KURUKSHETRA UNIVERSITY KURUKSHETRA

Bachelor of Technology (Electrical & Electronics Engineering) (Credit Based)

Scheme of Studies/Examination

Semester III (w.e.f. session 2019-2020)

Sr. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	***EE-201A**	**Electrical Circuit Analysis**	3:1:0	4	4	75	25	0	100	3
2	BS-201A	Optics & Waves	3:0:0	3	3	75	25	0	100	3
3	***EE-205A**	**Electrical Machines - I**	3:1:0	4	4	75	25	0	100	3
4	EEN-205A	Analog Electronics	3:0:0	3	3	75	25	0	100	3
5	EEN -209A	Signals and Systems	3:1:0	4	4	75	25	0	100	3
6	***EE-211A**	**Electrical Machines Lab – I**	0:0:2	2	1	-	40	60	100	3
7	EEN -207A	Analog Electronics Lab	0:0:2	2	1	-	40	60	100	3
8	EEN -211A	Signal and Systems Lab	0:0:2	2	1	-	40	60	100	3
9	**EEN-215A	Industrial Training-I	2:0:0	2	-	-	100	-	100	3
10	***MC-901A	Environmental Sciences	3:0:0	3	-	100	-	0	100	3
		Total		**29**	**21**	**375**	**245**	**180**	**800**	

* Subjects Common with III Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

**EEN-215A is a mandatory credit-less course in which the students will be evaluated for the industrial training undergone after 2nd semester and students will be required to get passing marks to qualify.

***MC-901A is a mandatory credit-less course in which the students will be required to get passing marks in the major test.

KURUKSHETRA UNIVERSITY KURUKSHETRA

Bachelor of Technology (Electrical & Electronics Engineering) (Credit Based)

Scheme of Studies/Examination

Semester IV (w.e.f. session 2019-2020)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	BS-204A	Higher Engineering Mathematics	3:0:0	3	3	75	25	0	100	3
2	HM-903A	Soft Skills & Interpersonal Communication	3:0:0	3	3	75	25	0	100	3
3	***EE- 206A**	**Electrical Machines – II**	3:1:0	4	4	75	25	0	100	3
4	***EE-208A**	**Power Electronics**	3:0:0	3	3	75	25	0	100	3
5	EEN-210A	Digital Electronics	3:0:0	3	3	75	25	0	100	3
6	EEN -202A	Basics of Analog Communication	3:0:0	3	3	75	25	0	100	3
7	***EE-214A**	**Electrical Machines Lab - II**	0:0:2	2	1	-	40	60	100	3
8	***EE-216A**	**Power Electronics Lab**	0:0:2	2	1	0	40	60	100	3
9	EEN-218A	Digital Electronics Lab	0:0:2	2	1	-	40	60	100	3
10	**MC-902A	Constitution of India	3:0:0	3	-	100	-	0	100	3
		Total		**28**	**22**	**450**	**270**	**180**	**900**	

* Subjects Common with IVth Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

**MC-202A is a mandatory credit-less course in which the students will be required to get passing marks in the major test.

Note: All the students have to undergo 4 to 6 weeks Industrial Training after 4th semester which will be evaluated in 5th semester.

KURUKSHETRA UNIVERSITY KURUKSHETRA

Bachelor of Technology (Electrical & Electronics Engineering) (Credit Based)
Scheme of Studies/Examination
Semester V (w.e.f. session 2020-2021)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	***EE-301A**	**Power Systems – I**	3:1:0	4	4	75	25	0	100	3
2	***EE-305A**	**Control Systems**	3:1:0	4	4	75	25	0	100	3
3	EENP**	Program Elective - I	3:0:0	3	3	75	25	0	100	3
4	***EE-309A**	**Microprocessors**	3:0:0	3	3	75	25	0	100	3
5	EENO**	Open Elective - I	3:0:0	3	3	75	25	0	100	3
6	***EE-313A**	**Power Systems Lab - I**	0:0:2	2	1	-	40	60	100	3
7	***EE-315A**	**Microprocessors Lab**	0:0:2	2	1	0	40	60	100	3
8	***EE-317A**	**Control Systems Lab**	0:0:2	2	1	0	40	60	100	3
9	***EEN-319A	Industrial Training-II	2:0:0	2	-	-	*100	-	*100	3
10	****MC-903A	Essence of Indian Traditional Knowledge	3:0:0	3	-	100	-	0	100	3
		Total		**28**	**20**	**375**	**245**	**180**	**800**	

* Subjects Common with Vth Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

****The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

***EEN-319A is a mandatory credit-less course in which the students will be evaluated for the industrial training undergone after 4th semester and students will be required to get passing marks to qualify.

****MC-903A is a mandatory credit-less course in which the students will be required to get passing marks in the major test.

Course No.	Program Elective I
EENP-301A	Digital Signal Processing
EENP-303A	Electrical Machine Design
EENP-305A	Electromagnetic Field Theory
EENP-307A	Computer Architecture

Course No.	Open Elective I
EENO-301A	Computer Networks
EENO-303A	Big Data Analysis
EENO-305A	VLSI Circuits
EENO-307A	Power Plant Engineering

KURUKSHETRA UNIVERSITY KURUKSHETRA

Bachelor of Technology (Electrical & Electronics Engineering) (Credit Based)
Scheme of Studies/Examination
Semester VI (w.e.f. session 2020-2021)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	***EE-302A**	**Power Systems – II**	3:1:0	4	4	75	25	0	100	3
2	HM-901A	Organizational Behavior	3:0:0	3	3	75	25	0	100	3
3	EENP**	Program Elective - II	3:0:0	3	3	75	25	0	100	3
4	EENO**	Open Elective - II	3:0:0	3	3	75	25	0	100	3
5	***EE-310A**	**Electrical Measurements and Measuring Instrumentation**	3:0:0	3	3	75	25	0	100	3
6	***EE-312A**	**Power Systems Lab - II**	0:0:2	2	1	-	40	60	100	3
7	***EE-314A**	**Measurements and Instrumentation Lab**	0:0:2	2	1	-	40	60	100	3
8	EEN-316A	Electronic Design Lab	0:0:4	4	2	-	40	60	100	3
		Total		**24**	**20**	**375**	**245**	**180**	**800**	

