SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

FACULTY OF ENGINEERING & TECHONOLOGY

ORDINANCE No. V-2 (B2)

RELATING TO COURSE CURRICULUM & SYLLABUS OF UG PROGRAM

BACHELOR OF TECHNOLOGY (B.Tech.) IT

(Effective from the Session – 2025-26)

Apporved by the Academic Council of the Meeting held on 06 May 2025

Apporved by the Executive Council of the Meeting held on 28 June 2025

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
(As per NEP 2020 and AICTE Guidelines)
B.Tech Ist Year/Ist Semester (Common to All Branches)
w.e.f. academic Session 2025-26

SEMESTER I (Physics Group)

3-WEEKS INDUCTION PROGRAMME in the beginning of the session

S. No.	Course Code	Course Name	Course Domain	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UAS-101	Engineering Physics	BS	4	0	0	20	10	30	-	70	-	100	4
2	UAS-103	Engineering Mathematics-I	BS	4	0	0	20	10	30	-	70	-	100	4
3	UECE-101	Basic Electronics Engineering	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCSE-101	Programming For Problem Solving	ES	3	0	0	20	10	30	-	70	-	100	3
5	UME-151	Engineering Graphics & Design Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
6	UAS-151	Engineering Physics Lab	BS	0	0	2	-	-	-	15	-	35	50	1
7	UECE-151	Basic Electronics Engineering Lab	ES	0	0	2	-	-	-	15	-	35	50	1
8	UCSE-151	Programming for Problem Solving Lab	ES	0	0	2	-	-	-	15	-	35	50	1
9	UVA-101	IDEA Lab Workshop	VAC	0	0	4	-	-	-	15	-	35	50	2
10	VAC-RB	Rashtrabodh	VAC	2	0	0	-	-	-	-	50	-	50	2
Total													**700**	**23**

***Compulsory Qualifying Audit Course**

Abbreviation Used:

BS: Basic Science Course
ES: Engineering Science Course
HS: Humanities and Social Sciences including Management Course
AU: Audit Course

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FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
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B.Tech Ist Year/2nd Semester (Common to All Branches)
w.e.f. academic Session 2025-26

SEMESTER II (Chemistry Group)

S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UAS-201	Engineering Physics	BS	4	0	0	20	10	30	-	70	-	100	4
2	UAS-203	Engineering Mathematics-II	BS	4	0	0	20	10	30	-	70	-	100	4
3	UECE-201	Basic Electronics Engineering	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCSE-201	Python Programming	ES	3	0	0	20	10	30	-	70	-	100	3
5	UHU-201	Professional Communication	AEC	2	0	0	20	10	30	-	70	-	100	2
6	UME-251	Engineering Graphics & Design Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
7	UAS-251	Engineering Physics Lab	BS	0	0	2	-	-	-	15	-	35	50	1
8	UECE-251	Basic Electronics Engineering Lab	ES	0	0	2	-	-	-	15	-	35	50	1
9	UCSE-251	Python Programming Lab	ES	0	0	2	-	-	-	15	-	35	50	1
10	UHU-251	Professional Communication Lab	AEC	0	0	2	-	-	-	15	-	35	50	1
11	UVA-201	IDEA Lab Workshop	VAC	0	0	4	-	-	-	15	-	35	50	2
12	UAU-202*	Sports and Yoga/NSS or NCC	AU	0	0	3	-	-	-	100	-	-	100	0
Total													**900**	**24**

***Compulsory Qualifying Audit Course**

Summer Internship (4-week) during summer break after Semester-II and same will be assessed/ evaluated in the Semester-III

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UAS-101 / UAS-201	ENGINEERING PHYSICS	3L:1T:0P	4 Credits

Course Objective:
The objective of the course is to understand the basic concepts of nature around us and to synthesize the knowledge from different areas of physics for analysing and solving various critical problems.

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand and apply the principle of conservation of momentum, the theory of relativity.	K1, K2
CO2	To explain the distribution of energy in black body radiation and to understand the difference in particle and wave nature with explanation of Compton effect and Schrodinger wave equation.	K1, K4
CO3	Understand Maxwell's equations of electromagnetic theory with the aim to apply them in a communication system.	K1, K2, K5
CO4	To understand the behavior of waves through various examples/applications of interference and diffraction phenomenon and the concept of grating and resolving power.	K2, K3
CO5	To know the functioning of optical fiber and its properties and applications. To understand the concept, properties and applications of Laser.	K1, K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Relativistic Mechanics	9
Inertial and Non- Inertial Frames of references, Galilean transformation equations, Michelson Morley Experiment, Lorentz Transformation equations, Length contraction, Time dilation and its experimental evidence, Relativistic velocity addition formula, Relativistic variation of mass with velocity, Evidence of variation of mass with velocity, Einstein's Mass-Energy equivalence, examples from nuclear physics, Relativistic energy momentum relation.	
Unit-2: Quantum mechanics	9
Inadequacy of classical mechanics, Planck's theory of black body radiation(qualitative), Compton effect, de-Broglie concept of matter waves, Davisson and Germer Experiment, Phase velocity and group velocity, Time-dependent and time-independent Schrodinger wave equations, Physical interpretation of wave function, Particle in a one-Dimensional box.	

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Unit-3: Electromagnetic Field Theory	**8**
Ampere's law and Faraday's law of electromagnetic induction, Derivation of Maxwell's equations and their physical significance, Correction of Ampere's law by Maxwell, Concept of displacement current, Poynting theorem, Maxwell's equations in free space & velocity of electromagnetic waves, Transverse character of the wave and orthogonality of **E**, **H** and **k** vectors, Maxwell's equation in dielectric medium and velocity of e.m. wave, Comparison with free space, Maxwell's equations in conducting media & solution of differential equation in this case, penetration depth & its significance.	
Unit-4: Wave Optics	**10**
Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications, Introduction to diffraction, Fraunhoffer diffraction at single slit and double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power, Rayleigh's criterion of resolution, Resolving power of grating.	
Unit-5: Fiber Optics & Laser	**9**
Fibre Optics: Principle and construction of optical fiber, Acceptance angle, Numerical aperture, Acceptance cone, Step index and graded index fibers, Fiber optic communication principle, Attenuation, Dispersion, Application of fiber. **Laser**: Absorption of radiation, Spontaneous and stimulated emission of radiation, Population inversion, Einstein's Coefficients, Principles of laser action, Solid state Laser (Ruby laser) and Gas Laser (He-Ne laser), Laser applications.	

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Optics - Brijlal & Subramanian (S. Chand)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
4. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
5. Engineering Physics-Malik HK and Singh AK (Mc Graw Hill)

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UAS-103	Engineering Mathematics-I	3L:1T:0P	4 Credits

Objectives:

- To acquaint the student with the essential tools of matrices, eigen values and its application in a Comprehensive-manner.
- To apply the knowledge of differential calculus in the various fields of engineering and have a basic understanding of Beta and Gamma functions and application of Dirichlet's integral.
- To deal with functions of several variables that is essential in optimizing the results of real life problems
- To deal with vector calculus that is required in different branches of Engineering to graduate engineer.

Unit No.	Particulars	Contact Hours
1	**Matrices:** Complex Matrices, Hermitian, Skew-Hermitian and Unitary Matrices, Elementary transformations, Inverse of a matrix, Rank of matrix, Solution of a system of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Linear Dependence and Independence of vectors, Eigen values and Eigen vectors, Linear Transformation and matrix representation, Applications to Engineering problems.	8
2	**Differential Calculus- I:** Successive Differentiation (nth order derivatives), Leibnitz theorem, Partial derivatives, Euler's Theorem for homogeneous functions, Total derivative, Change of variables, Curve tracing.	8
3	**Differential Calculus-II:** Expansion of functions by Taylor's and Maclaurin's theorems for functions of one and two variables, Maxima and Minima of functions of several variables, Lagrange's method of multipliers, Jacobians, Approximation of errors.	8
4	**Multiple integration:** Double integral, Triple integral, change of order of integration, Change of variables, Beta and Gama functions and their properties, Dirichlet's integral and its applications to area and volume, Liouville's extensions of Dirichlet's integral.	8
5	**Vector Calculus:** **Vector differentiation**: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. **Vector Integration**: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications.	8

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Course Outcomes:

	Course Outcome (CO)	Bloom's Level
	At the end of this course, the students will be able to:	
CO 1	Understand the concept of complex matrices, Eigen values, Eigen vectors and applythe concept of rank to evaluate linear simultaneous equations	K2 & K5
CO 2	Remember the concept of differentiation to find successive differentiation,Leibnitz Theorem, and create curve tracing, and find partial and total derivatives	K1,K6 & K5
CO 3	Applying the concept of partial differentiation to evaluate extrema, series expansion,error approximation of functions and Jacobians	K3 &K5
CO 4	Remember the concept of Beta and Gamma function; analyze area and volume and Dirichlet's theorem in multiple integral	K1 & K4
CO 5	Apply the concept of Vector Calculus to analyze and evaluate directional derivative, line, surface and volume integrals.	K3, K4& K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd.,2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House2002.

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
6. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill; Sixth Edition
7. P. Sivaramakrishna Das and C. Vijaya Kumari, Engineering Mathematics, 1st Edition, Pearson Education.
8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

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UECE-101/ UECE-201	BASIC ELECTRONICS ENGINEERING	3 L: 0 T: 0 P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To understand basics of semiconductor, devices and their applications in different areas	K1 , K2
CO2	To implement and understand different biasing techniques of BJTs, FETs, and operational amplifiers	K2 K3
CO3	To analyze output in different operating modes of different semiconductor devices	K4
CO4	To implement circuits and evaluate different parameters of electronic devises	K5
CO5	To compare design issues, advantages, disadvantages and limitations of basic electronics	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit -1: Semi-conductors and Diodes	**10**
Conductors, Semiconductors, Intrinsic Semiconductors, Extrinsic Semi Conductors. Diode Theory: Basic Ideas, The ideal Diode, Forward and Reverse Bias, Diode Equation, Volt-Ampere Characteristic. Special diodes: symbol of Zenner diode, operation, V-I characteristics, symbol of photo diode, working principle, LED symbol and principle. Diode break down and capacitances	
Unit-2: Applications of Diodes	**6**
Half-wave Rectifier, Full-wave and Bridge Rectifier, derivation of Ripple factor, efficiency of Half-wave, full-wave and Bridge rectifiers, Merits and demerits of Half-wave, full-wave and Bridge rectifiers, Comparisons of rectifiers, Clippers and Clampers	
Unit-3: Bipolar Junction Transistors	**8**
Symbols of p-n-p and n-p-n transistors and their working principles, Transistor currents, input and output characteristics of Common base configuration, Common Emitter configuration Transistor Switch, Amplifiers: working principles of Common base amplifier, Common Emitter amplifier, Common collector amplifier and their applications	
Unit 4: Field Effect Transistors	**8**

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Classification of FET – Comparative study of BJT and JFET – Merits and demerits of FET – Construction of JFET – JFET Characteristics – MOSFET (Enhancement & Depletion), working and IV characteristics	
Unit 5: Operational Amplifiers and Electronics Instruments	**8**
Introduction to OP-amp, Op-amp Block Diagram, ideal and practical Op-amp specifications, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Output off set voltages & currents, slew rates, CMRR, PSRR. Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Comparators. **Introduction to Electronic Instruments:** CRO, Multi meter, Signal Generators.	

Text Books:

1. Electronic Principles, Albert Malvino and David J Bates, 7th Edition, Tata McGraw–Hill.
2. Electronic Devices and Circuits Theory, Boyelstad, Pearson Education, 8thEdition, September 2011.
3. Op-Amps and Linear Integrated Circuits, - RamakanthA.Gayakwad,PHI,4thEdition, 2009
4. Linear Integrated Circuits–D. Roy Chowdhury, New Age International Pvt. Ltd.,2nd Edition, 2003.

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky,10th Edition(2010), Pearson/PHI
2. Electronic Devices and Circuits, David A. Bell, Oxford, 5th edition, 2009.
3. Electronic Devices and Circuits, S. Salivahanan, Kumar, Vallavaraj,TATAMcGrawHill,2nd Edition, 2003.
4. Operational Amplifiers & Linear ICs, David A Bell, Oxford Uni.Press,3rd Edition,2005.

Spoken Tutorial (MOOCs):

1. http://nptel.ac.in/courses.phphttp://jntuk-coeerd.in/

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UCSE-101/ UCSE-201	PROGRAMMING FOR PROBLEM SOLVING	3L:1T:0P	4 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To Develop Simple Algorithms for Arithmetic and Logical Problems.	K2, K3
CO2	To Translate the Algorithms to Programs & Execution (in C Language).	K3
CO3	To Implement Conditional Branching, Iteration and Recursion.	K3
CO4	To Decompose a Problem into Functions and Synthesize a Complete Program Using Divide and Conquer Approach.	K4
CO5	To Use Arrays, Pointers and Structures to Develop Algorithms and Programs.	K2, K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit -1:	**8**
Introduction to Components of a Computer System: Memory, Processor, I/O Devices, Storage, Operating System, Concept of Assembler, Compiler, Interpreter, Loader and Linker. **Idea of Algorithm:** Representation of Algorithm, Flowchart, Pseudo Code with Examples, From Algorithms to Programs, Source Code. **Programming Basics:** Structure of C Program, Writing and Executing the First C Program, Syntax and Logical Errors in Compilation, Object and Executable Code. Components of C Language. Standard I/O in C , Fundamental Data types, Variables and Memory Locations, Storage Classes.	
Unit-2:	**8**
Arithmetic Expressions and Precedence : Operators and Expression Using Numeric and Relational Operators, Mixed Operands, Type Conversion, Logical Operators, Bit Operations, Assignment Operator, Operator precedence and Associatively. **Conditional Branching:** Applying if and Switch Statements, Nesting if and Else and Switch.	
Unit-3:	**8**
Iteration and Loops: Use of While, do While and for Loops, Multiple Loop Variables, Use of Break , Goto and Continue Statements. **Arrays:** Array Notation and Representation, Manipulating Array Elements, using Multi Dimensional Arrays. Character Arrays and Strings, Structure, union, Enumerated Data types, Array of Structures, Passing Arrays to Functions.	
Unit-4:	**8**
Functions: Introduction, Types of Functions, Functions with Array, Passing Parameters to Functions, Call by Value, Call by Reference, Recursive Functions.	

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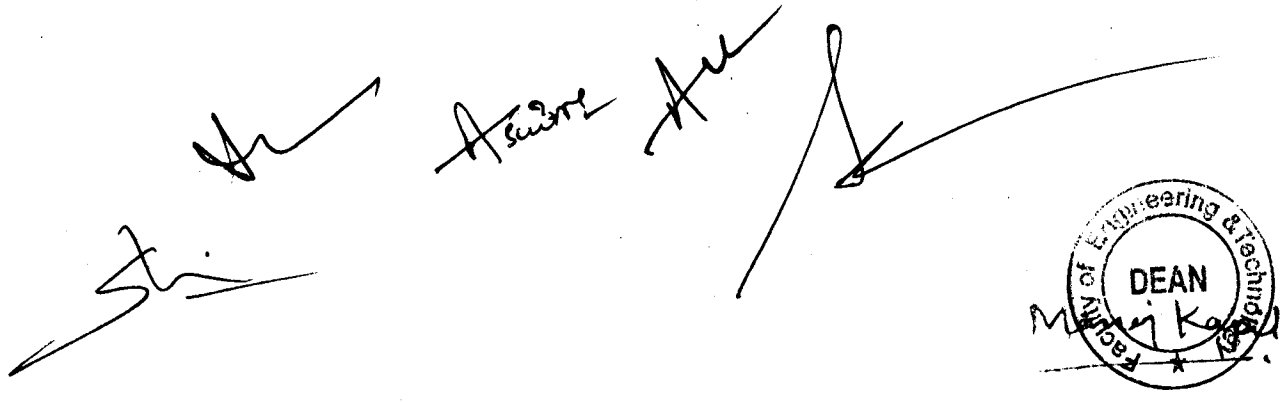
Basic of searching and Sorting Algorithms: Searching & Sorting Algorithms (Linear Search , Binary search , Bubble Sort, Insertion and Selection Sort)	
Unit-5:	**8**
Pointers: Introduction, Declaration, Applications, Introduction to Dynamic Memory Allocation (Malloc, Calloc, Realloc, Free), String and String functions , Use of Pointers in Self-Referential Structures, Notion of Linked List (No Implementation) **File Handling:** File I/O Functions, Standard C Preprocessors, Defining and Calling Macros and Command-Line Arguments.	

