

CLOBJ 1	extract the historical context and significance of the Indian Constitution, including the Preamble and its interpretation.
CLOBJ 2	Comprehend the structure and roles of the Union Government, including the President, Prime Minister, and Parliament.
CLOBJ 3	Gain insight into the functions and powers of State Governments, including the roles of Governors, Chief Ministers, and State Legislatures.
CLOBJ 4	Familiarize with the structure and functions of local administration, including District Administration, Municipal Corporations, and Zila Panchayats.
CLOBJ 5	Interpret the role and functioning of the Election Commission, including the Chief Election Commissioner and State Election Commissions, in conducting free and fair elections in India.

f. Course Learning Outcomes:

CLO 1	Illustrate the Constitution.
CLO 2	Ability to analyze, Union Government State Government , Local Administration and Election Commission.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**-**	**20**	**20**	**-**	**-**	**-**	**40**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
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.	**25%**	**7**
2	**UNION GOVERNMENT:** Structure of the Indian Union, President -Role and Power, Prime Minister and Council of Ministers, Lok Sabha and Rajya Sabha	**20%**	**5**

3	**STATE GOVERNMENT:** Governor -Role and Power, Chief Minister and Council of Ministers, State Secretariat.	**20%**	**4**
4	**LOCAL ADMINISTRATION:** District Administration, Municipal Corporation, Zila Panchayat	**15%**	**4**
5	**ELECTION COMMISSION:** Role and Functioning, Chief Election Commissioner, State Election Commission	**20%**	**4**

i. Text Book and Reference Book:

1. An Introduction to the Constitution of India D.D. Basu; Prentice Hall, New Delhi
2. An Introduction to the Constitution of India M. V. Pylee; Vikas New Delhi

(2)

a. Course Name: Computer Networking and Data Communication

b. Course Code: 03608351

c. Prerequisite: Knowledge of Basic Communication System

d. Rationale: Computers and computer networks are the sole of the present telecommunication system. Advanced digital communication system is based on the computer networks. Now a days every organization, industry or the service sector own their private computer networks. Therefore in every organization, the maintenance of the computer networks becomes one of the essential jobs of a diploma electronics engineer too. This course is therefore designed to help the Electronics and Communication diploma holders to develop this competency.

e. Course Learning Objective:

CLOBJ 1	- Illustrate the need for computer networks and their advantages in various domains such as business, industrial, and home applications. Identify and differentiate between hardware and software components of computer networks. Explore different network topologies including star, ring, bus, mesh, tree, and hybrid configurations. - Classify networks based on transmission technologies (point-to-point, broadcast), scale (PAN, LAN, WAN, MAN, VPN, Internet), and architecture (peer-to-peer, client-server).
CLOBJ 2	- Extract the concepts and processes involved in digital-to-digital, analog-to-digital, and digital-to-analog conversions. Explore various line coding techniques such as unipolar, polar, and bipolar encoding. Examine block coding methods used in digital transmission and sampling, quantization, and encoding in analog transmission. - Differentiate between transmission modes including simplex, half-duplex, and full-duplex.

CLOBJ 3	- Define key terms like protocol, interface, services, primitives, semantics, and syntax. - Classify the OSI-ISO reference model and its seven layers, along with associated protocols. - Explore the TCP/IP reference model and its four layers, along with corresponding protocols.
CLOBJ 4	- Differentiate between guided (wired) and unguided (wireless) transmission media. - Explore various types of transmission media including UTP, coaxial, and fiber optic cables. - Identify physical layer interfaces, connectors, signals, and line coding techniques. - Interpret the functions and roles of network devices such as repeaters, hubs, bridges, switches, routers, gateways, network adapters, and access points.
CLOBJ 5	Extract the basics of IP protocols (IPv4, IPv6), addressing schemes, subnetting, and masking. - Explore network applications like DNS, email, FTP, and HTTP, and their roles in communication.

f. Course Learning Outcomes:

CLO 1	Identify computer network on the basis of various network parameters.
CLO 2	Identify OSI-ISO and TCP/IP computer network models.
CLO 3	Select guided and unguided medium for various types of data transmission.
CLO 4	Assign IP address to the network and network component as per the networks
CLO 5	Maintain protection schemes for power systems against overvoltages. Install various types of modems and other network hardware.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Network Fundamentals** Need and Advantages of Computer Networks, Applications of computer networks: Business, Industrial and home applications, Components of Computer Networks: hardware and software, Network topologies: Star, Ring, Bus, Mesh, Tree, Hybrid, Network Classification i. Based on Transmission Technologies: Point-to point, broadcast ii. Based on scale: PAN LAN, WAN, MAN, VPN, and Internet iii. Based on Architecture: Peer to Peer, Client Server, advantages of Client Sever over Peer-to-Peer Model	**15%**	**10**
2	**Digital & Analog Transmission** Digital Transmission ′Digital to Digital Conversion, Line Coding, Unipolar Encoding, Polar Encoding, Bipolar Encoding, block Coding Analog Transmission - Analog-to-Digital Conversion, Digital to analog Conversion, Analog to Analog Conversion. Sampling, Quantization, Encoding, Transmission Modes.	**25%**	**12**
3	**Reference Model Terms:** Protocol, Interface, Services, Primitives, semantics, syntax, The OSI-ISO Reference Model: Brief functional description of each layers with list of protocols, The TCP/IP Reference Model: Brief functional description of each of the Layer with list of protocols.	**25%**	**10**
4	**Network Media and Hardware Transmission Media:** Unguided and Guided media, Wired and Wireless, UTP, Coaxial and Fiber optical cable, Physical Layer Interfaces: Types of Connectors and Signals, Line coding and Line coded signal, Network devices: Repeater, Hub, Bridge, Switch , Router, B-router, Gateway, Network Adapter, Access point, Wireless Access points.	**25%**	**10**
5	**IP Protocol and Network Applications** IP Protocol ′IP v4, IP v6., Addressing Schemes, Subnet & masking, DNS , Email, FTP, HTTP	**10%**	**8**

i. Text Book and Reference Book:

1. **Data Communications and Networking** By B. A. Forouzan | Tata McGraw Hill | 4th Edition.
2. **Computer Networks** By Tannebaum AndrewS Wetherall David J. | Pearson, New

Delhi
3. **Data and computer communications** By William Stallings | Prentice Hall
4. **Data Communication Networks** By Sharma Sanjay

(3)

a. **Course Name:** Computer Networking and Data Communication Lab
b. **Course Code:** 03608352
c. **Prerequisite:** Knowledge of Basic Communication System
d. **Rationale:** Computers and computer networks are the sole of the present telecommunication system. Advanced digital communication system is based on the computer networks. Now a days every organization, industry or the service sector own their private computer networks. Therefore in every organization, the maintenance of the computer networks becomes one of the essential jobs of a diploma electronics engineer too. This course is therefore designed to help the Electronics and Communication diploma holders to develop this competency.

e. **Course Learning Objective:**

CLOBJ 1	- Illustrate the need for computer networks and their advantages in various domains such as business, industrial, and home applications. Identify and differentiate between hardware and software components of computer networks. Explore different network topologies including star, ring, bus, mesh, tree, and hybrid configurations. - Classify networks based on transmission technologies (point-to-point, broadcast), scale (PAN, LAN, WAN, MAN, VPN, Internet), and architecture (peer-to-peer, client-server).
CLOBJ 2	- Extract the concepts and processes involved in digital-to-digital, analog-to-digital, and digital-to-analog conversions. Explore various line coding techniques such as unipolar, polar, and bipolar encoding. Examine block coding methods used in digital transmission and sampling, quantization, and encoding in analog transmission. - Differentiate between transmission modes including simplex, half-duplex, and full-duplex.
CLOBJ 3	- Define key terms like protocol, interface, services, primitives, semantics, and syntax. - Classify the OSI-ISO reference model and its seven layers, along with associated protocols. - Explore the TCP/IP reference model and its four layers, along with corresponding protocols.
CLOBJ 4	- Differentiate between guided (wired) and unguided (wireless) transmission media. - Explore various types of transmission media including UTP, coaxial, and fiber optic cables. - Identify physical layer interfaces, connectors, signals, and line coding techniques. - Interpret the functions and roles of network devices