* Subjects Common with VIth Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

**** The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section. Note: All the students have to undergo 4 to 6 weeks Industrial Training after 6th semester which will be evaluated in 7th semester.**

Course No.	Program Elective II
EENP-302A	Power System Protection
EENP-304A	Electrical Energy Conservation and Auditing
EENP-306A	Electromagnetic Waves and Lines
EENP-308A	Biomedical Signal & Image Processing

Course No.	Open Elective II
EENO-302A	Electrical Materials
EENO-304A	Strength of Materials
EENO-306A	Modern Manufacturing Processes
EENO-308A	Internet of Things

KURUKSHETRA UNIVERSITYKURUKSHETRA

BachelorofTechnology(Electrical & ElectronicsEngineering)(CreditBased)
Scheme of Studies/Examination
SemesterVII(w.e.f.session2021-2022)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	HM- 904A	IntellectualPropertyRightsfor Technology Development& Management	3:0:0	3	3	75	25	0	100	3
2	EENP*	Program Elective - III	3:0:0	3	3	75	25	0	100	3
3	EENP*	Program Elective - IV	3:0:0	3	3	75	25	0	100	3
4	EENO*	Open Elective - III	3:0:0	3	3	75	25	0	100	3
5	EEN-401LA	Project Stage-I	0:0:6	3	3	-	40	60	100	3
6	**EEN-403A	Industrial Training-III	2:0:0	2	-	-	*100	-	*100	3
		Total		**17**	**15**	**300**	**140**	**60**	**500**	

***Thecourseofboth ProgramElective andOpenElective willbeofferedat1/3rd strengthor20students(whichever issmaller)ofthesection.**

**EEN-403A is a mandatory credit-less course in which the students will be evaluated for the industrial training undergone after 6th semester and students will be required to get passing marks to qualify.

Program Elective-III	
Course No.	**Course Name**
EENP-401A	Industrial Electrical System
EENP-403A	Digital Control System
EENP-405A	High Voltage Engineering

Program Elective-IV	
Course No.	**Course Name**
EENP-407A	Electric Drives
EENP-409A	Wind and Solar Energy
EENP-411A	Computational Electromagnetic

Open Electives-III	
Course No.	**Course Name**
EENO-401A	Electronic Devices
EENO-403A	Data Structure & Algorithms
EENO-405A	Signal and Image Processing

KURUKSHETRA UNIVERSITYKURUKSHETRA

Bachelor of Technology (Electrical & Electronics Engineering) (Credit Based)
Scheme of Studies/Examination
Semester VIII (w.e.f. session 2021-2022)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam. (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	EENP*	Program Elective-V	3:0:0	3	3	75	25	0	100	3
2	EENP*	Program Elective-VI	3:0:0	3	3	75	25	0	100	3
3	EENO*	Open Elective-IV	3:0:0	3	3	75	25	0	100	3
4	EENO*	Open Elective-V	3:0:0	3	3	75	25	0	100	3
5	EEN-402LA	Project Stage-II	0:0:12	12	6	-	40	60	100	3
		Total		**26**	**20**	**300**	**140**	**60**	**500**	

Program Elective- V		Program Elective-VI	
Course No.	**Course Name**	**Course No.**	**Course Name**
EENP-402A	Power Quality & FACTS	EENP-408A	HVDC Transmission System
EENP-404A	Control System Design	EENP-410A	Power System Dynamics and Control
EENP-406A	Electrical & Hybrid Vehicles	EENP-412A	Advanced Electric Drives

Open Elective- IV		Open Elective-V	
Course No.	**Course Name**	**Course No.**	**Course Name**
EENO-402A	Analog & Digital Communication	EENO-408A	Mobile Communication & Networks
EENO-404A	Wavelets Transform	EENO-410A	Thermal and Fluid Engineering
EENO-406A	Embedded System	EENO-412A	Automobile Engineering

***The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

Cluster –II: Common with B.Tech in (a) ComputerSci. & Engg. (b) Information Technology (c) Electronics & Communication Engg. (d) Electrical Engineering (e) Electrical & Electronics Engineering (f) Electronics Engg.

Bachelor of Technology inElectrical & Electronics Engineering(Credit Based)

KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme of Studies/Examination

Semester I (w.e.f. session 2018-2019)

S.No.	CourseNo./ Code	Subject	L:T:P	Hours/ Week	Credits	ExaminationSchedule(Marks)				Duration of exam(Hours)
						Major Test	MinorTest	Practical	Total	
1A	BS-115A	Semiconductor Physics	3:1:0	4	4	75	25	0	100	3
1B	BS-101A	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105A	ProgrammingforProblemSolving	3:0:0	3	3	75	25	0	100	3
2B	HM-101A	English	2:0:0	2	2	75	25	0	100	3
3	BS-133A	Calculus&LinearAlgebra	3:1:0	4	4	75	25	0	100	3
4A	ES-109A	EngineeringGraphics&Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111LA	ManufacturingProcessesWorkshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141A	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101A	BasicElectricalEngineering	4:1:0	5	5	75	25	0	100	3
6A	BS-117LA	Semiconductor Physics Lab	0:0:3	3	1.5	--	20	30	50	3
6B	BS-103LA	ChemistryLab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107LA	ProgrammingforProblemSolvingLab	0:0:2	2	1	--	20	30	50	3
7B	ES-103LA	BasicElectricalEngineeringLab	0:0:2	2	1	--	20	30	50	3
8A	ES-113LA	EngineeringGraphics&DesignPractice	0:0:3	3	1.5	--	20	30	50	3
8B	HM-103LA	LanguageLab	0:0:2	2	1	--	20	30	50	3
		Total	12:5:8/ 12:3:10	25/25	21.0/ 20.0	375/ 300	185/ 200	90/ 150	650A/ 650B	

Note: A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. marked B in one particular semester.
Induction Program (Three weeks duration) is a part of scheme of first year in 1st semester for all branches.