Text Books:

1. Schaum's Outline of Programming with C by Byron Gottfried , McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
5. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
6. Let Us C By Yashwant P. Kanetkar.
7. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison- Wesley, 2006.
8. Programming in C by Kochan Stephen G. Pearson Education – 2015.
9. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
12. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication



UME-151/ UME -251	ENGINEERING GRAPHICS & DESIGN LAB	1L:0T:4P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Use scales and draw projections of objects.	K1,K2,K6
CO2	Explain views of solids and their sectional surfaces.	K2,K3
CO3	Analyze and draw isometric projections of objects.	K4,K6
CO4	Demonstrate orthographic representation of perspective views using modern tools.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Content
Unit-1: Introduction to Engineering Drawing (8 hours)
Principles of Engineering Graphics and their significance. Dimensioning, Lettering. Scales: Plain, Diagonal and Engineering Scales.
Unit-2: Projection of Points and Lines (8 hours)
Orthographic Projection, Projection of Point, Projection of Lines: Projection of straight lines; Projection of lines inclined to one plane and both planes.
Unit-3: Projection of Planes and Solids (8 hours)
Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.
Unit-4: Sections of Regular Solids and development of Surfaces (8 hours)
Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.
Unit-5: Isometric Projection (8 hours)
Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids. Perspective Projection: Orthographic representation of perspective views — Plane figures and simple solids — Visual Ray Method. Conversion of pictorial view into orthographic Projection.

Suggested Text/ Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
4. Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
6. (Corresponding set of) CAD Software Theory and User Manuals.

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UME-152/ UME -252	WORKSHOP PRACTICES LAB	1L:0T:4P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Use various engineering materials, tools, machines and measuring equipments.	K3
CO2	Perform machine operations in lathe and CNC machine.	K3
CO3	Perform manufacturing operations on components in fitting and carpentry shop.	K3
CO4	Perform operations in welding, moulding, casting and gas cutting.	K3
CO5	Fabricate a job by 3D printing manufacturing technique	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

S. No.	Mechanical Workshop	Duration
1	**Introduction to Mechanical workshop material, tools andmachines**	3 Hrs
	To study layout, safety measures and different engineering materials (mild steel, medium carbon steel, high carbon steel, high speed steel and cast iron etc) used in workshop.	
	To study and use of different types of tools, equipment, devices & machines used in fitting, sheet metal and welding section.	
	To determine the least count of Vernier calliper, vernier height gauge, micrometer (Screw gauge) and take different reading over given metallic pieces using these instruments.	
2	**Machine shop**	6 Hrs
	Demonstration of working, construction and accessories for Lathe machine	
	Perform operations on Lathe - Facing, Plane Turning, step turning, taper turning, threading, knurling and parting.	
3	**Fitting shop**	6 Hrs
	1. Practice marking operations. 2. Preparation of U or V -Shape Male Female Work piece which contains: Filing, Sawing, Drilling, Grinding.	
4	**Carpentry Shop**	3 Hrs
	Study of Carpentry Tools, Equipment and different joints.	

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	Making of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint	
5	**Welding Shop**	**6 Hrs**
	Introduction to BI standards and reading of welding drawings.	
	Practice of Making following operations Butt joint, Lap Joint using ARC Welding, MIG Welding	
6	**Moulding and Casting Shop**	**6 Hrs**
	Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes Demo of mould preparation and Aluminum casting Practice – Study and Preparation of mould for Plastic	
7	**CNC Shop**	**6 Hrs**
	Study of main features and working parts of CNC machine and accessories that can be used. Perform different operations on metal components using any CNC machines	
	Total	**36 Hrs**

Reference Books:

1. Workshop Practice, H S Bawa, McGraw Hill
2. Mechanical Workshop Practice, K C John, PHI
3. Workshop Practice Vol 1, and Vol 2, by HazraChoudhary , Media promoters and Publications
4. CNC Fundamentals and Programming, By P. M. Agrawal, V. J. Patel, Charotar Publication.

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UAS-151/ UAS -251	ENGINEERING PHYSICS LAB	0L:0T:3P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	***Apply*** the principle of interference and diffraction to find the wavelength of monochromatic and polychromatic light.	Apply
CO2	***Compute*** and **analyze** various electrical and electronic properties of a given material by using various experiments.	Analyze
CO3	***Verify*** different established laws with the help of optical and electrical experiments.	Apply
CO4	***Determine*** and ***calculate*** various physical properties of a given material by using various experiments.	Apply
CO5	**Study** and **estimate** the performance and parameter of given equipment by using graphical and computational analysis.	Apply

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.

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4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar & Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (Krishna Prakashan Meerut)

UECE-151/ UECE-251	BASIC ELECTRONICS ENGINEERING LAB	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.	K3
CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.	K4
CO3	Perform experiment illustrating BH curve of magnetic materials.	K3
CO4	Calculate efficiency of a single phase transformer and DC machine.	K4
CO5	Understand the principles, operation and application of the basic electronic component/devices and the Characteristics of the active and passive devices. And create a working mini-project	K2, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

LIST OF EXPERIMENTS

Note: A minimum of ten experiments, five from each section from the following should be performed.

(A) Section A

1. Verification of Kirchhoff's laws
2. To assemble and test 5V/9V DC regulated power supply
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two-wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit.
8. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase Transformer
9. Determination of efficiency of a dc shunt motor by load test.
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single phase induction machine and synchronous machine.

(B) Section B

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1. To get familiar with the working of the following instruments:
   a) Cathode ray oscilloscope (CRO)
   b) Multimeter (Analog and Digital)
   c) Function generator
   d) Power supply.
2. a) Plot the forward and reverse V-I characteristics of P-N junction diode
   b) Study of Zener diode in breakdown region
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, V_{dc}.
4. To assemble and test 5V/9V DC regulated power supply.
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Soldering shop: Soldering and disordering of Resistor in PCB. Soldering and disordering of IC in PCB. Soldering and disordering of Capacitor in PCB
7. Micro project (Submit any circuitry on general purpose PCB based on experiment number 2-4)

(C) Experiments available on virtual lab

1. **Kirchhoff's laws. Virtual lab link:** http://vlab.amrita.edu/?sub=3&brch=75&sim=217&cnt=2
2. **Thevenin Theorem. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=75&sim=313&cnt=1
3. **RLC series resonance. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1
4. **Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load. Virtual lab link:** http://vp-dei.vlabs.ac.in/Dreamweaver/measurement.html
5. **Determination of parameters of ac single phase series RLC circuit. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=75&sim=332&cnt=1
6. **To observe the B-H loop of a ferromagnetic material in CRO. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=2
7. **Determination of the efficiency of a dc motor by loss summation method (Swinburne's test). Virtual lab link:** http://em-iitr.vlabs.ac.in/exp5/index.php?section=Theory

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UCSE-151/ UCSE-251	PROGRAMMING FOR PROBLEM SOLVINGLAB	0L:0T:3P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.	K3, K4
CO2	Demonstrate an understanding of computer programming language concepts.	K3, K2
CO3	Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.	K6, K4
CO4	Able to define data types and use them in simple data processingapplications he/she must be able to use the concept of array of structures.	K1, K5
CO5	Develop confidence for self-education and ability for life-long learning needed for Computer language.	K3, K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5= (F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%	Print 'A'
80-90%	Print 'B'
60-80%	Print 'C'
Below 60%	Print 'D'

11. WAP that takes two operands and one operator from the user, perform the operation, and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third

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array and prints them.

23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
29. Define a structure data type TRAIN_INFO. The type contain
    Train No.: integer type
    Train name: string
    Departure Time: aggregate type
    TIME Arrival Time: aggregate type
    TIME Start station: string
    End station: string
    The structure type Time contains two integer members: hour and minute.
    Maintain a train timetable and implement the following operations:
    a. List all the trains (sorted according to train number) that depart from a particular section.
    b. List all the trains that depart from a particular station at a particular time.
    c. List all he trains that depart from a particular station within the next one hour of a given time.
    d. List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

Note:

a) *The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner*

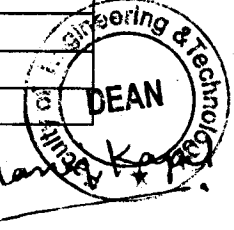
b) *The subject teachers are suggested to use the concept of project based learning. The subject teacher may giver certain use cases/case studies where student is able to apply multiple concepts in one single program*

c) *It is also suggested that open source tools should be preferred to conduct the lab. Some open source online compiler to conduct the C lab are as follows:*

- **https://www.jdoodle.com/c-online-compiler/**
- **https://www.tutorialspoint.com/compile_c_online.php**
- **https://www.programiz.com/c-programming/online-compiler/**
- **https://www.hackerrank.com/**

Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Problem Solving Lab	Numerical Representation
	Beauty of Numbers
	More on Numbers
	Factorials
	String Operations
	Recursion
	Advanced Arithmatic
	Searching and Sorting
	Permutation
	Sequences



UVA-101/ UVA-201	IDEA Lab Workshop	0L:0T:4P	2 Credit

Course Objectives:

1. To learn all the skills associated with the tools and inventory associated with the IDEA Lab.
2. Learn useful mechanical and electronic fabrication processes.
3. Learn necessary skills to build useful and standalone system/ project with enclosures.
4. Learn necessary skills to create print and electronic documentation for the system/project

Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	To familiarize the students with basic electronic components, mechanical tools and basic Binary system	K1, K2
CO2	To understand working of Basic measuring instruments, power tools and five component model of a computer.	K2
CO3	To study basic building blocks of circuits, 3D printing and latest technology and equip oneself with MS office.	K2, K3
CO4	To apply the knowledge gained to plan and implement a mini project.	K3, K4, K5
CO5	To create a mini project replete with Report and video.	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Course Contents:

Unit #	Topics		
1.	Electronic component familiarization, Understanding electronic system design flow. Schematic design and PCB layout	Introduction to basic hand tools - Tape measure, combination square, Vernier Calipers, Micrometers, Dial Gauges, Height Gauges, Depth Gauges, Slip gauge, Filler gauge, Thread Gauge, Dial Indicator, Surface plate, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading.	**Number Systems and Codes:-** Decimal, Binary, Octal and Hexadecimal Number systems, Codes-BCD, Gray Code, Excess-3 Code, ASCII, EBCDIC, Conversion between various Codes.

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2.	Familiarization and use of basic measurement instruments: Signal and function generator. Circuit prototyping using (a) breadboard, (b) Zero PCB (d) custom PCB. Single. PCBs. Single and PCB prototype fabrication in the lab. Soldering using soldering iron/station.	Introduction to Power tools: Power saws, hand saw, jigsaw, Grinder. Various types of drill bits. Introduction of Injection molding machine. Basic welding and other joining techniques for assembly. Concept of Lab aboard a Box.	**Five Component Model of a Computer:** System and Application software (introduction) storage devices , primary (RAM, ROM, PROM, EPROM, cache) Memory and secondary (magnetic tape, hard disk, Compact disks) memory , peripheral devices , printers.
3.	Electronic circuit building blocks including common sensors Digital Input and output. Measuring time and events. PWM. Serial communication. Analog input. Power Supply design (Linear).	3D printing and prototyping technology – 3D printing using FDM, and SLA. Prototyping using subtractive cutting processes. Basics of IPR and patents; Accessing and utilizing patent information in IDEA Lab	**Introduction to MS Office: Office Writer** : Editing and Reviewing, Drawing, Tables, Graphs, Templates, **Office Excel :** Worksheet Management , Formulas, Functions, Charts **Office Power Point:** designing powerful power-point presentation
4.	Discussion and implementation of a mini project.		
5.	Documentation of the mini project (Report and video).		

Laboratory Activities:

S. No.	List of Lab activities and experiments
1.	Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2.	Design of Half -Adder & Full-Adder using Logic Gates.
3.	Machining of 3-D geometry of soft material such as soft wood or modeling wax.
4.	3-D printing of scanned geometry using SLA printer.
5.	Familiarity and use Gauges, Vernier Calipers, micrometer, and dial indicator.
6.	Study of Computer Hardware: Dismantling and Installation of PC
7.	Understanding and working with MS Office, Inserting Table, Formatting
8.	Understanding and working with MS Excel: Worksheet Management, Formatting, working with numerical data
9.	Understanding and working with MS Excel: Formulas, Functions and Charts
10.	Understanding and working with MS Power Points: Preparing and presenting power point presentation

Reference Books:

1. AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual), Khanna Book Publishing.
2. All-in-One Electronics Simplified, A.K. Maini; 2021. ISBN-13: 978-9386173393, Khanna Book Publishing Company, New Delhi.

