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

Bachelor of Technology in Computer Sci. & Engg. (Credit Based)
KURUKSHETRA UNIVERSITY, KURUKSHETRA
Scheme of Studies/Examination
Semester I (w.e.f. session 2022-2023)

S.No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	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	Programming for Problem Solving	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 & Linear Algebra	3:1:0	4	4	75	25	0	100	3
4A	ES-109A	Engineering Graphics & Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111LA	Manufacturing Processes Workshop	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	Basic Electrical Engineering	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	Chemistry Lab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107LA	Programming for Problem Solving Lab	0:0:2	2	1	--	20	30	50	3
7B	ES-103LA	Basic Electrical Engineering Lab	0:0:2	2	1	--	20	30	50	3
8A	ES-113LA	Engineering Graphics & Design Practice	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.
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) Computer Sci. & Engg. (b) Information Technology (c) Electronics & Communication Engg. (d) Electrical Engineering (e) Electrical & Electronics Engineering (f) Electronics Engg.

Bachelor of Technology in Computer Sci. & Engg. (Credit Based)
KURUKSHETRA UNIVERSITY, KURUKSHETRA
Scheme of Studies/Examination
Semester II (w.e.f. session 2022-2023)

S.No.	Course No./Code	Subject	L:T:P	Hours/ Week	Credits	Major Test	Minor Test	Practical	Total	Duration of exam (Hours)
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	Programming for Problem Solving	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	Engineering Graphics & Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111LA	Manufacturing Processes Workshop	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	Basic Electrical Engineering	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	Chemistry Lab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107LA	Programming for Problem Solving Lab	0:0:2	2	1	--	20	30	50	3
7B	ES-103LA	Basic Electrical Engineering Lab	0:0:2	2	1	--	20	30	50	3
8A	ES-113LA	Engineering Graphics & Design Practice	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.

B. Tech in Artificial Intelligence and Machine Learning
Scheme of Studies/Examination
Semester III
(w.e.f. session 2023-2024)

S. No.	Course No.	Subject	L:T:P	Hour/ Week	Credits	Major Test	Minor Test	Practical	Total	Duration of Exam (Hrs.)
						Examination Schedule				
1	PC-AI-201A	Data Structure & Applications	3:0:0	3	3	75	25	0	100	3
2	PC-AI-203A	Introduction to Object oriented Programming	3:0:0	3	3	75	25	0	100	3
3	PC-AI-205A	Digital Electronics	3:0:0	3	3	75	25	0	100	3
4	PC-AI-207A	Statistical Analysis for AI & ML	3:0:0	3	3	75	25	0	100	3
5	PC-AI-209A	Introduction to AI	3:0:0	3	3	75	25	0	100	3
6	HM-902A	Business Intelligence & Entrepreneurship	3:0:0	3	3	75	25	0	100	3
7	PC-AI-211LA	Data Structure Lab	0:0:4	4	2	0	40	60	100	3
8	PC-AI-213LA	Object oriented Programming Lab	0:0:4	4	2	0	40	60	100	3
9	PC-AI-215LA	AI &ML workshop-I	0:0:4	4	2	0	40	60	100	3
		Total		30	24	450	270	180	900	
11	SIM-201A*	Seminar on Summer Internship	2:0:0	2	0	0	50	0	50	

Note: SIM-201A is a mandatory credit-less course in which the students will be evaluated for the Summer Internship (training) undergone after 2nd semester and students will be required to get passing marks to qualify.

1. Regarding the course SIM-201A* (Seminar on Summer Internship) is a part of the curriculum of B.Tech – 2nd Semester. Since the students are admitted directly through LEET (Lateral Entrance Examination Test) in the B.Tech. – 3rd Semester, therefore, they need not to undergo this course.
2. In the D.M.C for LEET students it may be mentioned
   *NOT APPLICABLE
   * ADMITTED UNDER LEET