Cluster –II: Common with B.Tech in (a) ComputerSci. & Engg. (b) Information Technology (c) Electronics & Communication Engg. (d) Electrical Engineering (e) Electrical & Electronics Engineering (f) Electronics Engg.

Bachelor of Technology inElectrical & Electronics Engineering(Credit Based)
KURUKSHETRA UNIVERSITY, KURUKSHETRA
Scheme of Studies/Examination
Semester II (w.e.f. session 2018-2019)

S.No.	CourseNo./ Code	Subject	L:T:P	Hours/ Week	Credits	ExaminationSchedule(Marks)				Duration of exam(Hours)
						Major Test	MinorTest	Practical	Total	
1A	BS-115A	Semiconductor Physics	3:1:0	4	4	75	25	0	100	3
1B	BS-101A	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105A	ProgrammingforProblemSolving	3:0:0	3	3	75	25	0	100	3
2B	HM-101A	English	2:0:0	2	2	75	25	0	100	3
3	BS-134A	Probablity& Statistics	3:1:0	4	4	75	25	0	100	3
4A	ES-109A	EngineeringGraphics&Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111LA	ManufacturingProcessesWorkshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141A	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101A	BasicElectricalEngineering	4:1:0	5	5	75	25	0	100	3
6A	BS-117LA	Semiconductor Physics Lab	0:0:3	3	1.5	--	20	30	50	3
6B	BS-103LA	ChemistryLab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107LA	ProgrammingforProblemSolvingLab	0:0:2	2	1	--	20	30	50	3
7B	ES-103LA	BasicElectricalEngineeringLab	0:0:2	2	1	--	20	30	50	3
8A	ES-113LA	EngineeringGraphics&DesignPractice	0:0:3	3	1.5	--	20	30	50	3
8B	HM-103LA	Language Lab	0:0:2	2	1	--	20	30	50	3
		Total	12:5:8/ 12:3:10	25/ 25	21.0/ 20.0	375/ 300	185/200	90/150	650A/ 650B	

Note: A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. marked B in one particular semester.

BS-115 A	Semiconductor Physics						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3h

Purpose	To introduce the fundamentals of solid state physics and its applications to the students.
	Course Outcomes
CO1	To make the students aware of basic terminology of crystal structure.
CO 2	Introduce the elementary quantum mechanics, which will be useful in understanding the concepts of solid state physics.
CO 3	Discussion of classical free electron theory, quantum theory and Band theory of solids.
CO 4	Basics and applications of semiconductors.

Unit - I

Crystal Structure: Crystalline and Amorphous solids, Crystal Structure: lattice translation vector, symmetry operations, space lattice, basis; Unit cell and Primitive cell, Fundamental types of lattices: two-dimensional and three dimensional Bravais lattices; Characteristics of Unit cells: Simple Cubic (SC), Body Centred Cubic (BCC), Face Centred Cubic (FCC), Hexagonal Close Packed (HCP) structure; Simple crystal structures: Sodium Chloride, Cesium Chloride, Diamond, Cubic Zinc Sulfide; Miller Indices, Bonding in Solids, Point defects in crystals: Schottky and Frenkel defects.

Unit – II

Quantum Theory: Need and origin of Quantum concept, Wave-particle duality, Phase velocity and group velocity, Uncertainty Principle and Applications; Schrodinger's wave equation: time-dependent and time –independent; Physical Significance of wave function ψ.

Unit – III

Free Electron Theory: Classical free electron theory: electrical conductivity in metals, thermal conductivity in metals, Wiedemann-Franz law, success and drawbacks of free electron theory; Quantum free electron theory: wave function, eigen values; Fermi-Dirac distribution function, Density of states, Fermi energy and its importance, Thermionic Emission (qualitative).

Band theory of Solids: Bloch theorem, Kronig-Penney Model (qualitative), E versus k diagram, Brillouin Zones, Concept of effective mass of electron, Energy levels and energy bands, Distinction between metals, insulators and semiconductors, Hall effect and its Applications.

Unit –IV

Semiconductors: Conduction in Semiconductors, Intrinsic Semiconductors: Conductivity of charge carriers, Carrier concentration in intrinsic semiconductors; Extrinsic Semiconductors: n-type semiconductors, p-type semiconductors, charge carrier concentration in extrinsic semiconductors.

Semiconductor Devices: The p-n junction, Current-voltage characteristics of p-n junction; The Transistor: Bipolar Junction Transistor (BJT), Field Effect Transistor (FET), Metal-Semiconductor Junction (Ohmic and Schottky); Semiconductor Laser.

Suggested Books:

1. Applied Physics for Engineers, Wiley India Pvt. Ltd.
2. Introduction to Solid State Physics, John Wiley & Sons. .
3. Concepts of Modern Physics (5th edition), Tata McGraw-Hill Publishing Company Limited.
4. Solid State Physics, New Age International (P) Limited.
5. A Textbook of Quantum Mechanics, McGraw Hill Education (India) Private Limited.
   Introduction to Nanotechnology, John Wiley & Sons.

Note: The paper setter will set the paper as per the question paper templates provided.

BS-117LA	Semiconductor Physics Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	3	1.5	30	20	50	3h
Purpose	To give the practical knowledge of handling the sophisticated instruments.						
Course Outcomes							
CO	To make the students familiar with the experiments related with Semiconductor Physics.						

Note: Student will be required to perform at least 10 experiments out of the following list.