	such as repeaters, hubs, bridges, switches, routers, gateways, network adapters, and access points.
CLOBJ 5	Extract the basics of IP protocols (IPv4, IPv6), addressing schemes, subnetting, and masking. - Explore network applications like DNS, email, FTP, and HTTP, and their roles in communication.

f. Course Learning Outcomes:

CLO 1	Identify computer network on the basis of various network parameters.
CLO 2	Identify OSI-ISO and TCP/IP computer network models.
CLO 3	Select guided and unguided medium for various types of data transmission.
CLO 4	Assign IP address to the network and network component as per the networks
CLO 5	Maintain protection schemes for power systems against overvoltages. Install various types of modems and other network hardware.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**30**	**-**	**20**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Mapping of Experiment List with Course Learning Outcomes:

Sr. NO.	**Experiment List**
1	To study the different physical equipment used for networking
2	Study the different internetworking devices in a computer network
3	Study the working of basic networking commands study PC to PC communication using parallel port
4	Study of LAN in Star Topology

5	Study of LAN in Bus Topology
6	Study of LAN in Tree Topology
7	Study and configuration of modem of computer
8	Study of wireless communication
9	Studying PC Communication using LAN

(4)

a. **Course Name:** VLSI
b. **Course Code:** 03608353
c. **Prerequisite:** Knowledge of Basic Electronics
d. **Rationale:** Digital integrated circuits are integral part of electronic equipment/gadgets starting from small toys to complex computer systems including personal digital assistants, mobile phones and Multimedia agents. This course will enable the students to acquire the basic skills to develop codes for VLSI circuits through VHDL programming. This course will also enable them to use FPGA and ASIC chips for design and development of various applications. Thus this course is an advance but very useful course for electronic engineers.

e. **Course Learning Objective:**

CLOBJ 1	- Illustrate VLSI design methodology and the VLSI design flow. - Explore the concepts of design hierarchy, regularity, modularity, and locality in VLSI design. - Analyze different design styles used in VLSI and identify important criteria for designing high-quality VLSI chips.
CLOBJ 2	Learn about the MOS structure and its behavior under external bias. - interpret the structure and operation of MOSFETs along with their current-voltage characteristics. - Explore MOSFET scaling, small geometry effects, and capacitance. Define various delay times associated with CMOS circuits and analyze switching power dissipation in CMOS inverters.
CLOBJ 3	- extract the basics of combinational circuits and their design using MOS logic and CMOS logic. - Learn about complex logic gates including NMOS depletion load complex logic gates, CMOS complex logic gates, and CMOS XOR gate. - Explore advanced logic gates like AOI and OAI gates, as well as pseudo-NMOS gates.

CLOBJ 4	- Gain knowledge about sequential circuits and the behavior of bistable elements. - Study different types of latches including SR latch based on depletion load NMOS, SR latch based on NOR and NAND gates, and clocked latch. - Learn about flip-flops and their operation in sequential circuits.
CLOBJ 5	- illustarte the basics of VHDL including its overview, design flow, and code structure. Explore different VHDL coding styles and extract the concepts of signals, variables, and data types in VHDL programming. - Gain proficiency in writing VHDL programs for designing digital circuits.

f. Course Learning Outcomes:

CLO 1	Maintain MOS based systems
CLO 2	Maintain MOS inverters
CLO 3	Maintain MOS circuits
CLO 4	Develop VHDL Programs related to Combinational circuits
CLO 5	Develop VHDL Programs related to Sequential circuits