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3. Simplified Q&A - Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Rajiv Chopra, ISBN: 978-9355380821, Khanna Book Publishing Company, New Delhi.
4. 3D Printing & Design, Dr. Sabrie Soloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
5. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.
6. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan (Author). Weldon Owen; 2017. ISBN-13: 978-1681881584.
7. Make: Tools: How They Work and How to Use Them. Platt, Charles. Shroff/Maker Media. 2018. ISBN-13: 978-9352137374
8. The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press. ISBN: 9780521809269
9. Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill. ISBN-13: 978-1259587542
10. Encyclopedia of Electronic Components (Volume 1, 2 and 3). Charles Platt. Shroff Publishers. ISBN-13: 978-9352131945, 978-9352131952, 978-9352133703
11. Building Scientific Apparatus. 4th edition. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer. Cambridge University Press. ISBN-13: 978-0521878586
12. Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk. McGraw Hill. ISBN-13: 978-1259641633
13. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education. ISBN-13 : 978-1260019193
14. Pro GIT. 2nd edition. Scott Chacon and Ben Straub. A press. ISBN-13 : 978-1484200773
15. Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer
16. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010
17. Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and distributors, 5th Edition,2002.
18. Morris Mano, Digital Logic and Computer Designl, Pearson
19. R.P. Jain, —Modern Digital Electronicsl, TMH, 2nd Ed,
20. A Anand Kumar, —Fundamentals of Digital Logic Circuitsl, PHI

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FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
(As per NEP 2020 and AICTE Guidelines)
B.Tech Ist Year/2nd Semester (Common to All Branches)
w.e.f. academic Session 2025-26

SEMESTER II (Physics Group)

S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UAS-202	Engineering Chemistry	BS	4	0	0	20	10	30	-	70	-	100	4
2	UAS-203	Engineering Mathematics-II	BS	4	0	0	20	10	30	-	70	-	100	4
3	UEEE-201	Basic Electrical Engineering	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCSE-201	Python Programming	ES	3	0	0	20	10	30	-	70	-	100	3
5	UHU-201	Professional Communication	AEC	2	0	0	20	10	30	-	70	-	100	2
6	UME-252	Workshop Practices Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
7	UAS-252	Engineering Chemistry Lab	BS	0	0	2	-	-	-	15	-	35	50	1
8	UEEE-251	Basic Electrical Engineering Lab	ES	0	0	2	-	-	-	15	-	35	50	1
9	UCSE-251	Python Programming Lab	ES	0	0	2	-	-	-	15	-	35	50	1
10	UHU-251	Professional Communication Lab	AEC	0	0	2	-	-	-	15	-	35	50	1
11	UVA-202	Introduction to Generative AI Lab	VAC	0	0	4	-	-	-	15	-	35	50	2
12	UAU-202*	Sports and Yoga/NSS or NCC	AU	0	0	3	-	-	-	100	-	-	100	0
Total													**900**	**24**

***Compulsory Qualifying Audit Course**

Summer Internship (4-week) during summer break after Semester-II and same will be assessed/ evaluated in the Semester-III

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FACULTY OF ENGINEERING AND TECHNOLOGY
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B.Tech Ist Year/Ist Semester (Common to All Branches)
w.e.f. academic Session 2025-26

SEMESTER I (Chemistry Group)

3-WEEKS INDUCTION PROGRAMME in the beginning of the session

S. No.	Course Code	Course Name	Course Domain	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UAS-102	Engineering Chemistry	BS	4	0	0	20	10	30	-	70	-	100	4
2	UAS-103	Engineering Mathematics-I	BS	4	0	0	20	10	30	-	70	-	100	4
3	UEEE-101	Basic Electrical Engineering	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCSE-101	Programming For Problem Solving	ES	3	0	0	20	10	30	-	70	-	100	3
5	UME-152	Workshop Practices Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
6	UAS-152	Engineering Chemistry Lab	BS	0	0	2	-	-	-	15	-	35	50	1
7	UEEE-151	Basic Electrical Engineering Lab	ES	0	0	2	-	-	-	15	-	35	50	1
8	UCSE-151	Programming for Problem Solving Lab	ES	0	0	2	-	-	-	15	-	35	50	1
9	UVA-102	Introduction to Generative AI Lab	VAC	0	0	4	-	-	-	15	-	35	50	2
10	VAC-RB	Rashtrabodh	VAC	2	0	0	-	-	-	-	50	-	50	2
Total													**700**	**23**

***Compulsory Qualifying Audit Course**

Abbreviation Used:

BS: Basic Science Course
ES: Engineering Science Course
HS: Humanities and Social Sciences including Management Course
AU: Audit Course

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UAS-102 / UAS-202	ENGINEERING CHEMISTRY	3L:1T:0P	4 Credits

Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	Get an understanding of the theoretical principles of chemistry of molecular structure, bonding and properties, Chemistry of advanced materials (Nanomaterials and Graphite) as well as the Principles of Green Chemistry.	K3
CO2	Apply the fundamental concepts of determination of structure with various spectral techniques.	K4
CO3	Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.	K3
CO4	Develop understanding of the sources, impurities and hardness of water, apply the concepts of determination of calorific values and analyze the coal.	K3
CO5	Develop the understanding of Chemical structure of polymers and its effect on their various properties when used as engineering materials. Understanding the applications of specific polymers and Chemistry applicable in industrial process.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Atomic and Molecular Structure: Molecular orbital's of diatomic molecules, Bond Order, Magnetic characters and numerical problems. **Chemistry of Advanced Materials:** ***Graphite;*** Introduction, Structure and applications. ***Nanomaterials;*** Introduction, Preparation, characteristics of nanomaterials and applications of nanomaterials, Carbon Nano Tubes (CNT), **Green Chemistry:** Introduction, 12 principles and importance of green Synthesis, Green Chemicals, Synthesis of typical organic compounds by conventional and Green route (Adipic acid and Paracetamol), Environmental impact of Green chemistry on society.	
Unit-2:	**8**
Spectroscopic Techniques and Applications: **Atomic spectroscopy:** Introduction to spectroscopy, atomic absorption spectrophotometry and its application. **Molecular Spectroscopy**: Beer-Lambert's Law, molecular spectroscopy, principle, instrumentation and applications of UV-Vis and IR spectroscopy	

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Unit-3:	**8**
Electrochemistry and Batteries: Basic concepts of electrochemistry, Nernst Equation. ***Batteries;*** Classification and applications of Primary Cells (Dry Cell) and Secondary Cells (Lead Acid battery). ***Corrosion:*** Introduction to corrosion, Types of corrosion, Cause of corrosion, Corrosion prevention and control, Corrosion issues in specific industries (Power generation, Chemical processing industry, Oil & gas industry and Pulp & paper industries). **Phase Rule:** States of matter; phase; component and degree of freedom; Gibb's phase rule; one component and two component systems.	
Unit-4:	**8**
Water Technology: Sources and impurities of water, Hardness of water, Boiler troubles (Scale and Sludge Formation in boiler and its prevention) Techniques for water softening (Lime-Soda, Zeolite, Ion Exchange and Reverse Osmosis process), Determination of Hardness and alkalinity, Numerical problems. **Fuels and Combustion:** Definition, Classification, Characteristics of a good fuel, Calorific Values, Gross & Net calorific value, Determination of calorific value by Bomb Calorimeter and Dulong's method, Analysis of coal by Proximate and Ultimate analysis method, Numerical problems.	
Unit-5:	**8**
Materials Chemistry: ***Polymers;*** Classification, Polymerization processes, Thermosetting and Thermoplastic Polymers, Polymer Blends and Composites, Conducting and Biodegradable polymers, Preparation, properties, industrial applications of Teflon, Lucite, Bakelite, Kelvar, Dacron, Thiokol, Nylon, Buna-N and Buna-S and their environmental impact on society, Speciality polymers. **Organometallic Compounds:** General methods of preparation and applications of Organometallic compounds (RMgX and LiAlH4).	

Reference Books:

1. Engineering Chemistry by Rath & Singh, 2nd Edition, Cengage Learning India Pvt Ltd Delhi.
2. Engineering Chemistry by SS Dara, S Chand & Co Ltd
3. Engineering Chemistry by Jain & Jain, S.Chand & Comp, New Delhi
4. Engineering Chemistry by K. Sesha Maheswaramma, Pearson
5. Engineering Chemistry by OG Palanna, Mc Graw Hill Education, New Delhi
6. Engineering Chemistry by Shashi Chawala, Dhanpat Rai Publishing Comp. New Delhi
7. University Chemistry by BH Mahan
8. University Chemistry by CNR Rao

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UEEE-101/ UEEE-201	Basic Electrical Engineering	L	T	P	3 Credits
		3	0	0	

Objectives: The expected student learning outcomes of this goal are to graduate engineers who have:

a) The ability to apply science, engineering science, and mathematics to solve engineering problems.

b) The ability to put their engineering and design skills into practice.

c) The ability to use industrial-quality laboratory equipment and engineering software for analysis, testing, design, and communication.

d) The ability to design systems, components, and processes that satisfy predetermined constraints.

e) The ability to put engineering problems, put them in solvable form, and develop and evaluate alternative solutions.

Prerequisites of the course: Concepts of electricity and Magnetism, Electromagnetic Induction,

Course Outcome		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.	K3
CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits.	K4
CO3	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.	K4
CO4	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.	K2
CO5	Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.	K2, K3

KL-Bloom's Knowledge Level (K1, K2, K3, K4, K5, and K6)
K1–Remember K2–Understand K3–Apply K4–Analyze K5–Evaluate K6–Create

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Detailed contents:

UNIT 1: DC Circuits **[08]**

Concept of potential difference, current, resistance. Ohm's law, effect of temperature on resistance. Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

UNIT - 2: Steady- State Analysis of Single Phase AC Circuits [10]

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits.

UNIT - 3 : Transformers **[08]**

Introduction to magnetism, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer.

UNIT –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems).

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

UNIT –5: Emerging Electrical Trends **[06]**

Types of Batteries, Characteristics for Batteries,Basic Concept of Solar Photo-Voltaic Cell, Types of PV- Cells. Installation of Solar Panel.

Text Books:

1. RituSahdev, "Basic Electrical Engineering", Khanna Publishing House.
2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

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UEEE-151/ UEEE-251	Basic Electrical Engineering Lab	L	T	P	1 credit
		0	0	2	

Course Outcome		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Apply Kirchhoff's Voltage and Current Laws (KVL/KCL) and network theorems (Superposition and Thevenin's) to DC electrical circuits through experimental validation.	K3
CO2	Analyze the behavior of AC circuits and measure power and power factor in single-phase and three-phase systems using wattmeters and capacitors.	K3, K4
CO3	Demonstrate and interpret the B-H curve characteristics of ferromagnetic materials using CRO.	K3, K4
CO4	Calculate the efficiency of a single-phase transformer and a DC shunt motor using load test data.	K3, K5
CO5	Perform and explain the working principle of a Solar Photo-Voltaic Cell through a basic laboratory experiment.	K2, K3

LIST OF EXPERIMENTS

Note: A minimum of eight experiments from the following should be performed.

1. Verification of Kirchhoff's laws.
2. Verification of Superposition and Thevenin's Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 1- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
6. Determination of parameters of ac single phase series RLC circuit.
7. To observe the B-H loop of a ferromagnetic material in CRO.
8. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
9. Determination of efficiency of a dc shunt motor by load test.
10. To study the basic Concept of Solar Photo-Voltaic Cell.

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UECE-101/ UECE-201	BASIC ELECTRONICS ENGINEERING	3 L: 0 T: 0 P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To understand basics of semiconductor, devices and their applications in different areas	K1 , K2
CO2	To implement and understand different biasing techniques of BJTs, FETs, and operational amplifiers	K2 K3
CO3	To analyze output in different operating modes of different semiconductor devices	K4
CO4	To implement circuits and evaluate different parameters of electronic devises	K5
CO5	To compare design issues, advantages, disadvantages and limitations of basic electronics	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit -1: Semi-conductors and Diodes	**10**
Conductors, Semiconductors, Intrinsic Semiconductors, Extrinsic Semi Conductors. Diode Theory: Basic Ideas, The ideal Diode, Forward and Reverse Bias, Diode Equation, Volt-Ampere Characteristic. Special diodes: symbol of Zenner diode, operation, V-I characteristics, symbol of photo diode, working principle, LED symbol and principle. Diode break down and capacitances	
Unit-2: Applications of Diodes	**6**
Half-wave Rectifier, Full-wave and Bridge Rectifier, derivation of Ripple factor, efficiency of Half-wave, full-wave and Bridge rectifiers, Merits and demerits of Half-wave, full-wave and Bridge rectifiers, Comparisons of rectifiers, Clippers and Clampers	
Unit-3: Bipolar Junction Transistors	**8**
Symbols of p-n-p and n-p-n transistors and their working principles, Transistor currents, input and output characteristics of Common base configuration, Common Emitter configuration Transistor Switch, Amplifiers: working principles of Common base amplifier, Common Emitter amplifier, Common collector amplifier and their applications	
Unit 4: Field Effect Transistors	**8**

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Classification of FET – Comparative study of BJT and JFET – Merits and demerits of FET – Construction of JFET – JFET Characteristics – MOSFET (Enhancement & Depletion), working and IV characteristics	
Unit 5: Operational Amplifiers and Electronics Instruments	**8**
Introduction to OP-amp, Op-amp Block Diagram, ideal and practical Op-amp specifications, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Output off set voltages & currents, slew rates, CMRR, PSRR. Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Comparators. **Introduction to Electronic Instruments:** CRO, Multi meter, Signal Generators.	

Text Books:

1. Electronic Principles, Albert Malvino and David J Bates, 7th Edition, Tata McGraw–Hill.
2. Electronic Devices and Circuits Theory, Boyelstad, Pearson Education, 8thEdition, September 2011.
3. Op-Amps and Linear Integrated Circuits, - RamakanthA.Gayakwad,PHI,4thEdition, 2009
4. Linear Integrated Circuits–D. Roy Chowdhury, New Age International Pvt. Ltd.,2nd Edition, 2003.

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky,10th Edition(2010), Pearson/PHI
2. Electronic Devices and Circuits, David A. Bell, Oxford, 5th edition, 2009.
3. Electronic Devices and Circuits, S. Salivahanan, Kumar, Vallavaraj,TATAMcGrawHill,2nd Edition, 2003.
4. Operational Amplifiers & Linear ICs, David A Bell, Oxford Uni.Press,3rd Edition,2005.

Spoken Tutorial (MOOCs):

1. http://nptel.ac.in/courses.phphttp://jntuk-coeerd.in/

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UECE-151/ UECE-251	BASIC ELECTRONICS ENGINEERING LAB	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.	K3
CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.	K4
CO3	Perform experiment illustrating BH curve of magnetic materials.	K3
CO4	Calculate efficiency of a single phase transformer and DC machine.	K4
CO5	Understand the principles, operation and application of the basic electronic component/devices and the Characteristics of the active and passive devices. And create a working mini-project	K2, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

LIST OF EXPERIMENTS

Note: A minimum of ten experiments, five from each section from the following should be performed.

(A) Section A

1. Verification of Kirchhoff's laws
2. To assemble and test 5V/9V DC regulated power supply
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two-wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit.
8. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase Transformer
9. Determination of efficiency of a dc shunt motor by load test.
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

(B) Section B

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1. To get familiar with the working of the following instruments:
   a) Cathode ray oscilloscope (CRO)
   b) Multimeter (Analog and Digital)
   c) Function generator
   d) Power supply.
2. a) Plot the forward and reverse V-I characteristics of P-N junction diode
   b) Study of Zener diode in breakdown region
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, V_{dc}.
4. To assemble and test 5V/9V DC regulated power supply.
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Soldering shop: Soldering and disordering of Resistor in PCB. Soldering and disordering of IC in PCB. Soldering and disordering of Capacitor in PCB
7. Micro project (Submit any circuitry on general purpose PCB based on experiment number 2-4)

(C) Experiments available on virtual lab

1. **Kirchhoff's laws. Virtual lab link:** http://vlab.amrita.edu/?sub=3&brch=75&sim=217&cnt=2
2. **Thevenin Theorem. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=75&sim=313&cnt=1
3. **RLC series resonance. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1
4. **Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load. Virtual lab link:** http://vp-dei.vlabs.ac.in/Dreamweaver/measurement.html
5. **Determination of parameters of ac single phase series RLC circuit. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=75&sim=332&cnt=1
6. **To observe the B-H loop of a ferromagnetic material in CRO. Virtual lab link:** https://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=2
7. **Determination of the efficiency of a dc motor by loss summation method (Swinburne's test). Virtual lab link:** http://em-iitr.vlabs.ac.in/exp5/index.php?section=Theory

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UAS-152/ UAS -252	ENGINEERING CHEMISTRY LAB	0L:0T:3P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Get an understanding of the use of different analytical instruments.	K3
CO2	Measure the molecular / system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in the water.	K3
CO3	Measure the hardness and alkalinity of the water.	K3
CO4	Know the fundamental concepts of the preparation of phenol formaldehyde & urea formaldehyde resin, adipic acid and Paracetamol.	K3
CO5	Estimate the rate constant of reaction.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

Instructor may choose any 10 experiments from above and may also change any two of the above.