1. To study the V-I characteristics of a p-n diode.
2. To find the flashing and quenching potential of Argon and to find the capacitance of unknown capacitor.
3. To find the value of Planck's constant by using photoelectric cell.
4. To find the temperature coefficient of resistance by using Pt resistance thermometer by post office box.
5. To find the ionization potential of Argon/Mercury using a thyratron tube.
6. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
7. To study the characteristics of (Cu-Fe, Cu-Constantan) thermocouple.
8. To find the value of Hall Coefficient of semiconductor.
9. To find the value of e/m for electrons by Helical method.
10. To find the band gap of intrinsic semiconductor using four probe method.
11. To calculate the hysteresis loss by tracing a B-H curve.
12. To find the frequency of ultrasonic waves by piezoelectric methods.
13. To verify Richerdson thermionic equation.

Suggested Books:

1. C.L.Arora, B. Sc. Practical Physics, S. Chand.
2. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
3. S.L. Gupta & V. Kumar, Practical Physics, PragatiPrakashan.

BS-101A	Chemistry						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3h

Purpose	To familiarize the students with basic and applied concept in chemistry
CO1	An insight into the atomic and molecular structure
CO2	Analytical techniques used in identification of molecules
CO3	To understand Periodic properties
CO4	To understand the spatial arrangement of molecules

UNIT - I

Atomic and molecular structure (10 lectures)

Molecular orbitals of diatomic molecules (N_2, O_2, CO) Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and energy level diagrams of $[Co(NH_3)_6]$, $[Ni(CO)_4]$, $[PtCl_2(NH_3)_2]$ and magnetic properties of metal complexes. Band structure of solids and the role of doping on band structures.

UNIT - II

Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy(basic concept). Fluorescence and its applications in medicine.Vibrational and rotational spectroscopy of diatomic molecules.Applications.Basic concepts of Nuclear magnetic resonance and magnetic resonance imaging, Diffraction and scattering.

UNIT - III

Use of free energy in chemical equilibria (4 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.

Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries (H_2O, NH_3, PCl_5, SF_6, CCl4, $Pt(NH_3)_2Cl_2$

UNIT - IV

Stereochemistry (6 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis.

Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule(paracetamol and Aspirin)

Suggested Books:

1) University chemistry, by B. M. Mahan, Pearson Education
2) Chemistry: Principles and Applications, byM. J. SienkoandR. A. Plane
3) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan
5) Physical Chemistry, by P. W. Atkins
6)Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore,5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Note: The paper setter will set the paper as per the question paper templates provided.

BS-103LA	Chemistry Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	3	1.5	30	20	50	3h

LIST OF EXPERIMENTS

1. To Determine the surface tension of a given liquid
2. To determine the relative viscosity of a given liquid using Ostwald's viscometer
3. To identify the number of components present in a given organic mixture by thin layer chromatography
4. To determine the alkalinity of a given water sample
5. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using conductometer
6. Synthesis of a drug (paracetamol/Aspirin)
7. Determination of chloride content of a given water sample
8. To determine the calcium & magnesium or temporary & permanent hardness of a given water sample by EDTA method
9. To determine the total iron content present in a given iron ore solution by redox titration
10. Determination of the partition coefficient of a substance between two immiscible liquids
11. To find out the content of sodium, potassium in a given salt solution by Flame Photometer
12. To find out the λmax and concentration of unknown solution by a spectrophotometer
13. To find out the flash point and fire point of the given oil sample by Pensky Martin apparatus
14. To determine the amount of dissolved oxygen present in a given water sample
15. To find out the pour point and cloud point of a lubricating oil
16. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using pH meter
17. Using Redwood Viscometer find out the viscosity of an oil sample

Note: Atleast 9 experiments to be performed from the list.

ES-105A	Programming for Problem Solving						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3h
Purpose	To familiarize the students with the basics of Computer System and C Programming						
Course Outcomes							
CO 1	Describe the overview of Computer System and Levels of Programming Languages.						
CO 2	Learn to translate the algorithms to programs (in C language).						
CO 3	Learn description and applications of conditional branching, iteration and recursion.						
CO 4	To use arrays, pointers and structures to formulate algorithms and programs.						

UNIT – I

Overview of Computers: Block diagram and its description, Number systems, Arithmetic of number systems, Computer Hardware: Printers, Keyboard and Mouse, Storage Devices.

Introduction to programming language: Different levels of PL: High Level language, Assembly language, Machine language; Introduction to Compiler, Interpreter, Debugger, Linker, Loader, Assembler.

Problem Analysis: Problem solving techniques, Algorithms and Flowchart representation.

UNIT – II

Overview of C: Elements of C, Data types; Storage classes in C; Operators: Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators, precedence & associativity of operators.

Input/output: Unformatted & formatted I/O function in C.

Control statements: if statement, switch statement; Repetition: for, while, and do-while loop; break, continue, goto statements.

UNIT – III

Arrays: Definition, types, initialization, processing an array, String handling.

Functions: Definition, prototype, parameters passing techniques, recursion, built-in functions, passing arrays to functions, returning arrays from functions.

UNIT – IV

Pointers: Declaration, operations on pointers, pointers and arrays, dynamic memory allocation, pointers and functions, pointers and strings.

Structure & Union: Definition, processing, passing structures to functions, use of union.

Data files: Opening and closing a file, I/O operations on files.

Suggested Books:

1. Brian W. Kernighan Dennis Ritchie, "C Programming Language" Pearson Education India.
2. SubrataSaha,Subhodip Mukherjee:Basic Computation & Programming with 'C'-Cambridge University Press.
3. Ajay Mittal, "Programming in C - A Practical Approach", Pearson.
4. E Balagurusamy :Programming in ANSI C,TMH Education.
5. PradipDey and ManasGhose, "Computer Fundamental and Programming in C", Oxford Pub.
6. ForouzanBehrouz, "Computer Science: A Structured Programming Approach Using C", Cengage Learning.
7. Ashok Kamthane, "Programming in C, 3e", Pearson Education India..
8. YashwantKanetker, "Let us C", BPB Publications.
9. A K Sharma, " Fundamentals of Computers & Programming" DhanpatRai Publications
10. Rajaraman V., "Computer Basic and C Programming", Prentice Hall of India Learning.