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction to VLSI** VLSI design methodology, VLSI design flow, Concept of design Hierarchy, Concept of Regularity, Modularity and Locality , Design style of VLSI , Important criteria for design quality of VLSI chip	**15%**	**6**
2	**MOS transistor and Inverter** Introduction of MOS structure , MOS System under External Bias, Structure &	**25%**	**10**

	Operation of MOSFET , MOSFET Current -Voltage characteristics , MOSFET scaling and small geometry effects, MOSFET capacitance , Introduction of MOS Inverter , Resistance load inverter , Enhanced load NMOS inverter , Depletion load NMOS inverter , CMOS inverter , Definitions of different Delay times, CMOS Ring Oscillator Circuit, Switching power dissipation on CMOS Inverter		
3	**Combinational Circuits** Basic of Combination circuit, MOS logic circuits with depletion NMOS load, CMOS logic circuits , Complex logic circuits ΄NMOS depletion load complex logic gate , Complex CMOS logic Gates , CMOS XOR Gate , AOI and OAI gates , Pseudo-NMOS gates	**25%**	**10**
4	**Sequential circuits** Basic of Sequential circuits , Behavior of Bistable Element , SR latch ΄Depletion load NMOS SR Latch based on NOR , SR Latch based on NAND gate , Clocked Latch and flip flop	**20%**	**8**
5	**Introduction of VHDL and its Programming** Overview of VHDL , Design flow , VHDL Code structure , VHDL coding styles , Signal and Variables , Data types , VHDL programs	**15%**	**10**

i. Text Book and Reference Book:

1. **Introduction to VLSI Circuits & Systems** By John P. Uyemura
2. **Introduction to VLSI Systems** By Mead C and Conway | Addison Wesley
3. **Principles Of CMOS VLSI Design** By Neil H. E. Weste and David Harris | Pearson

(5)

a. Course Name: VLSI lab
b. Course Code: 03608354
c. Prerequisite: Knowledge of Basic Electronics
d. Rationale: Digital integrated circuits are integral part of electronic equipment/gadgets starting from small toys to complex computer systems including personal digital assistants, mobile phones and Multimedia agents. This course will enable the students to acquire the basic skills to develop codes for VLSI circuits through VHDL programming. This course will also enable them to use FPGA and ASIC chips for design and development of various applications. Thus this course is an advance but very useful course for electronic engineers.

e. Course Learning Objective:

CLOBJ 1	- Illustrate VLSI design methodology and the VLSI design flow. - Explore the concepts of design hierarchy, regularity, modularity, and locality in VLSI design. - Analyze different design styles used in VLSI and identify important criteria for designing high-quality VLSI chips.
CLOBJ 2	Learn about the MOS structure and its behavior under external bias. - interpret the structure and operation of MOSFETs along with their current-voltage characteristics. - Explore MOSFET scaling, small geometry effects, and capacitance. Define various delay times associated with CMOS circuits and analyze switching power dissipation in CMOS inverters.
CLOBJ 3	- extract the basics of combinational circuits and their design using MOS logic and CMOS logic. - Learn about complex logic gates including NMOS depletion load complex logic gates, CMOS complex logic gates, and CMOS XOR gate. - Explore advanced logic gates like AOI and OAI gates, as well as pseudo-NMOS gates.
CLOBJ 4	- Gain knowledge about sequential circuits and the behavior of bistable elements. - Study different types of latches including SR latch based on depletion load NMOS, SR latch based on NOR and NAND gates, and clocked latch. - Learn about flip-flops and their operation in sequential circuits.
CLOBJ 5	- illustarte the basics of VHDL including its overview, design flow, and code structure. Explore different VHDL coding styles and extract the concepts of signals, variables, and data types in VHDL programming. - Gain proficiency in writing VHDL programs for designing digital circuits.

f. Course Learning Outcomes:

CLO 1	Maintain MOS based systems
CLO 2	Maintain MOS inverters
CLO 3	Maintain MOS circuits
CLO 4	Develop VHDL Programs related to Combinational circuits
CLO 5	Develop VHDL Programs related to Sequential circuits

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**		
L	**T**	**P**	**C**	**Internal Evaluation**	**ESE**	**Total**

				MSE	CE	P	Theory	P	
-	-	2	1	-	-	30	-	20	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

j. Mapping of Experiment List with Course Learning Outcomes:

Sr. NO.	Experiment List
1	Identify VHDL entities and coding styles
2	Simulate the Basic logic gates using VHDL
3	Simulate the Universal logic gates using VHDL
4	Simulate the Universal logic gates using VHDL
5	Simulate Half Adder using VHDL
6	Simulate Half Subtractor using VHDL
7	Simulate Full Subtractor using VHDL
8	Simulate 1 : 4 de-mux using VHDL
9	Simulate 3 : 8 decoder using VHDL
10	Simulate SR flip-flops using VHDL
11.	Simulate 4 bit Up counter using VHDL

(6)

a. Course Name: Signal and Systems
b. Course Code: 03608355
c. Prerequisite: Inclination to learn mathematics, basic knowledge of differential equations and difference equations, electrical circuits and networks.

d. Rationale: : The course will provide a strong foundation on signals and systems which will be useful for creating the foundation of communication and signal processing. The students will learn basic continuous time and discrete time signals and systems. Students will eleborate the application of various transforms for analysis of signals and systems both continuous time and discrete time. Students will also explore power and energy signals and spectrum.

e. Course Learning Objective:

CLOBJ 1	Define fundamental concepts in signals and systems. - Classify signals and systems based on various criteria. - Explore operations and properties of signals including basic continuous time signals, signal sampling, quantization, discretization, and representation of digital signals. - extract basic system properties and methods for representing digital signals
CLOBJ 2	- gain knowledge of impulse response characterization and convolution integral for continuous-time linear time-invariant (CT-LTI) systems. - Analyze signal responses to CT-LTI systems and properties of convolution. - Investigate the impulse response characterization, convolution sum, and properties of discrete-time linear time-invariant (DT-LTI) systems. - Explore the causal signal response to DT-LTI systems and properties of convolution summation.
CLOBJ 3	- Learn about the representation of periodic functions using Fourier series.- extract the frequency spectrum of aperiodic signals and the concept of Fourier Transform. - Explore the relationship between Laplace Transform and Fourier Transform along with their properties. -
CLOBJ 4	Introduction to Discrete-Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT).
CLOBJ 5	illustrate the concept of the z-Transform and its convergence. Learn about basic z-Transform operations and their properties. Analyze inverse z-Transform and methods for solving difference equations using z-Transform.

f. Course Learning Outcomes:

CLO 1	Classify about various types of signals, classify them, analyze them, and perform various operations on them.
CLO 2	Classification of various types of systems, classify them, analyze them and extract their response behavior
CLO 3	Appreciate use of transforms in analysis of signals and system.

CLO 4	Carry simulation on signals and systems for observing effects of applying various properties and operations.
CLO 5	Create strong foundation of communication and signal processing to be studied in the subsequent Semester

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	-	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Signals and systems** Basic definitions, Classification of signals and systems, Signal operations and properties. Basic continuous time signals, signal sampling and quantization, discretization of continuous time signals, discrete time signals. Basic system properties, Representation of digital signals.	25%	10
2	**Mathematical operations on Signals and Systems** Impulse response characterization and convolution integral for CT- LTI system, signal responses to CT-LTI system, properties of convolution, LTI system response properties from impulse response.	25%	8
3	**Introduction of Impulse Response** Impulse response characterization and convolution sum, Causal signal response to DT-LTI systems. Properties of convolution summation,Impulse response of DT-LTI system.	20%	8
4	**Analysis of discrete time signals** Representation of periodic functions, Fourier series, Frequency spectrum of aperiodic signals, Fourier Transform, Relation between Laplace Transform and Fourier Transform and its properties. Introduction to DTFT and DFT	20%	8