B. Tech in Artificial Intelligence and Machine Learning
Scheme of Studies/Examination
Semester IV
(w.e.f. session 2023-2024)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule				Duration of Exam (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	PC-AI-202A	Programming Language	3:0:0	3	3	75	25	0	100	3
2	PC-AI-204A	Operating Systems	3:0:0	3	3	75	25	0	100	3
3	PC-AI-206A	Database Management System	3:0:0	3	3	75	25	0	100	3
4	PC-AI-208A	Intelligent Systems	3:0:0	3	3	75	25	0	100	3
5	PC-AI-210A	Machine Learning	3:0:0	3	3	75	25	0	100	3
6	PC-AI-212AL	Operating Systems Lab	0:0:4	4	2	0	40	60	100	3
7	PC-AI-214AL	Database Management System Lab	0:0:4	4	2	0	40	60	100	3
8	PC-AI-216AL	AI & ML workshop-II	0:0:4	4	2	0	40	60	100	3
		Total		27	21	375	245	180	800	
9	MC-901A	Environment Sciences	3:0:0	3	0	75	25	0	100	3

*MC-901A is a mandatory credit-less course and student has to get passing marks in order to qualify for the award of B.Tech. Degree.

B. Tech in Artificial Intelligence and Machine Learning
Scheme of Studies/Examination
Semester V
(w.e.f. session 2024-2025)

S. No.	Course No.	Subject	L:T:P	Hours /Week	Credit	Examination Schedule				Duration of Exam (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	PC-AI-301A	Software Engineering	3:0:0	3	3	75	25	0	100	3
2	EEE-309A	Microprocessor	3:0:0	3	3	75	25	0	100	3
3	PC-AI-303A	Design and Analysis of Algorithms	3:0:0	3	3	75	25	0	100	3
4	PC-AI-305A	Theory of Computation	3:0:0	3	3	75	25	0	100	3
5	PC-AI-307A	Neural network and Deep Learning	3:0:0	3	3	75	25	0	100	3
6	HTM-901A	Universal Human values: Understanding Harmony	2:0:0	2	2	75	25	0	100	3
7	EEE-315A	Microprocessor Lab	0:0:4	2	1	0	40	60	100	3
8	PC-AI-309LA	Neural network and Deep Learning Lab	0:0:4	4	2	0	40	60	100	3
		Total		**25**	**20**	**450**	**230**	**120**	**800**	
9	MC-904A	Energy Resources & Management	3:0:0	3	0	0	100	0	100	3
10	SIM-201A*	Seminar on Summer Internship	2:0:0	2	0	0	50	0	50	

*Note: SIM-301*is a mandatory credit-less course in which the students will be evaluated for the Summer Internship undergone after 4th semester and students will be required to get passing marks to qualify.

B. Tech in Artificial Intelligence and Machine Learning
Scheme of Studies/Examination
Semester VI
(w.e.f. session 2024-2025)

S. No.	Course Code	Subject	L:T:P	Hours /Week	Credit	Examination Schedule				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	PC-AI-302A	Big Data Analysis	3:0:0	3	3	75	25	0	100	3
2	PC-AI-304A	Optimization Techniques in ML	3:0:0	3	3	75	25	0	100	3
3	PE	Elective-I	3:0:0	3	3	75	25	0	100	3
4	PE	Elective-II	3:0:0	3	3	75	25	0	100	3
5	OE	Open Elective-I	3:0:0	3	3	75	25	0	100	3
6	PROJ-PC-AI-306A	Project-1	0:0:6	6	3	0	40	60	100	3
7	PC-AI-308LA	Big Data Analysis Lab	0:0:4	4	2	0	40	60	100	3
8	PC-AI-310LA	Optimization Techniques in ML Lab	0:0:4	4	2	0	40	60	100	3
Total				29	22	375	245	180	800	

PE-Elective-I	PE- Elective-II
Human AI interaction: PE-AI-S306A	Natural Language Processing: PE-AI-S310A
Simulation & Modelling: PE-CS-S310A	Computer vision Techniques: PE-AI-S312A
Bioinformatics: PE-AI-S308A	Computer Architecture: PE-AI-S314A

OE-AI Open Elective-I
Soft Skills and Interpersonal Communication: OE-CS-302A
Data Mining: OE-AI-304A
Software Project Management: OE-AI-306A

Note: Students be encouraged to go to 6-8 weeks summer internships mandatory during the summer break after the completion of sixth semester exams.