Note: The paper setter will set the paper as per the question paper templates provided.

ES-107LA	Programming for Problem Solving Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	2	1	30	20	50	3h
Purpose	To Introduce students with problem solving using C Programming language						
Course Outcomes							
CO 1	To formulate the algorithms for simple problems						
CO 2	Implementation of arrays and functions.						
CO 3	Implementation of pointers and user defined data types.						
CO 4	Write individual and group reports: present objectives, describe test procedures and results.						

LIST OF PROGRAMS

1. Write a program to find the sum of individual digits of a positive integer.
2. Write a program to generate the first n terms of the Fibonacci sequence.
3. Write a program to generate all the prime numbers between 1 and n, where n is the input value given by the user.
4. Write a program to find the roots of a quadratic equation.
5. Write a function to generate Pascal's triangle.
6. Write a program for addition of Two Matrices
7. Write a program for calculating transpose of a matrix.
8. Write a program for Matrix multiplication by checking compatibility
9. Write programs to find the factorial of a given integer by using both recursive and non-recursive functions.
10. Write a function that uses functions to perform the count the lines, words and characters in a given text.
11. Write a program to explores the use of structures, union and other user defined variables
12. Write a program to print the element of array using pointers
13. Write a program to implement call by reference
14. Write a program to print the elements of a structure using pointers
15. Write a program to read a string and write it in reverse order
16. Write a program to concatenate two strings
17. Write a program to check that the input string is a palindrome or not.
18. Write a program which copies one file to another.
19. Write a program to reverse the first n characters in a file.

Note: At least 10 programs are to be performed & executed from the above list.

HM-101 A	English						
L	T	P	Credit	Major Test	Minor Test	Total	Time
2	-	-	2	75	25	100	3h

Course Outcomes	
CO 1	Building up the vocabulary
CO 2	Students will acquire basic proficiency in English including writing skills

UNIT- 1

Vocabulary Building

1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to formderivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

UNIT- 2

Basic Writing Skills

2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

UNIT- 3

Identifying Common Errors in Writing

3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

UNIT- 4

Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion
4.6 Comprehension
4.7 Précis Writing
4.8 Essay Writing

Suggested Books:

(i) Practical English Usage. Michael Swan. OUP. 1995.
(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly.Cambridge University Press. 2006.
(v) Communication Skills. Sanjay Kumar and PushpLata.Oxford University Press. 2011.
(vi) Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University Press

Note: The paper setter will set the paper as per the question paper templates provided.

HM-103LA	Language Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**2**	**1**	**30**	**20**	**50**	**3h**

OBJECTIVES

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

BS-133 A	Calculus and Linear Algebra						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3 h
Purpose	To familiarize the prospective engineers with techniques in calculus, sequence & series, multivariable calculus, and linear algebra.						
Course Outcomes							
CO1	To introduce the idea of applying differential and integral calculus to notions of improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.						
CO 2	To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.						
CO 3	To develop the essential tool of matrices and linear algebra in a comprehensive manner.						
CO 4	To familiarize the student with vector space as an essential tool in most branches of engineering.						

UNIT-I (12 hrs)

Calculus:

Evaluation of definite and improper integrals: Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Rolle's Theorem, Mean value theorems, Indeterminate forms and L'Hospital's rule.

UNIT-II (8 hrs)

Matrices

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

UNIT-III (10 hrs)

Vector spaces

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps.

UNIT-IV (10 hrs)

Vector spaces

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases. Diagonalization; Inner product spaces.

Suggested Books:

1.ErwinKreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. Erwin Kreyszig and SanjeevAhuja, Applied Mathematics- I, Wiley India Publication, Reprint 2015.

3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

6. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

9. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint

2005.

10. S. Lipschutz and M. Lipson, Schaum's outline of Linear Algebra,, McGraw Hill Education; 3 edition (1 July 17).

Note: The paper setter will set the paper as per the question paper templates provided.

BS-134 A	Probability & Statistics						
L	T	P	Credit	Major Test	Minor Test	Total	Time
4	1	-	4.5	75	25	100	3 h
Purpose	To familiarize the prospective students with techniques of probability and statistics.						
Course Outcomes							
CO1	Probability theory provides models of probability distributions(theoretical models of the observable reality involving chance effects) to be tested by statistical methods which has various engineering applications, for instance, in testing materials, control of production processes, robotics, and automatization in general, production planning and so on.						
CO 2	To develop the essential tool of statistics in a comprehensive manner.						
CO 3	To familiarize the student with the problem of discussing universe of which they in which complete enumeration is impractical, tests of significance plays a vital role in their hypothesis testing.						

UNIT-I (10 Hrs)

Basic Probability: Introduction, additive law of probability, Conditional Probability, Independent Events, Bayes' Theorem.

Random Variables: Discrete random variables, probability distribution, Probability mass function and distribution function, Expectation, Moments, Variance and standard deviation of discrete random variables.

UNIT-II (10 Hrs)

Continuous Probability distribution:

Continuous random variables, probability distribution, Probability density function and distribution function, Expectation, Moments, Variance and standard deviation of Continuous random variables.

Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions.

UNIT-III (10 hrs)

Basic Statistics:

Measures of Central tendency: Mean, median, quartiles, mode, Geometric mean, Harmonic mean, Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, Skewness and Kurtosis, Correlation, Coefficient of correlation, methods of calculations, Lines of regression, Rank correlation.