1. Calibration of Analytical Equipment and apparatus.
2. Determination of Hardness of water sample by EDTA method.
3. Determination of Alkalinity of water sample.
4. Determination of pH by titrimetric method.
5. Determination of surface tension of given liquid.
6. Determination of Viscosity of a given liquid by viscometer.
7. Determination of the strength of Ferrous ammonium sulfate using external indicator.
8. Determination of the strength of Potassium dichromate using internal indicator.
9. Determination of available chlorine in bleaching powder.
10. Determination of chloride content in water sample.
11. Preparation of Phenol formaldehyde (PF) resin.
12. Preparation of Urea formaldehyde (UF) resin.
13. Preparation of Adipic acid / Paracetamol.
14. Determination of Cell Conductance of a solution.
15. Determination of Rate constant of hydrolysis of esters.
16. Element detection and identification of functional groups in organic compounds.

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UAS-103	Engineering Mathematics-I	3L:1T:0P	4 Credits

Objectives:

- To acquaint the student with the essential tools of matrices, eigen values and its application in a Comprehensive-manner.
- To apply the knowledge of differential calculus in the various fields of engineering and have a basic understanding of Beta and Gamma functions and application of Dirichlet's integral.
- To deal with functions of several variables that is essential in optimizing the results of real life problems
- To deal with vector calculus that is required in different branches of Engineering to graduate engineer.

Unit No.	Particulars	Contact Hours
1	**Matrices:** Complex Matrices, Hermitian, Skew-Hermitian and Unitary Matrices, Elementary transformations, Inverse of a matrix, Rank of matrix, Solution of a system of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Linear Dependence and Independence of vectors, Eigen values and Eigen vectors, Linear Transformation and matrix representation, Applications to Engineering problems.	8
2	**Differential Calculus- I:** Successive Differentiation (nth order derivatives), Leibnitz theorem, Partial derivatives, Euler's Theorem for homogeneous functions, Total derivative, Change of variables, Curve tracing.	8
3	**Differential Calculus-II:** Expansion of functions by Taylor's and Maclaurin's theorems for functions of one and two variables, Maxima and Minima of functions of several variables, Lagrange's method of multipliers, Jacobians, Approximation of errors.	8
4	**Multiple integration:** Double integral, Triple integral, change of order of integration, Change of variables, Beta and Gama functions and their properties, Dirichlet's integral and its applications to area and volume, Liouville's extensions of Dirichlet's integral.	8
5	**Vector Calculus:** **Vector differentiation**: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. **Vector Integration**: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications.	8

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Course Outcomes:

	Course Outcome (CO)	Bloom's Level
	At the end of this course, the students will be able to:	
CO 1	Understand the concept of complex matrices, Eigen values, Eigen vectors and applythe concept of rank to evaluate linear simultaneous equations	K2 & K5
CO 2	Remember the concept of differentiation to find successive differentiation,Leibnitz Theorem, and create curve tracing, and find partial and total derivatives	K1,K6 & K5
CO 3	Applying the concept of partial differentiation to evaluate extrema, series expansion,error approximation of functions and Jacobians	K3 &K5
CO 4	Remember the concept of Beta and Gamma function; analyze area and volume and Dirichlet's theorem in multiple integral	K1 & K4
CO 5	Apply the concept of Vector Calculus to analyze and evaluate directional derivative, line, surface and volume integrals.	K3, K4& K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd.,2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House2002.

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
6. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill; Sixth Edition
7. P. Sivaramakrishna Das and C. Vijaya Kumari, Engineering Mathematics, 1st Edition, Pearson Education.
8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

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UAS-203	Engineering Mathematics-II	3L:1T:0P	4 Credits

Objectives:

- To apply the effective mathematical tools for the solutions of differential equations that model physical processes.
- To introduce the basic knowledge of Laplace transform and its applications in solving differential equations.
- To apply the tools for convergence of series and expansion of function using Fourier series for learning advanced Engineering Mathematics.
- To deal with the tools of differentiation and integration of complex functions that are used in various techniques dealing with engineering problems.

Unit No.	Particulars	Contact Hours
1	**Ordinary Differential Equation of Higher Orders:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Solution of second order linear differential equations with variable coefficients by changing independent variable and method of variation of parameters, Cauchy-Euler equation, Application of differential equations in solving engineering problems.	8
2	**Integral Transforms:** Laplace transform, Properties of Laplace Transform, Laplace transform of derivates and integrals, Unit step function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem. Application of Laplace Transform to solve ordinary differential equations and simultaneous differential equations, Z-transform, inverse Z-transform and its application to solve difference equations.	8
3	**Sequence and Series:** Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series by comparison test, D' Alembert's ratio test, Raabe's test, Fourier series, change of interval, half range Fourier sine and cosine series.	8
4	**Complex Variable–Differentiation:** Functions of complex variable, Limit, Continuity and differentiability, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Milne's Thompson Method, Conformal mapping, Mobius transformation and their properties.	8
5	**Complex Variable –Integration:** Complex integration, Cauchy- Integral theorem, Cauchy integral formula, Taylor's and Laurent's series, zeros of analytic functions, singularities and its classification, Residues, Cauchy's Residue theorem and its application to evaluate the real definite integrals $\int_0^{2\pi} f(\sin\theta, \cos\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.	8

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Course Outcomes:

	Course Outcome (CO)	Bloom's Level
At the end of this course, the students will be able to:		
CO 1	Remember the concept differentiation to evaluate LDE of nth order with constant coefficient and LDE with variable coefficient of 2nd order.	K1 &K5
CO 2	Understand and apply the concept of integral transforms to evaluate differential and difference equations	K2 ,K3 & K5
CO 3	Understand the concept of convergence to analyze the convergence of series and expansion of the function for Fourier series.	K2 & K4
CO 4	Apply the concept of analyticity, Harmonic function and create the image offunction applying conformal transformation	K3, K6& K3
CO 5	Apply the concept of Cauchy Integral theorem, Cauchy Integral formula, singularity and calculus of residue to evaluate integrals	K3& K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd.,2008.

2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.

3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House2002.

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

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

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

6. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill; Sixth Edition

7. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.

8. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition,McGraw-Hill.

9. P. Sivaramakrishna Das and C. Vijaya Kumari, Engineering Mathematics, 1st Edition, Pearson Education.

10. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

11. Laplace Transforms by Schaum's series, 2005 Edition, Spiegel Publicaiton.

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UAS-101 / UAS-201	ENGINEERING PHYSICS	3L:1T:0P	4 Credits

Course Objective:

The objective of the course is to understand the basic concepts of nature around us and to synthesize the knowledge from different areas of physics for analysing and solving various critical problems.

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand and apply the principle of conservation of momentum, the theory of relativity.	K1, K2
CO2	To explain the distribution of energy in black body radiation and to understand the difference in particle and wave nature with explanation of Compton effect and Schrodinger wave equation.	K1, K4
CO3	Understand Maxwell's equations of electromagnetic theory with the aim to apply them in a communication system.	K1, K2, K5
CO4	To understand the behavior of waves through various examples/applications of interference and diffraction phenomenon and the concept of grating and resolving power.	K2, K3
CO5	To know the functioning of optical fiber and its properties and applications. To understand the concept, properties and applications of Laser.	K1, K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Relativistic Mechanics	**9**
Inertial and Non- Inertial Frames of references, Galilean transformation equations, Michelson Morley Experiment, Lorentz Transformation equations, Length contraction, Time dilation and its experimental evidence, Relativistic velocity addition formula, Relativistic variation of mass with velocity, Evidence of variation of mass with velocity, Einstein's Mass-Energy equivalence, examples from nuclear physics, Relativistic energy momentum relation.	
Unit-2: Quantum mechanics	
Inadequacy of classical mechanics, Planck's theory of black body radiation(qualitative), Compton effect, de-Broglie concept of matter waves, Davisson and Germer Experiment, Phase velocity and group velocity, Time-dependent and time-independent Schrodinger wave equations, Physical interpretation of wave function, Particle in a one-Dimensional box.	

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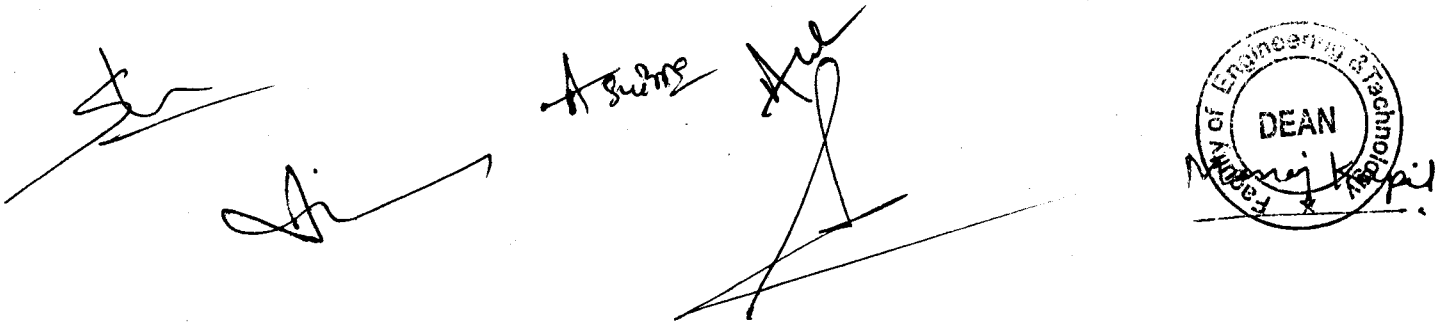
Unit-3: Electromagnetic Field Theory	**8**
Ampere's law and Faraday's law of electromagnetic induction, Derivation of Maxwell's equations and their physical significance, Correction of Ampere's law by Maxwell, Concept of displacement current, Poynting theorem, Maxwell's equations in free space & velocity of electromagnetic waves, Transverse character of the wave and orthogonality of **E**, **H** and **k** vectors, Maxwell's equation in dielectric medium and velocity of e.m. wave, Comparison with free space, Maxwell's equations in conducting media & solution of differential equation in this case, penetration depth & its significance.	
Unit-4: Wave Optics	**10**
Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications, Introduction to diffraction, Fraunhoffer diffraction at single slit and double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power, Rayleigh's criterion of resolution, Resolving power of grating.	
Unit-5: Fiber Optics & Laser	**9**
Fibre Optics: Principle and construction of optical fiber, Acceptance angle, Numerical aperture, Acceptance cone, Step index and graded index fibers, Fiber optic communication principle, Attenuation, Dispersion, Application of fiber. **Laser**: Absorption of radiation, Spontaneous and stimulated emission of radiation, Population inversion, Einstein's Coefficients, Principles of laser action, Solid state Laser (Ruby laser) and Gas Laser (He-Ne laser), Laser applications.	

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Optics - Brijlal & Subramanian (S. Chand)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
4. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
5. Engineering Physics-Malik HK and Singh AK (Mc Graw Hill)



UAS-151/ UAS -251	ENGINEERING PHYSICS LAB	0L:0T:3P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	***Apply*** the principle of interference and diffraction to find the wavelength of monochromatic and polychromatic light.	Apply
CO2	***Compute*** and **analyze** various electrical and electronic properties of a given material by using various experiments.	Analyze
CO3	***Verify*** different established laws with the help of optical and electrical experiments.	Apply
CO4	***Determine*** and ***calculate*** various physical properties of a given material by using various experiments.	Apply
CO5	**Study** and **estimate** the performance and parameter of given equipment by using graphical and computational analysis.	Apply

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.

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4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar & Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (Krishna Prakashan Meerut)

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UVA-102/ UVA-202	Introduction to Generative AI Lab	0L:0T:4P	2 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Describe foundational concepts and architectures of generative AI systems.	K1, K2
CO2	Apply prompt engineering techniques to generate coherent text and multimedia outputs using AI tools.	K3
CO3	Analyze and compare different generative model capabilities (text, image, audio, and video).	K4, K5
CO4	Demonstrate responsible use of generative AI by identifying and mitigating ethical and bias-related issues.	K5, K6
CO5	Design and implement a small-scale generative AI project integrating text and/or media generation.	K3, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit -1: Foundations of Generative AI	4
History and evolution of AI: discriminative vs. generative approaches, High-level survey: GANs, VAEs, Transformers, Diffusion Models, Use-cases: text, art, design, code, audio, simulation, Interactive demo with ChatGPT: Q&A, summarization, brainstorming, Group exercise: Compare outputs from two simple prompts	
Unit-2: Prompt Engineering for Text Generation	4
Anatomy of an effective prompt, Parameters: temperature, max tokens, context window, Techniques: zero-shot, few-shot, chain-of-thought, Common pitfalls and hallucinations, Craft prompts for tasks: email writing, story creation, code snippet generation, Evaluate and refine prompts based on output quality	
Unit-3: Image & Media Generation	4
Text-to-Image models: diffusion vs. GAN-based pipelines, Tools overview: DALL·E, Midjourney, Stable Diffusion, Bing Image Creator, Basics of AI audio/video generation (RunwayML, Synthesia), Create AI-generated images from thematic prompts, Edit or remix generated media into a poster or digital collage	
Unit-4: Ethics, Bias & Responsible AI	4
Understanding bias: data, algorithmic, societal impacts, Deepfakes, misinformation, copyright issues, Privacy and consent in AI-generated content, Governance frameworks and disclosure best practices, Case study analysis: real-world bias example, Debate: labeling requirements for AI-generated media	

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Unit-5: Mini-Project: Creative Application	4
Planning: choose theme, define scope, select tools, Implementation: integrate text and/or media generation, Documentation: explain design choices, ethical safeguards, Project workstations: hands-on coding and prompt tuning, Final presentations: demonstration & peer review	

Recommended Resources

1. Bernard Marr, *Generative AI in Practice: 100+ Applications*, Wiley, 2024.
2. OpenAI Documentation: https://platform.openai.com/docs
3. DALL·E & Stable Diffusion User Guides
4. OpenPromptBook (prompt engineering examples)
5. Articles on AI Ethics: UNESCO, IEEE guidelines

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UHU-201	Professional Communication	2L:0T:0P	2 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand and apply the formal elements of specific genres of Technical communication.	K2, K3
CO2	Understand and apply the formal elements of specific genres of written Technical communication.	K2, K3
CO3	Developing intellectual, personal and professional abilities through effective communication skills	K6
CO4	Analyse and evaluate different styles of spoken technical communication.	K4 & K6
CO5	Understand various elements of communication and create their own style of writing.	K1, K2 & K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Course Objectives:

1. Students will be enabled to understand the correct usage of technical communication.
2. Students will be able to converse well with effective speaking skills in English.
3. Students will be able to learn motivational skills.
4. Student will be able to equip with basics of conversational & social skills and will apply it in their professional as well as personal level.
5. Students will be able to build up personal traits that will make the transition from institution to workplace smoother and help them to excel in their jobs.

Course Content:

Unit	Description	Lectures
Unit-1	**COMMUNICATION SKILLS**	08
	Technical Communication: Introduction to Communication, Definition, Process of Communication & types of communication, Levels of communication, Flows of Communication, Barriers to communication. **Mass Communication**: Print media, Electronic media	
Unit-2	**CONVERSATIONAL & SOCIALSKILLS**	10
	Parts of speech: Review **Advanced Vocabulary:** Antonyms, Synonyms, Homophones, Homonyms, One word substitution, Abbreviations, New word Formation, Prefix and Suffix. **Conversation:** Definition, Speech and Conversation, Rules of Conversation, Conversation and Personality, Importance of Conversation **Social Skills:** Role of Communication; Purposeful Socializing.	