The course of both (PE) & (OE) will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

B. Tech in Artificial Intelligence and Machine Learning
Scheme of Studies/Examination
Semester VII
(w.e.f. session 2025-2026)

S. No.	Course Code	Subject	L:T:P	Hours/Week	Credits	Major Test	Minor Test	Practical	Total	Duration of Exam (Hrs)
1	PE	Elective-III	3:0:0	3	3	75	25	0	100	3
2	PE	Elective-IV	3:0:0	3	3	75	25	0	100	3
3	OE	Open Elective-II	3:0:0	3	3	75	25	0	100	3
4	PROJ-PC-AI-401A	Project-II	0:0:12	12	6	0	40	60	100	3
5	PE- AI-LA	Elective-III Lab	0:0:2	2	1	0	40	60	100	3
6	PE-AI- LA	Elective-IV Lab	0:0:2	2	1	0	40	60	100	3
	Total			21	17	225	115	180	600	
7	SIM-401*	Seminar on Summer Internship	2:0:0	2	0	0	50	0	50	

PE- Elective-III	PE- Elective-IV
Computer Graphics and Animation: PE-AI-403A	Problem Solving, Reasoning in Robotics: PE-AI-409A
Signal and System: PE-AI-405A	Cloud Computing: PE-CS-A402A
Speech and Natural Processing: PE-CS-D407A	Introduction to R Programming: PE-AI-411A
OE- Elective-II	
Cyber Law & Ethics: OE-CS-401A	
Android Application &Development: OE-AI-403A	
Software Engineering: OE-AI-405A	

The course of both (PE) & (OE) will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

Note: SIM-401 **is** a mandatory credit-less course in which the students will be evaluated for Summer Internship undergone after 6th semester and students will be required to get passing marks to qualify.

B. Tech in Artificial Intelligence and Machine Learning
Scheme of Studies/Examination
Semester VIII
(w.e.f. session 2025-2026)

S. No.	Course Code	Subject	L:T:P	Hours/Week	Credits	Major Test	Minor Test	Practical	Total	Duration of Exam (Hrs)
1	PE	Elective-V	3:0:0	3	3	75	25	0	100	3
2	OE-AI	Open Elective-III	2:0:0	2	2	75	25	0	100	3
3	OE-AI	Open Elective-IV	2:0:0	2	2	75	25	0	100	3
4	PROJ-PC-AI-402A	Project-III	0:0:12	12	6	0	40	60	100	3
5	PE-AI-LA	Elective-VI Lab	0:0:4	4	2	0	40	60	100	3
		Total		**23**	**15**	**225**	**155**	**120**	**500**	

The course of both (PE-AI) & (OE-AI) will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

PE-Elective-V
Internet of Things:PE-AI-402A
Data Handling & Visualization:PE-AI-404A
Software Reliability: PE-CS-A406A

OE-AI Elective-III	OE-AI Elective-IV
Intellectual Property Rights: OE-AI-402A	Web and Internet Technology: OE-AI-408A
AI and Expert System: OE-AI-404A	Image Processing: OE-AI-410A
Cluster Computing: OE-AI-406A	Distributed Operating System: OE-AI-412A

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							
CO1	To make the students familiar with the working of semiconductor devices.						
CO2	To make the students familiar with the working of physics related phenomenon.						
CO3	To make the students familiar with the physics behind semiconductors.						
CO4	To make the students familiar with the physics behind magnetic materials.						

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, Pragati Prakashan.

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
Course Outcomes	
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, by M. 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**
Purpose	**To make student gain a practical work experience of chemical and its chemistry in industries.**						
Course Outcomes							
CO 1	**To familiarize the understanding of use of chemicals in different industries.**						
CO 2	**To learn working with various equipment available in industries.**						
CO 3	**To practice working on basic requirements based on chemistry.**						
CO 4	**To gain practical experience with physio-chemical based machines.**						

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, go to 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. Subrata Saha, 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. Pradip Dey and Manas Ghose, "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.Yashwant Kanetker, "Let us C", BPB Publications.
9. A K Sharma, " Fundamentals of Computers & Programming" Dhanpat Rai 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
Purpose		To develop & enhance the industry related communication, interaction and discussion skills.					
Course Outcomes							
CO 1		Building up the vocabulary					
CO 2		Students will acquire basic proficiency in English including writing skills					
CO 3		Develop correct and better pronunciation through stress on word accent, intonation and weak forms.					
CO 4		Improve fluency in English and thereby respond confidently due to reduced communication apprehension.					