UNIT-IV (10 hrs)

Applied Statistics:

Curve fitting by the method of least squares: Introduction, Fitting of a straight line, fitting of second degree curve, fitting of a polynomial of degree m, fitting of a geometric or power curve of the form $y = ax^b$, fitting of an exponential curve of the form $y = ab^x$.

Test of significance: Basic terminology, Large sample test for single proportion, difference of proportions, single mean, difference of means, Small samples test for single mean, difference of means, Chi-square test for goodness of fit.

Suggested Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed.,Wiley, 1968.
5. N.P. Bali and and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
8.Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Note: The paper setter will set the paper as per the question paper templates provided.

Course code	**ES-109A**							
Coursetitle	**EngineeringGraphics&Design**							
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Major Test**	**Minor Test**	**Total**	**Time**
	1	**2**	**0**	**3**	**75**	**25**	**100**	**3h**

Course Outcomes

Objective- To expose students to the basics of Engineering Drawing , graphics and Projections.	
CO-1	**To learn about construction of various types of curves and scales.**
CO-2	**To learn about orthographic projections of points, lines and planes.**
CO-3	**To Learn about the sectional views and development of Right regular solids**
CO-4	**To Learn about the construction of Isometric Projections and conversion of Isometric views to Orthographic views and vice-versa.**

UNIT - I

IntroductiontoEngineeringDrawing:
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

UNIT - II

Orthographic Projections:
PrinciplesofOrthographicProjections-Conventions-Projections ofPointsandlinesinclined tobothplanes;Projectionsofplanesinclined to one principalPlane.

ProjectionsofRegular Solids:
Solid with axis inclinedtobothePlanes;

UNIT - III

Sections andSectionalViewsofRightRegular Solids:
Sectional views of simple right regular soilds like prism, pyramid, Cylinder and Cone. Development ofsurfacesofRightRegularSolids-Prism,Pyramid,CylinderandCone;

UNIT - IV

Isometric Projections:
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of IsometricViews to Orthographic Views and Vice-versa, Conventions;

Suggested Books:

1. Engineering Graphics using AUTOCAD 2000: T. Jeyapoovan, Vikas Publishing House.
2. Engineering Drawing: Plane and Solid Geometry: N.D. Bhatt and V.M.Panchal, Charotar Publishing House.
3. Engineering Drawing: Amar Pathak, Dreamtech Press, New Delhi.

4. Thomas E.French, Charles J.Vierck, Robert J.Foster, "Engineering drawing and graphic technology", McGraw Hill International Editions.
5. Engineering Graphics and Drafting: P.S. Gill, Millennium Edition, S.K. Katariaand Sons.
6. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.
7. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press.
8. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann,1999.
9. BSI, Technical production documentation (TPD) – specification for defining, specifying and graphically reporting products, BS8888, 2002.
10. CorrespondingsetofCADSoftwareTheoryandUserManuals.

Note: The paper setter will set the paper as per the question paper templates provided.

Course code	**ES-113LA**							
Coursetitle	**EngineeringGraphics&Design Practice**							
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Practical**	**Minor Test**	**Total**	**Time**
	-	**-**	**3**	**1.5**	**30**	**20**	**50**	**3h**
Pre-requisites(if any)	**-**							

Aim: To make student practice on engineering graphics and designsoftwaresand provide exposuretothevisualaspectsofengineeringdesign.	
CO-1	**To give an overview of the user interface and toolboxes in a CAD software.**
CO-2	**To understand to customize settings of CAD software and produce CAD drawing.**
CO-3	**To practice performing various functions in CAD softwares.**
CO-4	**To Learn about solid modelling and demonstration of a simple team design project.**

Module 1:OverviewofComputerGraphics:
Listingthecomputertechnologiesthatimpactongraphicalcommunication,Demonstrating Knowledgeofthetheory ofCADsoftware[suchas:TheMenuSystem,Toolbars(Standard, ObjectProperties,Draw,Modify andDimension),DrawingArea(Background,Crosshairs, CoordinateSystem),Dialogboxes andwindows,Shortcutmenus(Button Bars),The CommandLine(whereapplicable),TheStatusBar,Differentmethodsofzoom asusedin CAD,Selectanderaseobjects.; IsometricViewsoflines,Planes, Simpleandcompound Solids];

Module2:Customization &CAD Drawing:
Setupofthedrawingpageandtheprinter,includingscalesettings,Settingup ofunitsanddrawing limits;ISOand ANSIstandardsforcoordinatedimensioningandtolerancing; Orthographic constraints, Snap to objects manually and automatically; Producingdrawingsbyusingvariouscoordinateinputentrymethodstodrawstraightlines,Applyingvari ouswaysofdrawingcircles;

Module3:Annotations,layering&other functions:
Applyingdimensionstoobjects,applyingannotationstodrawings;Settingupanduseof Layers,layerstocreatedrawings,Create,editandusecustomizedlayers; Changingline lengthsthroughmodifyingexisting lines(extend/lengthen);Printingdocumentstopaper usingtheprintcommand;orthographicprojection techniques;Drawingsectionalviewsof compositerightregulargeometricsolids andprojectthetrueshapeof thesectionedsurface; Drawing annotation,Computer-aideddesign(CAD)softwaremodelingof partsand assemblies.Parametricandnon-parametricsolid,surface,and wireframemodels.Partediting andtwo-dimensionaldocumentationofmodels.Planarprojectiontheory,includingsketching of perspective,isometric,multi-view,auxiliary,andsectionviews.Spatialvisualization exercises.Dimensioning guidelines,tolerancingtechniques; dimensioningandscalemulti viewsofdwelling;

Module4:Demonstration ofasimpleteamdesign project:
Geometryandtopologyofengineeredcomponents:creation ofengineeringmodelsandtheir presentationinstandard2Dblueprintform andas3Dwire-frameandshadedsolids;meshed topologiesforengineeringanalysisandtool-path generationforcomponentmanufacture; geometricdimensioningandtolerancing;Useof solid-modelingsoftwareforcreating associativemodels atthecomponentand assemblylevels;floorplans thatinclude: windows,doors,andfixturessuchasWC,bath,sink,shower,etc.Applying colourcodingaccordingto buildingdrawingpractice;Drawingsectionalelevation showingfoundation toceiling; IntroductiontoBuildingInformationModeling (BIM).