Unit-3	**WRITING AND READING SKILLS**	08
	Letter Writing, Application writing, Report Writing, Paragraph Writing, Précis writing, Reading Comprehension	
Unit-4	**WORK-PLACE SKILLS**	08
	Managing Stress: Techniques: Application of 4A's; Avoid; Alter; Access; Adapt **Resilience:** Flexibility in Thought and Behavior; Tolerance and Self-Belief; Team-Work and Communication; Compassion in Leadership; Communication Skills; Listening and Responding; Speaking Skills; Positive Thinking: Controlling Mind.	
Unit-5	**PRESENTATION SKILLS**	09
	Introduction to oral communication, Nuances and Modes of Speech Delivery, Elements OF Non- verbal Communication: Kinesics, Proxemics, Chronemics, Paralinguistic features of Voice-Dynamics, and Presentation Strategies: planning, preparation, organization, delivery	

Text/Reference Books:

1. Personality Development & Soft Skills: Barun K. Mitra, Oxford University Press, New Delhi, 2012.
2. Technical Communication, (Second Ed.); O.U.P., Meenakshi Raman & S. Sharma, New Delhi, 2011.
3. Personality Development, Harold R. Wallace et.al, Cengage Learning India Pvt. Ltd; New Delhi, 2006.
4. Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Banerji; McMillan India Ltd, Delhi, 1990.
6. Communication Skills for Engineers and Scientists: Sangeeta Sharma et. al., THI Learning Pvt. Ltd, New Delhi, 2011.
7. Public Speaking, William S. Pfeiffer, Pearson, Delhi, 2012.
8. Human Values, A.N. Tripathi, New Age International Pvt. Ltd. Publishers NewDelhi, 2005.
9. Business Communication for Managers, Payal Mehra, Pearson, Delhi, 2012.

Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute
1	ENGLISH LANGUAGE FOR COMPETITIVE EXAMS	PROF. AYSHA IQBAL	IIT MADRAS
2.	TECHNICAL ENGLISH FOR ENGINEERS	PROF. AYSHA IQBAL	IIT MADRAS

Course Outcomes: The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

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UHU-251	Professional Communication Lab	0L:0T:2P	1 Credit

Course Outcomes:

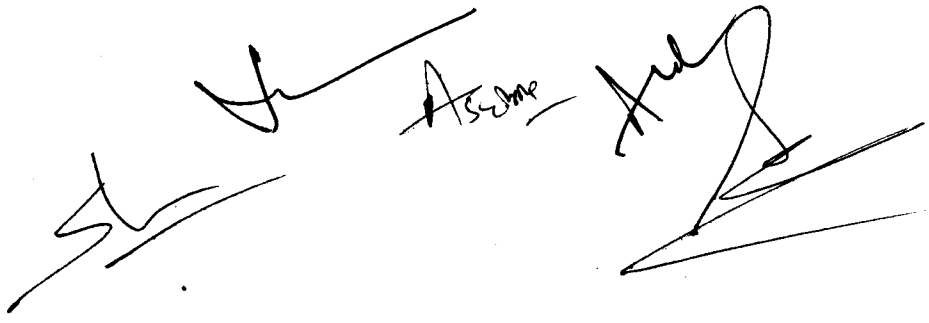
On completion of course the students are able:

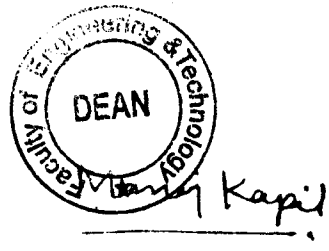
CO	CO Statement	Bloom's Level
CO1	Get familiarized with English vocabulary and language proficiency.	K1, K2
CO2	Improve nature and style of sensible writing, acquire employment and workplace communication skills.	K2, K3
CO3	Improve their Technical Communication Skills through Technical Reading and Writing practices.	K3,K4
CO4	Identify common errors in spoken and written communication.	K4, K5
CO5	Perform well in campus recruitment, engineering and all other general competitive examinations.	K4, K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

1. Introduction to Phonetics- Speech Sounds- Vowels and Consonants.
2. Articles, Prepositions, Word Formation-Prefixes & suffixes, Synonyms & Antonyms.
3. Descriptions- Narrations- Giving directions and guidelines Sequence of Tenses, Question Tags and One Word Substitutes.
4. Extempore- Public Speaking Active and Passive Voice, Common Errors in English, Idioms and Phrases.
5. Information Transfer- Oral Presentation Skills Reading Comprehension and Job Application with Resume Preparation





UCSE-251	Python Programming Lab	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	Execute Python scripts, use I/O, and apply control statements correctly.	K2,K3
CO2	Write and debug functions, including use of modules and lambda expressions.	K3, K4
CO3	Read from/write to files, handle JSON, and manage exceptions.	K3, K4
CO4	Implement simple class□based programs demonstrating inheritance.	K4, K5
CO5	Combine multiple concepts to deliver a small end□to□end Python project.	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

S. No.		Duration
1	**Python Essentials & I/O**	4 Hrs
	Familiarize with interpreter/script modes; use variables, types, operators, basic I/O. • Write scripts interactively and as .py files • Prompt user for input; perform arithmetic • Use f-strings for formatted output	
2	**Control Flow & Logic**	4 Hrs
	Implement branching and loops; solve simple algorithmic problems. • Build a number-guessing game with if/else • Compute series sums with for/while • Print star-patterns	
3	**Functions & Modules**	4 Hrs
	Create reusable functions; explore standard library modules; compare recursive vs. iterative approaches. • Write functions for factorial & Fibonacci • Use math and random modules • Package functions into a module and import it	
4	**File I/O & Exceptions**	4 Hrs
	Read/write text and JSON files; handle errors gracefully. • Parse a CSV or JSON file and extract data • Write processed data to a new file • Wrap file operations in try/except blocks	
5	**OOP Mini-Project333333333**	4 Hrs
	• Define base and derived classes with attributes/methods • Read initial data from file; allow CRUD ops	

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	• Handle invalid input and file errors via exceptions	
	Total	**20 Hrs**

Lab References

1. R. Nageswara Rao, *Core Python Programming*, Dreamtech, 2021
2. Python Software Foundation: https://www.python.org/doc/
3. Jupyter Notebook Docs: https://jupyter.org/documentation

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UCSE-201	Python Programming	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand Python's syntax, data types, and runtime environment.	K1, K2
CO2	Apply decision constructs and looping to implement simple algorithms.	K3
CO3	Develop modular code using functions and standard library modules.	K3, K4
CO4	Perform file I/O and handle exceptions to build robust scripts.	K4, K5
CO5	Design basic object-oriented programs using classes, inheritance, and special methods.	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Python & Development Setup	8
• History & features of Python • Installing Python, IDEs/Notebooks • Interpreter vs. script mode • Primitive data types: numeric, string, boolean • Variables, naming rules, and type conversion • Basic I/O: input(), print(), formatted output • Operators: arithmetic, relational, logical, bitwise, membership	
Unit-2: Control Flow	8
• Conditional statements: if, elif, else • Nested conditions • Looping: for, while • Loop controls: break, continue, pass • Simple algorithm examples (e.g., computing sums, factorial)	
Unit-3: Functions & Modules	8
• Defining functions: parameters, return values, scope • Default, keyword, *args/**kwargs • Anonymous functions: lambda • Organizing code into modules and packages • Using common standard-library modules (math, random, datetime)	
Unit-4: File Handling & Exceptions	8
• Opening/closing files: text and binary modes • Reading/writing files; context manager (with) • JSON serialization/deserialization	

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• Exception hierarchy; try/except/else/finally; raising custom errors	
Unit-5: Object-Oriented Programming	**8**
• Classes and objects; __init__ • Instance vs. class attributes • Methods and the self reference • Inheritance and method overriding • Special methods: __str__, __repr__, operator overloading • Brief look at decorators and generators (conceptual)	

Textbooks & References

1. Reema Thareja, *Python Programming*, OUP, 2021
2. Yashavant Kanetkar, *Let Us Python*, BPB, 2021
3. Charles Dierbach, *Intro to CS Using Python*, Wiley, 2015
4. Official Python Docs: https://docs.python.org/3/
5. Online Tutorials: GeeksforGeeks, Real Python
6. Online practice: HackerRank, LeetCode (basic problems)

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FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
(As per NEP 2020 and AICTE Guidelines)
B.Tech 2nd Year/3rd Semester (IT branch)
w.e.f. academic Session 2026-27

SEMESTER III

S. No.	Course Code	Course Name	Course Domain	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UOE-3**	Science Based Open Elective	ES	3	0	0	20	10	30	-	70	-	100	3
2	UHU-305	Soft Skills*	AEC	3	0	0	20	10	30	-	70	-	100	3
3	UCSE-301	Data Structure using C++	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCSE-302	Computer Organization and Architecture	ES	3	0	0	20	10	30	-	70	-	100	3
5	UCSE-303	Discrete Structures and Theory of Logic	ES	3	0	0	20	10	30	-	70	-	100	3
6	UCSE-351	Data Structure using C++ Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
7	UCSE-352	Computer Organization and Architecture Lab	ES	0	0	2	-	-	-	15	-	35	50	1
8	UVA-301	App Development using Flutter	VAC	0	0	4	-	-	-	15	-	35	50	2
9	UCC-351	Internship Assessment/Mini Project	PROJ	-	-	-	-	-	-	100	-	-	100	2
10	UNC-301	Disaster Management & Preparedness	MC	1	0	2	20	10	30	-	70	-	100	0
			Total										850	22

***May be offered through NPTEL**

Abbreviation Used:

BS: Basic Science Course
ES: Engineering Science Course
HS: Humanities and Social Sciences including Management Course
MC: Mandatory Course

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B.TECH 2nd YEAR

SCIENCE BASED OPEN ELECTIVE COURSES

(Effective from the Session 2026-27)

SEMESTER - III/IV

S.No.	Subject Codes	Subject	To be offered to
1.	UOE-301/ UOE-401	Electric and Hybrid Vehicles	Any Engg. Branch except ME and allied branches
2.	UOE-302/ UOE-402	Automation and Robotics	Any Engg. Branch except ME and allied branches
3.	UOE-303/ UOE-403	Material Science	Any Engg. Branch except ME/CE and allied branches
4.	UOE-304/ UOE-404	Energy Science & Engineering	Any Engg. Branch except EEE and allied branches
5.	UOE-305/ UOE-405	Sensor & Instrumentation	Any Engg. Branch except EEE and allied branches
6.	UOE-306/ UOE-406	Basics Data Structure & Algorithms	Any Engg. Branch except CSE and allied branches
7.	UOE-307/ UOE-407	Basics of Database Management Systems	Any Engg. Branch except CSE and allied branches
8.	UOE-308/ UOE-408	Analog Electronics Circuits	Any Engg. Branch except ECE and allied branches
9.	UOE-309/ UOE-409	Electronics Engineering	Any Engg. Branch except ECE and allied branches
10.	UOE-310/ UOE-410	Digital Electronics	Any Engg. Branch except ECE and allied branches
11.	UOE-311/ UOE-411	Polymer Science and Technology	Any Engg. Branch except Chemical Engg and Chemical Technology and allied branches
12.	UOE-312/ UOE-412	Laser System and Applications	Any Engg. Branch
13.	UOE-313/ UOE-413	Food Science and Nutrition	Any Engg. Branch except Food Technology/ Chemical Technology and allied branches
14.	UOE-314/ UOE-414	Building Science and Engineering	Any Engg. Branch except CE and allied branches

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UOE-302/402	Automation and Robotics	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To learn the concept of automation, its classification and terminology	K1
CO2	To understand the concept of basic principles of Robots.	K2
CO3	To apply knowledge of basics of Robot Programming and robotic Applications	K3
CO4	To understand and analyze the basic elements of Automation in manufacturing.	K2, K4
CO5	Evaluate effectively about robotics engineering technologies, their workings and potential applications.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction to Automation	**8**
Brief history of automation, Requirement of automation systems, classification & level of automation, Industrial Automation, benefits of Industrial Automation, closed loop & open loop system, role of automation in Industry 4.0.	
Unit-2: Introduction to Robotics	**8**
Overview: History, Definition and scope of robotics, laws of robotics, classification, advantages and disadvantages of Robot, applications of robots. **Robot components:** Joints, links, end-effectors, degrees of freedom, brief introduction to forward and inverse kinematics. **Robot Ethics:** Social impact of robots in society, ethical implications of robotics and automation.	
Unit-3: Industrial Automation Architecture	**8**
Input Devices: Transducers &sensors, Classification of sensors and applications. **Controllers:** Classification of controllers in Industrial Automation, principles of hard wire system and PLC, Types of PLC, I/O: Analog and Digital, Ladder programming for logic functions. **Actuators:** Basics of Hydraulic, Pneumatic and Electric actuators, merits and demerits.	
Unit-4: Automation in Manufacturing	**8**
Fundamentals of Computer Integrated Manufacturing, elements of a CIM system, benefits of CIM, types of automation in production system, fundamentals of Group Technology and Flexible Manufacturing System. Types and components of FMS.	
Unit-5: Industrial Applications	**8**
Industrial Applications of Automation and Robotics for material handling, welding, Spray painting, medical, mining, space, defence, security, domestic, entertainment.	

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Text Books

1. Gary Dunning, "Introduction to Programmable Logic Controllers" Thomson Learning, 2001.
2. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2011. 5.Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015
3. Introduction to Robotics (Mechanics and control), Niku, Wiley 2013.
4. Introduction to Robotics by S K Saha, McGraw Hill Education
5. R K Mittal and I J Nagrath, "Robotics and Control", Tata McGraw Hill, New Delhi,2003.

Reference books

1. Introduction to Robotics (Mechanics and control), J.J.Craig Pearson Education Asia 2002.
2. Program logic controllers, W.Bolton ,Elsevier 2009.

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UHU-305/405	Soft Skills	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To understand the importance of soft skills in personal and professional contexts	K1, K2
CO2	To apply effective communication skills in diverse situations	K3
CO3	To create strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading and writing.	K4, K6
CO4	To deliver engaging presentations with confidence at work place and maintain positive relationships with peers and colleagues	K3, K5
CO5	To build up personal and professional traits that will make the transition from institution to workplace smoother and help them to excel in their jobs.	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction to Soft Skills	**8**
• Meaning and Aspects of Soft Skills • Soft skills and Personality Development • Effective Communication Skills • Telephonic Communication Skills • Positive Thinking • Listening Skills, Types of Listening	
Unit-2: Negotiation vs. Communication Skills	**8**
• Meaning and definition of Negotiation Skill • Culture as Communication • Classification of Communication • Communicating without Words : Paralanguage, Proxemics, Haptics • Meta-communication • Organizational Communication • Communication Breakdown • Group Communication Skills	
Unit-3: Advanced Writing Skills	**8**
• Principles of Business Writing • Business Letters: Format and Style, Types of Business Letter • Writing Reports, Types of Report, Strategies for Report Writing, • Evaluation and Organization of Data	

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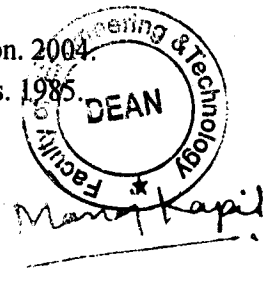
Unit-4: Advanced Presentation Skills	8
• Oral Presentation: Planning & Preparation • Speeches & Debates, Combating Nervousness • Patterns & Methods of Presentation • Making Effective Presentations • Speeches for Various Occasions	
Unit-5: Work- place skills	**8**
• Interviews, Planning & Preparing: • Drafting Effective Résumé • Facing Job Interviews • Emotional Intelligence & Critical Thinking	

Course Objectives:

1. To understand the aspects of soft skills for personal and professional world
2. To cultivate leadership qualities and teamwork abilities in the organization.
3. To develop effective communication skills, including verbal, non-verbal, and written communication.
4. To refine presentation and public speaking skills.
5. To develop work place skills for seeking good job opportunities.