5	**Analysis of Z-Transform** The z-Transform, Convergence of z-Transform, Basic z-Transform, Properties of z-Transform, Inverse z-Transform and Solving difference equation using z-Transform	**10%**	**6**

i. **Text Book and Reference Book:**
   1. **Signals and Systems** By K. Gopalan | Cengage Learning (India Edition)
   2. **Signals and Systems** By Michal J. Roberts and Govind Sharma | Tata Mc-Graw Hill Publications
   3. **Signals and Systems** By Simon Haykin and Bary Van Veen | Wiley

(7)

a. **Course Name:** Signal and Systems lab
b. **Course Code:** 03608356
c. **Prerequisite:** Inclination to learn mathematics, basic knowledge of differential equations and difference equations, electrical circuits and networks.
d. **Rationale:** : The course will provide a strong foundation on signals and systems which will be useful for creating the foundation of communication and signal processing. The students will learn basic continuous time and discrete time signals and systems. Students will understand the application of various transforms for analysis of signals and systems both continuous time and discrete time. Students will also explore power and energy signals and spectrum.

e. **Course Learning Objective:**

CLOBJ 1	Define fundamental concepts in signals and systems. - Classify signals and systems based on various criteria. - Explore operations and properties of signals including basic continuous time signals, signal sampling, quantization, discretization, and representation of digital signals. - extract basic system properties and methods for representing digital signals
CLOBJ 2	- gain knowledge of impulse response characterization and convolution integral for continuous-time linear time-invariant (CT-LTI) systems. - Analyze signal responses to CT-LTI systems and properties of convolution. - Investigate the impulse response characterization, convolution sum, and properties of discrete-time linear time-invariant (DT-LTI) systems. - Explore the causal signal response to DT-LTI systems and properties of convolution summation.

CLOBJ 3	- Learn about the representation of periodic functions using Fourier series.- extract the frequency spectrum of aperiodic signals and the concept of Fourier Transform. - Explore the relationship between Laplace Transform and Fourier Transform along with their properties. -
CLOBJ 4	Introduction to Discrete-Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT).
CLOBJ 5	illustrate the concept of the z-Transform and its convergence. Learn about basic z-Transform operations and their properties. Analyze inverse z-Transform and methods for solving difference equations using z-Transform.

f. Course Learning Outcomes:

CLO 1	Classify about various types of signals, classify them, analyze them, and perform various operations on them.
CLO 2	Classification of various types of systems, classify them, analyze them and extract their response behavior
CLO 3	Appreciate use of transforms in analysis of signals and systems.
CLO 4	Carry simulation on signals and systems for observing effects of applying various properties and operations.
CLO 5	Create strong foundation of communication and signal processing to be studied in the subsequent Semester

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

h. Mapping of Experiment List with Course Learning Outcomes:

Sr. No.	**Experiment List**
1	Generation of continuous time signals

2	Transformation of signals into time and frequency domains.
3	Generating standard test signals i.e., step, ramp, unit impulse on a simulator
4	To performs functions on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
5	Using digital circuit building block to perform operations on signals.
6	Simulation of continuous time LTI system
7	Simulation of discrete time LTI systems.
8	Obtaining impulse response of the systems.
9	Computing FT and DTFT of the CT signals and DT sequences.
10	To perform waveform synthesis using Laplace Transform of a given signal

(8)

a. **Course Name:** Major Project-II
b. **Course Code:** 03608360
c. **Prerequisite:** Basic Knowledge of Mathematics and computer.
d. **Rationale:** The course provides a gentle introduction to the MATLAB computing environment, and is intended for beginning users and those looking for a review. It is designed to give students a basic understanding of MATLAB, including toolboxes.

e. **Course Learning Objective:**

CLOBJ 1	Develop the ability to apply theoretical knowledge effectively in practical settings, demonstrating proficiency in transforming theoretical concepts into real-world applications.
CLOBJ 2	Foster and enhance innovative thinking and problem-solving skills, encouraging students to explore creative solutions and novel approaches to challenges encountered in their field of study.
CLOBJ 3	Cultivate a sense of curiosity and enthusiasm for learning, promoting active engagement in academic pursuits and fostering a passion for continuous self-improvement and exploration of new ideas.