Suggested Books(ES-113L):

1. Chris McMahon and Jimmie Browne, CAD/CAM – Principle Practice and Manufacturing Management, Addison Wesley England, Second Edition, 2000.
2. Chougule N.K.; CAD/CAM /CAE, Scitech Publications India Pvt. Ltd.
3. Vikram Sharma; Computer Aided Design and Manufacturing, S.K. Kataria and Sons.
4. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989
5. Ibrahim Zeid, CAD/CAM theory and Practice, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1992.
6. M.P. Groover, Automation, Productions systems and Computer-Integrated Manufacturing by Prentice – Hall.
7. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.
8. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press.
9. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann,1999.
10. BSI, Technical production documentation (TPD) – specification for defining, specifying and graphically reporting products, BS8888, 2002.
11. (Correspondingsetof)CADSoftwareTheoryandUserManuals
12. Ibrahim Zeid, Mastering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
13. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.
14. Groover M.P. and Zimmers E. W., CAD/CAM: Computer Aided Design and Manufacturing, Prentice Hall International, New Delhi, 1992.
15. Dr. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, New Delhi, Second Edition, 2000.
16. Thomas E.French, Charles J.Vierck, Robert J.Foster, “Engineering drawing and graphic technology”, McGraw Hill International Editions.

Course code	ES-111LA							
Coursetitle	ManufacturingProcessesWorkshop							
Scheme and Credits	L	T	P	Credits	Practical	Minor Test	Total	Time
	0	0	3	1.5	60	40	100	3h
Pre-requisites (if any)								

Aim: To make student gain a hands on work experience in a typical manufacturing industry environment.	
CO-1	To familiarize with different manufacturing methods in industries and work on CNC machine.
CO-2	To learn working in Fitting shop and Electrical and Electronics shops,
CO-3	To practice working on Carpentry and Plastic moulding/glass cutting jobs.
CO-4	To gain hands on practice experience on Metal casting and Welding jobs.

ManufacturingProcessesWorkshop

Contents

1.ManufacturingMethods-casting,forming,machining,joining, advancedmanufacturing methods
2. CNCmachining, Additivemanufacturing
3. Fittingoperations&powertools
4. Electrical&Electronics
5. Carpentry
6. Plasticmoulding,glasscutting
7. Metalcasting
8. Welding(arc welding&gas welding), brazing

Suggested Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology" , 7th edition, Pearson Education India Edition.
2. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K., " Elements of Workshop Technology" , Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
3. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, " Processes and Materials of Manufacture" , 4th edition, Prentice Hall India, 1998
5. Rao P.N., "Manufacturing Technology" , Vol. I and Vol. II, Tata McGraw-Hill House, 2017.

BS-141A	Biology						
L	T	P	Credit	Major Test	Minor Test	Total	Time
2	1	-	3	75	25	100	3h
Purpose	To familiarize the students with the basics of Biotechnology						
Course Outcomes							
CO1	Introduction to essentials of life and macromolecules essential for growth and Development						
CO2	Defining the basic concepts of cell division, genes and Immune system						
CO3	Introduction of basic Concept of ThermoGenetic Engg. & Biochemistry						
CO4	Introduction of basic Concept of Microbiology & Role of Biology in Different Fields						

Unit – I

Introduction to living world: Concept and definition of Biology; Importance of biology in major discoveries of life Characteristic features of living organisms; Cell ultra-structure and functions of cell organelles like nucleus, mitochondria,chloroplast, ribosomes and endoplasmic reticulum; Difference between prokaryotic and eukaryotic cell; Difference between animal and plant cell.

Classification of organisms: Classify the organisms on the basis of (a) Cellularity;- Unicellular and Multicellular organisms. (b) Energy and Carbon Utilization:- Autotrophs, Hetrotrophs and Lithotrops (c) Habitat (d) Ammonia excretion:- ammonotelic, 18ricotelic and ureotelic. (e) Habitat- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life

Unit-II

Introduction to Biomolecules: Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids (DNA& RNA: Structure and forms). Hierarch in protein structure: Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Enzymes as biocatalysts: General characteristics, nomenclature and classification of Enzymes. Effect of temperature, Ph, enzyme and substrate concentrations on the activity of enzymes. Elementary concept of and coenzymes. Mechanism of enzyme action. Enzyme kinetics and kinetic parameters (Km and Vmax)

Unit-III

Genetics:-Mendel's laws of inheritance. Variation and speciation.Concepts of recessiveness and dominance. Genetic Disorders: Single gene disorders in human. **Human traits**: Genetics of blood groups, diabetes type I & II.

Cell Division:- Mitosis and its utility to living systems. Meiosis and its genetic significance.Evidence of nucleic acids as a genetic material. Central Dogma of molecular biology

4. Role of immune system in health and disease: Brief introduction to morphology and pathogenicity of bacteria, fungi, virus, protozoa beneficial and harmful for human beings.

Unit-IV

Metabolism:-Concept of Exothermic and endothermic reactions. Concept of standard free energy and Spontaneity in biological reactions. Catabolism (Glycolysis and Krebs cycle) and synthesis of glucose (Photosynthesis:- Light and Dark Reaction) of glucose. ATP as Energy Currency of the cell

Microbiology: Concept of species and strains, sterilization and media compositions, growth kinetics.

Role of Biology : Role of Biology in Agriculture, Medicine, Forensic science, Bioinformatics, Nanotechnology, Micro-electromechanical systems (Bio-MEMS) and Sensors (Biosensors).