Books and references

1. Butterfield, Jeff. Soft Skills for Everyone. New Delhi: Cengage Learning. 2010.
2. Chauhan, G.S. and Sangeeta Sharma. Soft Skills. New Delhi: Wiley. 2016.
3. Goleman, Daniel. Working with Emotional Intelligence. London: Banton Books. 1998.
4. Hall, Calvin S. et al. Theories of Personality. New Delhi: Wiley. rpt. 2011.
5. Holtz, Shel. Corporate Conversations. New Delhi: PHI. 2007.
6. Kumar, Sanajy and Pushp Lata. Communication Skills. New Delhi: OUP. 2011.
7. Lucas, Stephen E. The Art of Public Speaking. McGraw-Hill Book Co. International Edition, 11th Ed. 2014.
8. Penrose, John M., et al. Business Communication for Managers. New Delhi: Thomson South Western. 2007.
9. Sharma, R.C. and Krishna Mohan. Business Correspondence and Report Writing. New Delhi: TMH. 2016.
10. Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. New Delhi: PHI Learning. 2009, 6th Reprint 2015.
11. Thorpe, Edgar and Showick Thorpe. Winning at Interviews. Pearson Education. 2004.
12. Turk, Christopher. Effective Speaking. South Asia Division: Taylor & Francis. 1985.



UCSE-301	Data Structure using C++	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand and apply the concepts of programming in C++	K_1, K_2
CO2	Understand data structure and implement arrays and linked lists using C++	K_2, K_3
CO3	Implementation of Stack, Queue and discuss the computational efficiency of the sorting and searching algorithms.	K_2 , K_3, K_4
CO4	Implementation of Trees and Graphs and perform various operations on these data structure.	K_3
CO5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	K_5, K_6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Introduction to C++: Basic Concepts of Object Oriented Programming, C++ Program Structure, Data Types, Tokens, Input/Output Streams, Dynamic Memory Allocation with new and delete, Control Structures, Function Prototyping, Call by Reference, Function Overloading, A Simple Class and Object, Accessing members of class, Initialization of class objects: (Constructor, Destructor), Inheritance example, Objects as Function Arguments, Member functions defined outside the class.	
Unit-2:	**8**
Introduction to Data Structure: Types, Operations on Data Structures, Built in and User Defined Data Structures, Applications of Data Structure, Algorithm Analysis, Worst, Best and Average Case Analysis, Notations of Space and Time Complexity, Basics of Recursion. **Arrays**: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Sparse Matrices. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	
Unit-3:	**8**
Stacks: Stack operations: Push & Pop, Array and Linked Implementation of Stack in C++, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Problem solving using iteration and recursion with examples such as Binary search, Fibonacci series, and Hanoi towers. Tradeoffs between iteration and recursion. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues,	

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Array and linked implementation of queues in C, Dequeue and Priority Queue. **Searching:** Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. **Sorting:** Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	
Unit-4:	**8**
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree, Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertion , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps	
Unit-5:	**8**
Graphs: Basic terminology, Data Structure for Graph Representations: Adjacency Matrices, Adjacency.List, Adjacency Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	

Reference Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI LearningPrivate Limited, Delhi India.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
3. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
5. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
6. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
7. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications",McGraw Hill.

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UCSE-302	Computer Organization and Architecture	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Study of the basic structure and operation of a digital computer system.	K_1, K_2
CO2	Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.	K_2, K_4
CO3	Implementation of control unit techniques and the concept of Pipelining	K_3
CO4	Understanding the hierarchical memory system, cache memories and virtual memory	K_2
CO5	Understanding the different ways of communicating with I/O devices and standard I/O interfaces	K_2, K_4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.	
Unit-2:	**8**
Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers	
Unit-3:	**8**
Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	
Unit-4:	**8**
Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks **Virtual memory**: concept implementation.	
Unit-5:	**8**
Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	

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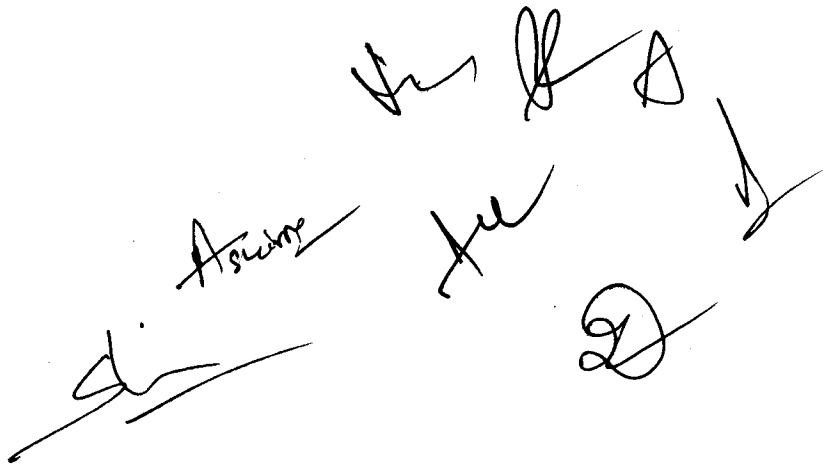
Reference Books:

1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books
4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed IndiaPrivate Limited, Fifth edition, 2012
7. Structured Computer Organization, Tannenbaum(PHI)



UCSE-303	Discrete Structures and Theory of Logic	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Acquire Knowledge of sets and relations for solving the problems of POSET and lattices.	K3, K4
CO2	Apply fundamental concepts of functions and Boolean algebra for solving the problems of logical abilities.	K1, K2
CO3	Employ the rules of propositions and predicate logic to solve the complex and logical problems.	K3
CO4	Explore the concepts of group theory and their applications for solving the advance technological problems.	K1, K4
CO5	Illustrate the principles and concepts of graph theory for solving problems related to computer science.	K2, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Set Theory& Relations: Introduction, Combination of sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. **POSET & Lattices**: Hasse Diagram, POSET, Definition & Properties of lattices – Bounded, Complemented, Distributed, Modular and Complete lattice.	
Unit-2:	**8**
Functions: Definition, Classification of functions, Operations on functions. Growth of Functions. **Boolean Algebra:** Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps.	
Unit-3:	**8**
Theory of Logics: Proposition, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.	
Unit-4:	**8**
Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets,Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	
Unit-5:	**8**

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Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. **Combinatorics**: Introduction, Counting Techniques, Pigeonhole Principle	

Reference Books:

1. Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill,2006.
2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.
3. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004
5. Liptschutz, Seymour, " Discrete Mathematics", McGraw Hill.
6. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill.
7. Deo,7.Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.
8. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi

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UCSE-351	Data Structure using C++ Lab	0L:0T:2P	1 Credit

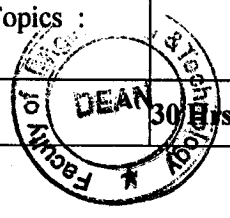
Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To identify the appropriate data structure for given problem.	K1,K2
CO2	To implement arrays and linked list data structures using C++	K3
CO3	To implement and analyze various searching and sorting techniques using C++	K3, K4
CO4	To implement and evaluate array and linked implementation of stacks and queues using C++	K3, K5
CO5	To create applications using trees and graphs in C++	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

S. No.		Duration
1	**Implementing Array and Linked List**	6 Hrs
	Array: Various operations on Array **Linked List**: Singly Linked Lists, Circular Linked List, Doubly Linked Lists : Insert, Traverse, Delete, Search, Count, Reverse(SLL), Polynomial , Addition , Comparative study of arrays and linked list	
2	**Implementing Searching and Sorting Techniques**	6 Hrs
	Searching: Linear search, Binary search, Methods for Hashing **Sorting:** Bubble Sort, Insertion Sort, Selection Sort, Shell , Sort, Radix Sort, Quick sort	
3	**Implementing Stacks and Queue**	6 Hrs
	Stacks: Array implementation, Linked List implementation, Evaluation of postfix expression and balancing of parenthesis , Conversion of infix notation to postfix notation **Queue**: Linked List implementation of ordinary queue, Array implementation of circular queue, Linked List implementation of priority queue, Double ended queue	
4	**Implementing Trees**	6 Hrs
	Binary search tree : Create, Recursive traversal: preorder, post order, in order, Search Largest , Node, Smallest Node, Count number of nodes, **Heap**: Min Heap, Max Heap: reheap Up,reheap Down, Delete , Expression Tree, Heapsort	
5	**Implementing Graphs**	6 Hrs
	Represent a graph using the Adjacency Matrix, BFS, Find the minimum spanning tree (using any method Kruskal's Algorithm or Prim's Algorithm) Self Learning Topics : Shortest Path Algorithm	
	Total	30 Hrs



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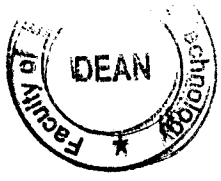
Reference Books:

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
2. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.
3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.



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UVA-301/ UVA-401	App Development using Flutter	0L:0T:4P	2 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand the fundamentals of Flutter framework and Dart programming language.	K2
CO2	Design user interfaces using Flutter widgets and layouts.	K3
CO3	Develop cross-platform mobile applications using Flutter components and state management.	K3, K4
CO4	Implement database, API integration, and testing techniques in Flutter applications.	K4, K5
CO5	Deploy and publish Flutter applications for Android and iOS platforms.	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

S. No.		Duration
1	**Introduction to Flutter**	6 Hrs
	Introduction to mobile app development, Flutter framework overview, installation and setup of Flutter SDK, Android Studio and VS Code configuration, project structure, Dart basics, widgets, stateless and stateful widgets, layouts, rows, columns, containers, text, images, buttons, gestures, running Flutter applications.	
2	**Flutter UI Design**	6 Hrs
	Scaffold widget, app bar, navigation drawer, forms, text fields, lists and grids, cards, themes, icons, navigation and routing, responsive UI design, custom widgets, handling user inputs, Flutter packages and dependencies.	
3	**State Management and Database**	6 Hrs
	Introduction to state management, setState(), Provider basics, Flutter packages, local storage and shared preferences, SQLite database concepts, JSON parsing, working with REST APIs, fetching and displaying data from APIs, asynchronous programming in Flutter.	
4	**Testing and Deployment**	6 Hrs
	Widget testing, debugging Flutter applications, performance optimization, app publishing process, generating APK files, deployment on Android Play Store and iOS App Store, introduction to Firebase integration, best practic	

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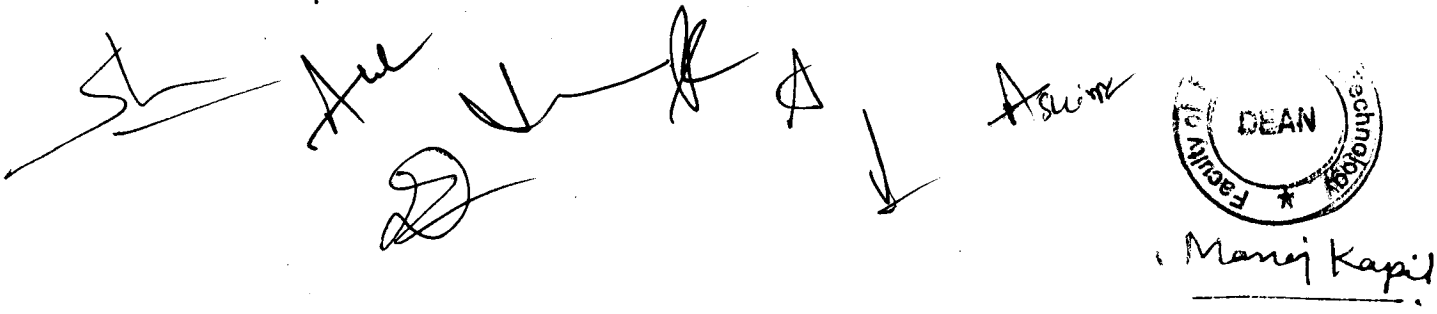
	in Flutter app development.	
	Total	**24 Hrs**

List of Experiments (Indicative & not limited to)

1. Install Flutter SDK and create a simple "Hello Flutter" application.
2. Design a user interface using Flutter widgets such as Text, Image, Row, Column, and Container.
3. Create a Flutter application using StatelessWidget and StatefulWidget.
4. Design a login and registration form using Flutter form widgets and validations.
5. Develop a navigation-based Flutter app using routes and navigation drawer.
6. Create a to-do list or notes application using ListView and Card widgets.
7. Implement state management using setState() and Provider package.
8. Create a Flutter application that consumes REST API data and displays it in list format.
9. Develop a simple Flutter app using SQLite or shared preferences for local data storage.
10. Build and deploy a mini-project such as Quiz App, Weather App, Expense Tracker, Portfolio App, or Student Management System using Flutter.

Reference Books:

1. Flutter Complete Reference, Alessandro Biessek, *Flutter Complete Reference*, Packt Publishing.
2. Beginning Flutter, Marco L. Napoli, *Beginning Flutter: A Hands-On Guide to App Development*, Wiley.
3. Flutter for Beginners, Alessandro Biessek, *Flutter for Beginners*, Packt Publishing.
4. Programming Flutter, Carmine Zaccagnino, *Programming Flutter*, Pragmatic Bookshelf.
5. Flutter Documentation
6. Flutter GitHub Repository



UCSE-352	Computer Organization and Architecture Lab	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To implement adder and conversion circuits using basic gates	K2, K3
CO2	To implement the converter circuits using basic gates.	K3
CO3	To analyze and evaluate the working of Multiplexers and Flip Flops	K4, K5
CO4	To understand the various circuits for ALU, data path and control units.	K6
CO5	To Implement a simple instruction set computer	K3, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments (Indicative & not limited to)

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its registertransfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

Reference Books:

1. Computer System Architecture: By M. Morris Mano.
2. Structured Computer Organization: By Tanenbaum.
3. Computer Organization: By Stallings.
4. Computer Architecture and Organization: By Hayes.