CLOBJ 4	Enhance leadership and teamwork abilities, equipping students with the skills necessary to lead and collaborate effectively in group settings, while also developing strategies for solving complex problems through collective effort and cooperation.

f. Course Learning Outcomes:

CLO 1	Makes Transformation of Theoretical Knowledge and its Applications.
CLO 2	Improves Innovative Spirit.
CLO 3	Boosts Curiosity and Liking for Studies.
CLO 4	Improves Team Leading and Problem-Solving Skills.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**12**	**6**	**-**	**-**	**60**	**-**	**40**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

(9)

a. **Course Name:** Artificial Intelligence
b. **Course Code:** 03606281
c. **Prerequisite:** Proficiency in programming languages is essential. Python is widely used in the AI community due to its simplicity and extensive libraries for AI development.
d. **Rationale:** The rationale behind artificial intelligence (AI) lies in its potential to revolutionize various aspects of human life and industry.

e. Course Learning Objective:

CLOBJ 1	Recall the fundamental concepts of artificial intelligence, such as machine learning, neural networks, and natural language processing.
CLOBJ 2	Explain the principles underlying AI technologies, including how machine learning models are trained and evaluated.
CLOBJ 3	Apply AI algorithms and techniques to solve specific problems, such as image classification, sentiment analysis, or predictive modeling.
CLOBJ 4	Evaluate different AI approaches and algorithms based on their performance, scalability, and suitability for specific tasks.
CLOBJ 5	Critique research papers and case studies related to AI, assessing the strengths and weaknesses of the proposed methods and findings.

f. Course Learning Outcomes:

CLO 1	Define artificial intelligence and explain its significance in modern technology and society.
CLO 2	Identify and describe key subfields and techniques within AI, such as machine learning, neural networks, and natural language processing.
CLO 3	Explore real-world applications of AI in different domains, such as healthcare, finance, and autonomous systems.
CLO 4	Evaluate the ethical, social, and legal implications of AI technologies, including issues related to bias, privacy, and transparency.
CLO 5	Demonstrate basic proficiency in programming languages and tools commonly used in AI development, such as Python, TensorFlow, or PyTorch.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction:** Overview and Historical Perspective, • Artificial Intelligence (AI) definition, Goals of AI, History of AI, Applications of AI, Agents, Difference between human intelligence vs. artificial intelligence	**10**	**6**
2	**Agents and Environments:**Agent Terminology, Types of Agents – Simple Reflex Agents, Model Based Reflex Agents, Goal Based Agents, Nature of Environments, Properties of Environments	**25**	**10**
3	**Search Algorithms:**Terminology, Brute Force Search Strategies – Breadth First Search, Depth First Search. Heuristic Search Strategies, Local Search Algorithms.	**25**	**10**
4	**Fuzzy Logic Systems:** Introduction to Fuzzy Logic and Fuzzy systems, Membership functions, Fuzzification, Defuzzification	**20**	**8**
5	**Neural Networks:**Basic structure of Neural Networks, Neural Network Elements, Perceptron, Back-propagation, Application of neural network	**20**	**8**

i. Text Book and Reference Book:

1. **Artificial Intelligence** By Elaine Rich And Kevin Knight | Tata Mcgraw-Hill
2. **Artificial Intelligence :**A Modern Approach By Stuart J. Russell and Peter Norvig | PEARSON EDUCATION LIMITED