Text Book:

1. Introduction to Biotechnology, By Deswal&Deswal, DhanpatRai Publications N.A

2.Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.

3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.

4.G. S. Stent and R. Calendar, "Molecular Genetics", Freeman and company, 1978.

Note: The paper setter will set the paper as per the question paper templates provided

Suggested Books:

1. Molecular Biology of cell, 4th ed. Alberts, Bruce et al. Garland Science Publishing, New York.
2. Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. Tata McGraw Hill, New Delhi.
3. Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox. Maxmillan/ Worth publishers.
4. Genetics by Snusted& Simmons.
5. Molecular Biotechnology: Principles Application of Recombinant DNA. Glick, B. R. and Pasternak, J. J. ASM press WashingtonDC.
6. Kuby's Immunology, Goldsby, R A,.Kindt, T.J, Osborne, B.A.(2003) W. H. Freeman and company, New York.
7. Recombinant DNA 2nd Edition. Watson, James D. and Gilman, M. (2001) W.H Freeman and Company, NewYork.
8. Essentials of Molecular Biology 4thed, Malacinski, G. M. (2003) Jones &Bartlet Publishers, Boston.

ES-101A	BASIC ELECTRICAL ENGINEERING						
L	T	P	Credit	Major Test	Minor Test	Total	Time(Hrs)
4	1	-	5	75	25	100	3
Purpose	To familiarize the students with the basics of Electrical Engineering						
Course Outcomes							
CO1	Deals with steady state circuit analysis subject to DC.						
CO 2	Deals with AC fundamentals & steady state circuit response subject to AC.						
CO 3	Deals with introductory Balanced Three Phase System analysis and Single Phase Transformer.						
CO 4	Explains the Basics of Electrical Machines & Electrical installations						

Unit-I

D.C. circuits: Ohm's Law, junction, node, circuit elements classification: Linear & nonlinear, active & passive, lumped & distributed, unilateral & bilateral with examples. KVL, KCL, Loop and node-voltage analysis of resistive circuit.Star-Delta transformation for resistors.

Network Theorems: Superposition, Thevenin's, Norton's and Maximum power transfer theorems in a resistive network.

Unit-II

AC Fundamentals: Mathematical representation of various wave functions. Sinusoidal periodicsignal, instantaneous and peak values, polar & rectangular form of representation of impedances and phasor quantities. Addition & subtraction of two or more phasor sinusoidal quantities using component resolution method.RMS and average values of various waveforms.

A.C. Circuits: Behavior of various components fed by A.C. source (steady state response of pureR, pure L, pure C, RL, RC, RLC series with waveforms of instantaneous voltage, current & power on simultaneous time axis scale and corresponding phasor diagrams), power factor, active, reactive & apparent power. Frequency response of Series & Parallel RLC ckts.including resonance, Q factor, cut-off frequency & bandwidth. Generation of alternating emf.

Unit-III

Balanced Three Phase Systems: Generation of alternating 3- phaseemf). 3-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of 3-phase power by two wattmeter method for various types of star & delta connected balanced loads.

Single Phase Transformer (qualitative analysis only): Concept of magnetic circuits.Relation between MMF & Reluctance.Hysteresis & Eddy current phenomenon.Principle, construction &emf equationPhasor diagram at ideal, no load and on load conditions. Losses & Efficiency, regulation. OC & SC test, equivalent circuit, concept of auto transformer.

Unit-IV

Electrical Machines (qualitative analysis only)**:** Construction and working of dc machine with commutateor action, speed control of dc shunt motor. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Basics of Single-phase induction motor, capacitor start capacitor run Single-phase induction motor working. Basic construction and working of synchronous generator and motor.

Electrical Installations (LT Switchgear): Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.

Suggested Books:

1. Basic Electrical Engg: A complete Solution by Vijay Kumar Garg, Wiley India Ltd.
2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
3. Basic Electrical Engg.by S.K. Sahdev, Pearson Education
4. Electrical Engg. Fundamentals:byBobrow, Oxford Univ.Press
5. Basic Electrical Engg. By Del Toro.
6. Saxena&Dasgupta: Fundamentals of Electrical Engg (Cambridge University Press).

Note: The paper setter will set the paper as per the question paper templates provided.

ES-103LA	BASIC ELECTRICAL ENGINEERING LAB						
L	T	Practical	Credit	Minor Test	(Practical)	Total	Time (Hrs)
-	-	2	1	20	30	50	3

Purpose	To familiarize the students with the Electrical Technology Practicals

Course Outcomes	
CO1	Understand basic concepts of Network theorems
CO 2	Deals with steady state frequency response of RLC circuit parameters solution techniques
CO 3	Deals with introductory Single Phase Transformer practicals
CO 4	Explains the constructional features and practicals of various types of Electrical Machines

LIST OF EXPERIMENTS

1. To verify KVL and KCL.
2. To verify Superposition theorem on a linear circuit with at least one voltage & one current source.
3. To verify Thevenin's Theorem on a linear circuit with at least one voltage & one current source.
4. To verify Norton's Theorem on a linear circuit with at least one voltage & one current source.
5. To study frequency response of a series R-L-C circuit on CRO and determine resonant frequency& Q- factor for various Values of R, L, and C.
6. To study frequency response of a parallel R-L-C circuit on CRO and determine resonant frequency& Q -Factor for various values of R, L, and C.
7. To perform O.C. and S.C. tests on a single phase transformer.
8. To perform direct load test on a single phase transformer and plot efficiency v/s load characteristic.
9. To perform speed control of DC shunt motor.
10. To perform starting & reversal of direction of a three phase induction motor.
11. Measurement of power in a 3 phase balanced system by two watt meter method.
12. Study of Cut sections of DC Machines, Induction Motor
13. To study components of various LT Switchgears

Note: At least 9 out of the listed experiments to be performed during the semester.