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FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
(As per NEP 2020 and AICTE Guidelines)
B.Tech 2nd Year/3rd Semester (IT branch)
w.e.f. academic Session 2026-27

SEMESTER IV

S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UAS-403	Engineering Mathematics-III	BS	3	0	0	20	10	30	-	70	-	100	3
2	UAS-404	Environmental Science	AEC	3	0	0	20	10	30	-	70	-	100	3
3	UCSE-401	Operating System	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCSE-402	Theory of Automata and Formal Languages	ES	3	0	0	20	10	30	-	70	-	100	3
5	UCSE-403	Object Oriented Programming with Java	ES	3	0	0	20	10	30	-	70	-	100	3
6	UCSE-451	Operating System Lab	ES	0	0	2	-	-	-	15	-	35	50	1
7	UCSE-452	Object Oriented Programming with Java Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
8	UVA-402	Web Designing	VAC	0	0	4	-	-	-	15	-	35	50	2
9	UHU-401	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	HS	3	0	0	20	10	30	-	70	-	100	3
Total													**750**	**23**

Abbreviation Used:

BS: Basic Science Course
ES: Engineering Science Course
HS: Humanities and Social Sciences including Management Course
MC: Mandatory Course

Summer Internship (4-6 weeks) during summer break after Semester-IV and same will be assessed/ evaluated in the Semester-V

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UAS-303/403	Engineering Mathematics-III	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand the concept of partial differential equation and to solve partial differential equations and analyze the concept of partial differential equations.	K1, K3, K4 & K5
CO2	Understand the concept of curve fitting. Correlation and regression.	K2
CO3	Understand the concept of probability to evaluate probability distributions and apply the concept of hypothesis testing	K1, K2, K3 & K5
CO4	Understand the concept of transcendental and polynomial equations and interpolation	K2
CO5	Analyze the concept the numerical differentiation and integration that are used in dealing with various engineering problems	K4 & K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Partial Differential Equations	**8**
Formation of partial differential equations, Linear and Non-Linear Partial Equations of first order, Lagrange's linear PDE, solution of first order linear and non-linear PDEs by Charpit's method, Solution of homogenous and non-homogenous linear partial differential equations of second and higher orders with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.	
Unit-2: Statistical Techniques I	**8**
Measures of central tendency, Measures of dispersion, Curve Fitting, Method of least squares, Fitting of straight lines, Correlation and regression analysis.	
Unit-3: Statistical Techniques II	**8**
Probability and Distribution: Introduction, Addition and multiplication law of probability, Discrete and Continuous Probability distributions: Binomial, Poisson and Normal distributions. **Sampling, Testing of Hypothesis:** Introduction, Sampling Theory (Small and Large), Hypothesis, Null hypothesis, Alternative hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, Student's t-test and Chi-square test.	
Unit-4: Numerical Techniques - I	

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Zeroes of transcendental and polynomial equations using Bisection method, Regula – Falsi method and Newton – Raphson method. **Interpolation:** Newton's forward and backward difference formulae, Lagrange's interpolation formula andNewton's divided difference formula for unequal intervals.	
Unit-5: Numerical Techniques - II	**8**
Numerical solution of system of linear equations by Jacobi method and Gauss- Seidel method. Numerical differentiation, Numerical integration by trapezoidal rule, Simpson's one-third and three-eight rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's and fourth-order Runge- Kutta methods.	

Reference Books:

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Dehli.
2. Peter V. O'Neil, "Advance Engineering Mathematics", SI Edition 8th Edition, Cengage Learning, 2017.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2017.
4. S. S. Sastry, "Introductory methods of Numerical solutions", 4th Edition , Prentice Hall of India.
5. Erwin Kreyszig , "Advanced Engineering Mathematics", John Wiley Publications, 1999.
6. R.K.Jain&S.R.K.Iyengar, "Numerical Methods" , New Age International (P) Limited
7. James F. Epperson Mathematical Reviews "An Introduction To Numerical Methods And Analysis" Second Edition, Wiley; https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf
8. Introduction to Engineering Mathematics Vol. IV: H.K. Das; S. Chand Publications, New Delhi,India.
9. Probability and statistics for Engineers: Johnson. PHI
10. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa PublishingHouse, New Delhi.
11. D.N. Elhance, V. Elhance & B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, New Delhi.

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UAS-304/404	Environmental Science	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand the definition, concept, and scope of environmental science and its multidisciplinary nature. Analyze the relationship between population growth, resource consumption, and sustainable development principles.	K2, K4
CO2	Understand the sources, effects, and control measures of air pollution Evaluate the phenomena of global warming, ozone layer depletion, and acid rain, and their impacts on human communities and agriculture.	K2, K5
CO3	Explore renewable energy sources including geothermal energy, ocean energy, hydroelectricity, and bioenergy. Assess the role of individuals in environmental conservation.	K3
CO4	Understand the concepts of industrial ecology and circular economy. Analyze water quality, reuse, and recycling methods. Identify causes, effects, and control measures of solid waste management, including the 3R's policy and e-waste management.	K2, K4, K6
CO5	Remember the importance of environmental policies and legislation. Familiarize with the legal and regulatory framework for environmental protection.	K1,K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Environmental Concerns-Definition, Concept and Scope, Multidisciplinary approach of environmental sciences. Physical and Biotic Component of environment, Need for public awareness. Concept of ecosystem structure and function. Energy flow in ecosystem: food chain, food web ,Population Growth, and Resource Consumption, Principles of Sustainable Development.	
Unit-2:	**8**
Understanding Air Pollution, Sources , Effect and control measures of Air. Climate Change: Scientific Basis, Mitigation & Adaption, Climate change, Global warming, Ozone layer depletion, acid rain and impacts on human communities and agriculture.	
Unit-3:	**8**
Renewable Energy – I (Solar Energy & Wind Energy) Renewable Energy – II (Geothermal Energy, Ocean Energy, Hydroelectricity, Bioenergy) Role of an individual in conservation of environment. Energy resources: Conventional and Nonconventional resources	

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Unit-4:	**8**
Industrial Ecology & Circular Economy Water Quality, Reuse and Recycling, Solid waste management: causes, effects and control measures, 3R's policy. (including E-waste Management) Noise Pollution, Ecology and Soil Pollution	
Unit-5:	**8**
Environmental Policies and Legislation, ntroduction to legal and regulatory framework. Salient features of The Air (Prevention & Control of Pollution) Act 1981; The Water (Prevention and Control of Pollution) Act, 1974; The Noise Pollution (Regulation and Control) Rules 2000 The Environment (Protection) Act 1986	

BOOKS AND REFERENCES

1. Environmental Science (16th Edition) by G. Tyler Miller, Jr. & Scott E. Spoolman (2017)
2. Living in the Environment: Concepts, Connections and Solutions (19th Edition) by G. Tyler Miller, Jr. & Scott E. Spoolman (2017)
3. Introduction to Engineering & the Environment by Edwards S. Rubin (2001)
4. Introduction to Environmental Engineering and Science by Gilbert M. Masters and Wendell P. Ela (2020)
5. Principles of Environmental Engineering and Science by M. L. Davis and S. J. Masten (2013)
6. Introduction to Environmental Sciences by R. S. Khoiyangbam and N. Gupta(2015)

UCSE-401	Operating System	3L:0T:0P	3 Credits

Course Outcomes:

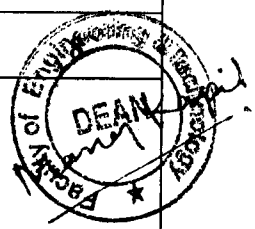
On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand the structure and functions of OS	K_1, K_2
CO2	Learn about Processes, Threads and Scheduling algorithms.	K_1, K_2
CO3	Understand the principles of concurrency and Deadlocks	K_2
CO4	Learn various memory management scheme	K_2
CO5	Study I/O management and File systems.	K_2,K_4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

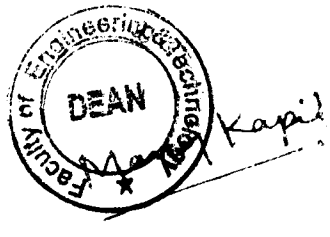
COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction	**8**
Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	
Unit-2: Concurrent Processes	**8**
Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	
Unit-3: CPU Scheduling	**8**
Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	
Unit-4: Memory Management	
Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	
Unit-5: I/O Management and Disk Scheduling	**8**
I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	



Reference Books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition, TMH
5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education



UCSE-402	Theory of Automata and Formal Languages	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars	K4, K6
CO2	Analyze and design, Turing machines, formal languages, and grammars	K4, K6
CO3	Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving	K1, K5
CO4	Prove the basic results of the Theory of Computation.	K2,K3
CO5	State and explain the relevance of the Church-Turing thesis.	K1, K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Basic Concepts and Automata Theory	**8**
Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata.	
Unit-2: Regular Expressions and Languages	**8**
Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages	
Unit-3: Regular and Non-Regular Grammars	
Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	
Unit-4: Push Down Automata and Properties of Context Free Languages	**8**
Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	

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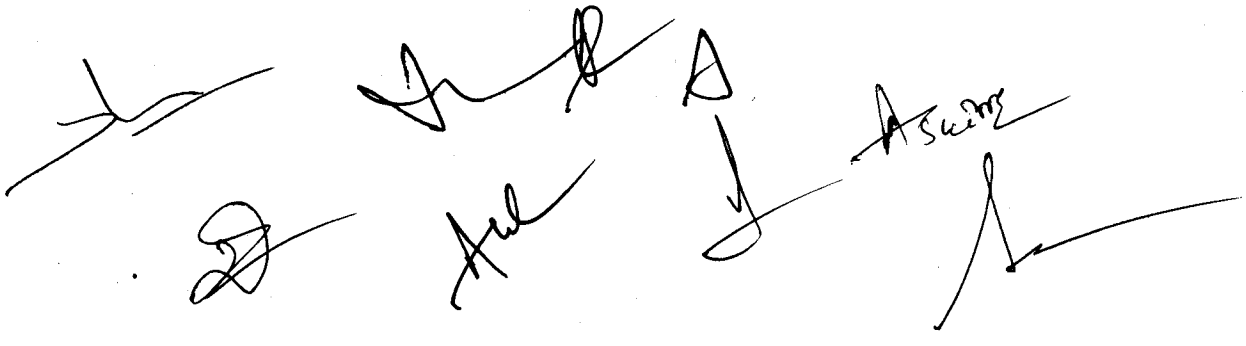
Unit-5: Turing Machines and Recursive Function Theory	8
Basic Turing Machine Model, Representation ofTuring Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory.	

Reference Books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2ndedition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International



UCSE-403	Object Oriented Programming with Java	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand the basics of Java and object-oriented programming concepts using Java	K1, K2
CO2	Understand exception handling, multi-threading in Java and develop packages in Java	K2, K3
CO3	Apply I/O programming, GUI programming with Applet and evaluate the developed applications.	K3, K5
CO4	Implement and analyze java programs with Event Handling and GUI Programming with Swing and JDBC	K3, K_4
CO5	Test web and RESTful Web Services with Spring Boot using Spring Framework concepts and create Web Application using Spring Framework	K_5, K_6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Introduction: Introduction of Java, Java Environment, Java Source File Structure, and Compilation. Fundamental, Tokens, Operator, Data type, Variable, Operators, Control statements, Methods, Arrays, String. **Object-Oriented programming concepts:** Basics of objects and classes, Constructors, Access Specifies, Static Members, Final Members, Visibility modifiers, Methods and objects. Inheritance and Polymorphism: Inheritance, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Abstract class, Interface.	
Unit-2:	**8**
Multithreading: Thread, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Inter-thread Communication. **Packages:** Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention for Packages. **Exception Handling**: The Idea behind Exception, Exceptions & Errors, Types of Exception, Control Flow in Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions, Checked and Un-Checked Exceptions.	
Unit-3:	**8**
Java I/O programming: The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file, Text and Binary I/O. **GUI programming with Applet**: Java Applet, Life cycle of an applet, Event handling,	

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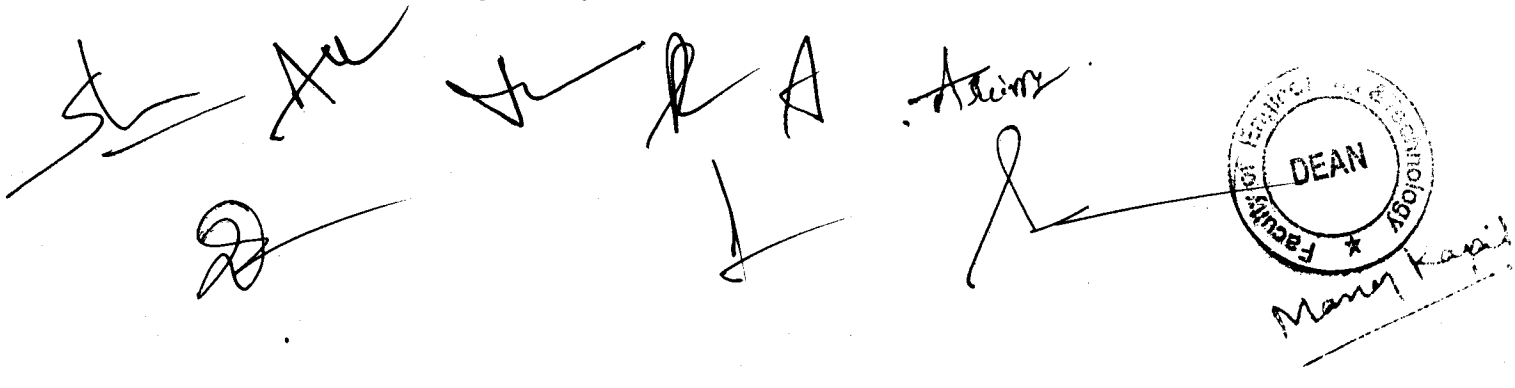
Introduction to AWT, AWT controls, Layout managers, String handling. **Event Handling:** The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.	
Unit-4:	**8**
GUI Programming with Swing: Introduction, limitations of AWT, MVC architecture, Components, Containers, Exploring swing- JApplet, JFrame and JComponent, Icons and Labels, Text fields, Buttons –The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. **Java Database Connectivity (JDBC):** Merging data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	
Unit-5:	**8**
Spring Framework: Spring Core Basics-Spring Dependency Injection concepts, Spring Inversion of Control, AOP, Bean Scopes- Singleton, Prototype, Request, Session, Application, Web Socket, Auto wiring, Annotations, Life Cycle Call backs, Bean Configuration styles **Spring Boot:** Spring Boot Build Systems, Spring Boot Code Structure, Spring Boot Runners, Logger, Building RESTful Web Services, Rest Controller, Request Mapping, Request Body, Path Variable, Request Parameter, GET, POST, PUT, DELETE APIs, Build Web Applications	

Reference Books:

1. Herbert Schildt, "Java The complete reference", McGraw Hill Education
2. Craig Walls, "Spring Boot in Action" Manning Publication
3. Steven Holzner, "Java Black Book", Dreamtech.
4. Balagurusamy E, "Programming in Java", McGraw Hill
5. Java: A Beginner's Guide by Herbert Schildt, Oracle Press
6. Greg L. Turnquist "Learning Spring Boot 2.0 - Second Edition", Packt Publication
7. AJ Henley Jr (Author), Dave Wolf, "Introduction to Java Spring Boot: Learning by Coding",Independently Published



UCSE-451	Operating System Lab	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Ability to implement the scheduling algorithms	K1, K2
CO2	Ability to implement interprocess communication between the two processes	K2,K3
CO3	Ability to solve and design synchronization problems	K4
CO4	Ability to develop solutions for synchronization problems using semaphores	K4,K5
CO5	Ability to simulate and implement OS concepts such as deadlock management	K3,K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments (Indicative & not limited to)

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP,WINDOWS7/8)
2. Implement CPU Scheduling Policies:
   i. SJF
   ii. Priority
   iii. FCFS
   iv. Round Robin
   v. Multi-level Queue
3. Implement file storage allocation technique:
   i. Contiguous(using array)
   ii. Linked –list(using linked-list)
   iii. Indirect allocation (indexing)
4. Implementation of contiguous allocation techniques:
   i. Worst-Fit
   ii. Best- Fit
   iii. First- Fit
5. Calculation of external and internal fragmentation
   i. Free space list of blocks from system
   ii. List process file from the system
6. Implementation of compaction for the continually changing memory layout and calculate total movementof data
7. Implementation of resource allocation graph RAG)
8. Implementation of Banker"s algorithm for deadlock prevention and avoidance.
9. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used forstoring graph.
10. Implement the solution for Bounded Buffer (producer-consumer)problem using inter processcommunication techniques-Semaphores
11. Implement the solutions for Readers-Writers problem using inter process communication technique –Semaphore

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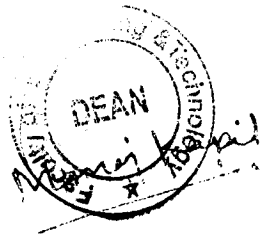
12. Simulate FIFO Page Replacement Algorithm
13. Simulate LRU (least-recently-used) Page Replacement algorithm
14. Simulate Paging technique of memory management.