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 form derivatives.

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 Pushp Lata. 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-103 LA				Language Lab			
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**2**	**1**	**30**	**20**	**50**	**3h**
Purpose	**To provide students a platform to enhance English language skills, communication skills and to practice soft skills.**						
Course Outcomes							
CO 1	**To equip the students with good communication skills,**						
CO 2	**To emphasis the need of English in technical world.**						
CO 3	**To enhance the confidence among students.**						
CO 4	**To improve presentation skills.**						

LIST OF EXPERIMENTS

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

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

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

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

Vector spaces

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

Suggested Books:

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

2. Erwin Kreyszig and Sanjeev Ahuja, 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 play a vital role in their hypothesis testing.						
CO 4	To familiarize the students with the various curve analysis methods and test for hypothesis verification.						

UNIT-I

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

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

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

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.

ES-109A				Engineering Graphics & Design			
L	T	P	Credit	Major Test	Minor Test	Total	Time
1	2	-	3	75	25	100	3 h
Purpose	To expose students to the basics of Engineering Drawing, graphics and Projections.						
Course Outcomes							
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

Introduction to Engineering Drawing:
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:
Principles of Orthographic Projections-Conventions-Projections of Points and lines inclined to both planes; Projections of planes inclined to one principal Plane.
Projections of Regular Solids:
Solid with axis inclined to both the Planes;

UNIT - III

Sections and Sectional Views of Right Regular Solids:
Sectional views of simple right regular soilds like prism, pyramid, Cylinder and Cone. Development of surfaces of Right Regular Solids-Prism, Pyramid, Cylinder and Cone;

UNIT - IV

Isometric Projections:
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views 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. Kataria and 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.   Corresponding set of CAD Software Theory and User Manuals.

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

ES-113LA			Engineering Graphics & Design Practice				
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	3	1.5	30	20	50	3h
Purpose	To make student practice on engineering graphics and design software and provide exposure to the visual aspects of engineering design.						
Course Outcomes							
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: Overview of Computer Graphics:

Listing the computer technologies that impact on graphical communication, Demonstrating Knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus(Button Bars),The Command Line(where applicable),The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Module2: Customization & CAD Drawing:

Setup of the drawing page and the printer ,including scale settings, Setting up of units and drawing limits ;ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Module3: Annotations, layering & other functions:

Applying dimensions to objects ,applying annotations to drawings ;Setting up and use of Layers ,layers to create drawings,Create ,edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen);Printing documents to paper using the print command ;orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation ,Computer-aided design(CAD) software modeling of parts and assemblies .Parametric and non-parametric solid, surface, and wire frame models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multi-view, auxiliary, and section views. Spatial visualization exercises .Dimensioning guidelines ,tolerancing techniques; dimensioning and scale multi views of dwelling;

Module4: Demonstration of a simple team design project:

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blue print form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows ,doors ,and fixtures such as WC, bath ,sink ,shower ,etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modeling (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. (Corresponding set of)CAD Software Theory and User Manuals
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.

ES-111LA			**Manufacturing Processes Workshop**				
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	-	3	1.5	60	40	100	3 h
Purpose	To make student gain a hands on work experience in a typical manufacturing industry environment.						
Course Outcomes							
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.						

Manufacturing Processes Workshop Contents

1. Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods
2. C N C Machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical & Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
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. Hajra Choudhury S.K., Hajra Choudhury 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**	**3 h**
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 Thermo Genetic 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, 19ricotelic 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).

Note: The paper setter will set the paper as per the question paper templates provided Text Book:
1. Introduction to Biotechnology, By Deswal & Deswal, Dhanpat Rai 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.

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 Washington DC.
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 h
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 periodic signal, 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- phase emf). 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 equation Phasor 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: by Bobrow, 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	P	Credit	Practical	Minor Test	Total	Time(Hrs)
-	-	2	1	30	20	50	3 h
Purpose	To familiarize the students with the Electrical Technology Practical						
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 practical						
CO 4	Explains the constructional features and practical 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 singlephase 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.