Reference Books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition, TMH
5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education



UCSE-452	Object Oriented Programming with Java Lab	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To use Java compiler and eclipse platform to write and execute java program based on OOPS.	K3
CO2	To apply the concept of multithreading, exception handling and implementation develop packages in Java.	K3, K4
CO3	To apply the concept of I/O programming, GUI programming with Applet and develop applications.	K3, K6
CO4	To Create and analyze java programs with Event Handling and GUI Programming with Swing and JDBC	K3, K6
CO5	To Develop RESTful web services and web applications using Spring Boot Framework	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments (Indicative & not limited to)

Note: Use Java compiler and eclipse platform to write and execute java program.

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate the Java Database Connectivity
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Swings and event handling
13. Create industry oriented application using Spring Framework.
14. Test RESTful web services using Spring Boot.
15. Test Frontend web application with Spring Boot

Reference Books:

1. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.
2. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.
3. Herbert Schildt, "Java The complete reference", McGraw Hill Education
4. Steven Holzner, "Java Black Book", Dreamtech.
5. Balagurusamy E, "Programming in Java", McGraw Hill

UVA-301/ UVA-401	App Development using Flutter	0L:0T:4P	2 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand the fundamentals of Flutter framework and Dart programming language.	K2
CO2	Design user interfaces using Flutter widgets and layouts.	K3
CO3	Develop cross-platform mobile applications using Flutter components and state management.	K3, K4
CO4	Implement database, API integration, and testing techniques in Flutter applications.	K4, K5
CO5	Deploy and publish Flutter applications for Android and iOS platforms.	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

S. No.		Duration
1	**Introduction to Flutter**	6 Hrs
	Introduction to mobile app development, Flutter framework overview, installation and setup of Flutter SDK, Android Studio and VS Code configuration, project structure, Dart basics, widgets, stateless and stateful widgets, layouts, rows, columns, containers, text, images, buttons, gestures, running Flutter applications.	
2	**Flutter UI Design**	6 Hrs
	Scaffold widget, app bar, navigation drawer, forms, text fields, lists and grids, cards, themes, icons, navigation and routing, responsive UI design, custom widgets, handling user inputs, Flutter packages and dependencies.	
3	**State Management and Database**	6 Hrs
	Introduction to state management, setState(), Provider basics, Flutter packages, local storage and shared preferences, SQLite database concepts, JSON parsing, working with REST APIs, fetching and displaying data from APIs, asynchronous programming in Flutter.	
4	**Testing and Deployment**	6 Hrs
	Widget testing, debugging Flutter applications, performance optimization, app publishing process, generating APK files, deployment on Android Play Store and iOS App Store, introduction to Firebase integration, best practices	

	in Flutter app development.	
	Total	**24 Hrs**

List of Experiments (Indicative & not limited to)

1. Install Flutter SDK and create a simple "Hello Flutter" application.
2. Design a user interface using Flutter widgets such as Text, Image, Row, Column, and Container.
3. Create a Flutter application using StatelessWidget and StatefulWidget.
4. Design a login and registration form using Flutter form widgets and validations.
5. Develop a navigation-based Flutter app using routes and navigation drawer.
6. Create a to-do list or notes application using ListView and Card widgets.
7. Implement state management using setState() and Provider package.
8. Create a Flutter application that consumes REST API data and displays it in list format.
9. Develop a simple Flutter app using SQLite or shared preferences for local data storage.
10. Build and deploy a mini-project such as Quiz App, Weather App, Expense Tracker, Portfolio App, or Student Management System using Flutter.

Reference Books:

1. Flutter Complete Reference, Alessandro Biessek, *Flutter Complete Reference*, Packt Publishing.
2. Beginning Flutter, Marco L. Napoli, *Beginning Flutter: A Hands-On Guide to App Development*, Wiley.
3. Flutter for Beginners, Alessandro Biessek, *Flutter for Beginners*, Packt Publishing.
4. Programming Flutter, Carmine Zaccagnino, *Programming Flutter*, Pragmatic Bookshelf.
5. Flutter Documentation
6. Flutter GitHub Repository

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UHV-401	UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society	K2
CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.	K2,K4
CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society	K2
CO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	K2
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	K3, K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Module 1 – Introduction to Value Education

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: Self-exploration as the Process for Value Education
Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

Module 2 – Harmony in the Human Being

Lecture 7: Understanding Human being as the Co-existence of the Self and the Body
Lecture 8: Distinguishing between the Needs of the Self and the Body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of Self and Body
Lecture 9: The Body as an Instrument of the Self
Lecture 10: Understanding Harmony in the Self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the Self
Lecture 11: Harmony of the Self with the Body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of Self with the Body

Module 3 – Harmony in the Family and Society

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

Module 4 – Harmony in the Nature/Existence

Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics

Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Guidelines and Content for Practice Sessions (Tutorials)

In order to connect the content of the proposals with practice (living), 14 practice sessions have been designed. The full set of practice sessions is available in the Teacher's Manual as well as the website.

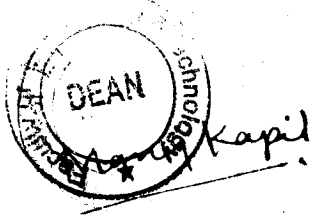
Text Books:

Text Book and Teachers Manual

1. The Textbook - A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1

2. The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53

3. Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.



FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 3rd Year/5th Semester (IT branch)
w.e.f. academic Session 2025-26

SEMESTER V

S. No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KCSE-501	Database Management System	PC	3	0	0	20	10	30	-	70	-	100	3
2	KIT-501	Data Analytics	PC	3	0	0	20	10	30	-	70	-	100	3
3	KCSE-503	Introduction to Cyber Security	PC	3	0	0	20	10	30	-	70	-	100	3
4	KCSE-511-S to KCSE-514-S	Departmental Elective-I * (Bucket of 4 courses from SWAYAM)	PE	3	0	0	20	10	30	-	70	-	100	3
5	KCSE-521 to KCSE-524	Departmental Elective-II	PE	3	0	0	20	10	30	-	70	-	100	3
6	KCSE-551	Database Management System Lab	PC	0	0	2	-	-	-	15	-	35	50	1
7	KIT-551	Data Analytics Lab	PC	0	0	4	-	-	-	15	-	35	50	2
8	KCSE-553	Cyber Security Lab	PC	0	0	2	-	-	-	15	-	35	50	1
9	KCC-551	Internship Assessment/ Mini Project #		-	-	-	-	-	-	200	-	-	200	2
10	KNC-501/ KNC-502	Constitution of India/ Essence of Indian Traditional Knowledge	MC	2	0	0	20	10	30	-	70	-	100	0
Total													**950**	**21**

#The Mini Project and internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester.

*** Will be offered through SWAYAM-NPTEL.**

Abbreviation Used:

PC: Professional Core Course
PE: Professional Elective Course
MC: Mandatory Course

DEAN Faculty of Engineering & Technology

Departmental Elective-I

* A bucket of four (04) courses should be prepared based on the courses offered by SWAYAM in the respective session.

Departmental Elective-II

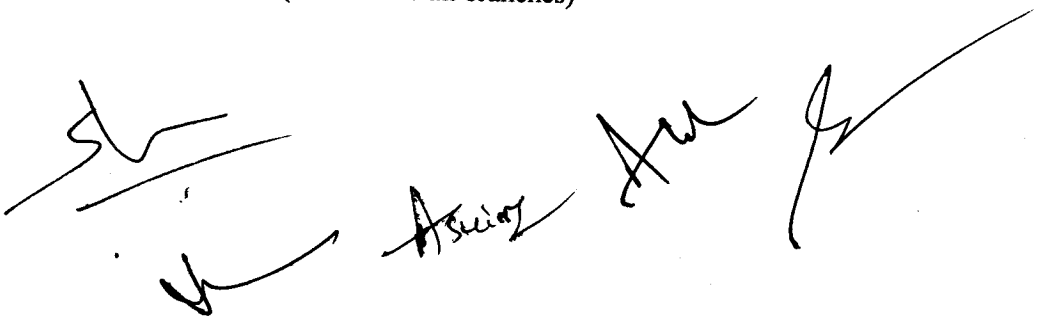
1. KCSE-521 - Software Engineering
2. KCSE-522 - Compiler Design
3. KCSE-523 - Augmented and Virtual Reality
4. KCSE-524 - Image Processing

Departmental Elective-III

* A bucket of four (04) courses should be prepared based on the courses offered by SWAYAM in the respective session.

Open Elective-I

Separate list is attached (common to all branches)



KCSE-501	Database Management System	3L:0T:0P	3 Credits

Course Outcomes:

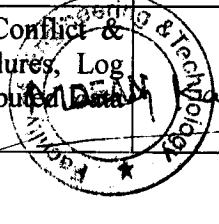
On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Apply knowledge of database for real life applications.	K3
CO2	Apply query processing techniques to automate the real time problems of databases.	K3, K4
CO3	Identify and solve the redundancy problem in database tables using normalization.	K2, K3
CO4	Understand the concepts of transactions, their processing so they will familiar with broad range of database management issues including data integrity, security and recovery.	K2, K4
CO5	Design, develop and implement a small database project using database tools.	K3, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction	**8**
Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	
Unit-2: Relational data Model and Language	**8**
Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	
Unit-3: Data Base Design & Normalization	**8**
Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	
Unit-4: Transaction Processing Concept	**8**
Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	



Unit-5: **Concurrency Control Techniques**	8
Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	

Reference Books:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH

KIT-501	Data Analytics	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Describe the nature, sources, and types of data; and differentiate between phases of the data analytics lifecycle.	K1, K2
CO2	Use R programming to import, manipulate, and visualize structured and unstructured datasets for preliminary analysis.	K2, K3
CO3	Apply appropriate statistical and machine learning models; and analyze their performance to gain insights from data.	K3, K4
CO4	Compare various stream mining techniques and evaluate their suitability for real-time data analytics use cases.	K4, K5
CO5	Design scalable analytics solutions by integrating frequent pattern mining, clustering methods, and Big Data frameworks.	K3, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction to Data Analytics & Data Analytics Lifecycle	**8**
Introduction to Data Analytics: Sources and nature of data, Types of data: structured, semi-structured, unstructured, Characteristics of data, Introduction to Big Data platform, Need for data analytics, Evolution of analytic scalability, Analytics process and tools: analysis vs reporting, Applications of data analytics, **Data Analytics Lifecycle**: Need for a structured lifecycle, Key roles in analytics projects, **Lifecycle phases**: Discovery, Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization.	
Unit-2: Introduction to R Programming for Data Analytics	**8**
Overview of R and its applications in data analytics, R installation and GUI interfaces, Data types, variables, and operators, Data import/export techniques (CSV, Excel, Databases), Data frames, lists, matrices, and vectors, Descriptive statistics and exploratory data analysis using R, Data visualization in R (histograms, boxplots, bar charts, scatter plots), Handling missing data and basic data wrangling, Using R for structured and unstructured data analytics	
Unit-3: Statistical & Machine Learning Methods	**8**
Regression modeling and multivariate analysis, Bayesian modeling and inference, Support vector machines and kernel methods, Time series analysis: linear systems and nonlinear dynamics, Neural networks: learning and generalization, Principal component analysis (PCA), Fuzzy logic: fuzzy models and decision trees	
Unit-4: Data Stream Mining & Real-time Analytics	**8**
Stream concepts and architecture, Stream data models and stream computing, Sampling and filtering streams, Estimating distinct elements and moments, Sliding window and decaying models, Real-Time Analytics Platforms (RTAP), Case	

studies: sentiment analysis, stock predictions	
Unit-5: Frequent Pattern Mining, Clustering & Big Data Frameworks	**8**
Frequent itemset mining: Apriori algorithm, market basket analysis, Counting frequent itemsets in streams, **Clustering techniques**: hierarchical, K-means, high-dimensional clustering (CLIQUE, ProCLUS), Clustering in non-Euclidean space and streaming data, **Big Data frameworks**: MapReduce, Hadoop, Hive, Pig, HBase, NoSQL, HDFS, S3	

Reference Books:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press.
3. John Garrett,Data Analytics for IT Networks : Developing Innovative Use Cases, Pearson Education
4. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with AdvancedAnalytics, John Wiley & Sons.
5. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging BusinessIntelligence and Analytic Trends for Today's Businesses", Wiley
6. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics", EMC Education Series,John Wiley
7. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series
8. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis",Elsevier
9. Michael Berthold, David J. Hand," Intelligent Data Analysis", Springer
10. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise ClassHadoop and Streaming Data", McGraw Hill
11. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer
12. Mark Gardner, "Beginning R: The Statistical Programming Language", Wrox Publication
13. Pete Warden, Big Data Glossary, O'Reilly
14. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons
15. Pete Warden, Big Data Glossary, O'Reilly.
16. Peter Bühlmann, Petros Drineas, Michael Kane, Mark van der Laan, "Handbook of Big Data", CRC Press
17. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier

KIT-501	Data Analytics	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Describe the nature, sources, and types of data; and differentiate between phases of the data analytics lifecycle.	K1, K2
CO2	Use R programming to import, manipulate, and visualize structured and unstructured datasets for preliminary analysis.	K2, K3
CO3	Apply appropriate statistical and machine learning models; and analyze their performance to gain insights from data.	K3, K4
CO4	Compare various stream mining techniques and evaluate their suitability for real-time data analytics use cases.	K4, K5
CO5	Design scalable analytics solutions by integrating frequent pattern mining, clustering methods, and Big Data frameworks.	K3, K6

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Overview of R and its applications in data analytics, R installation and GUI interfaces, Data types, variables, and operators, Data import/export techniques (CSV, Excel, Databases), Data frames, lists, matrices, and vectors, Descriptive statistics and exploratory data analysis using R, Data visualization in R (histograms, boxplots, bar charts, scatter plots), Handling missing data and basic data wrangling, Using R for structured and unstructured data analytics	
Unit-3: Statistical & Machine Learning Methods	**8**
Regression modeling and multivariate analysis, Bayesian modeling and inference, Support vector machines and kernel methods, Time series analysis: linear systems and nonlinear dynamics, Neural networks: learning and generalization, Principal component analysis (PCA), Fuzzy logic: fuzzy models and decision trees	
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Frequent itemset mining: Apriori algorithm, market basket analysis, Counting frequent itemsets in streams, **Clustering techniques**: hierarchical, K-means, high-dimensional clustering (CLIQUE, ProCLUS), Clustering in non-Euclidean space and streaming data, **Big Data frameworks**: MapReduce, Hadoop, Hive, Pig, HBase, NoSQL, HDFS, S3	

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9. Michael Berthold, David J. Hand," Intelligent Data Analysis", Springer
10. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise ClassHadoop and Streaming Data", McGraw Hill
11. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer
12. Mark Gardner, "Beginning R: The Statistical Programming Language", Wrox Publication
13. Pete Warden, Big Data Glossary, O'Reilly
14. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons
15. Pete Warden, Big Data Glossary, O'Reilly.
16. Peter Bühlmann, Petros Drineas, Michael Kane, Mark van der Laan, "Handbook of Big Data", CRC Press
17. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier

KCSE-503	Introduction to Cyber Security	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Explain core principles of cybersecurity, risk management, and network defense mechanisms.	K1, K2
CO2	Analyze cyber threats, cyber crimes, and legal frameworks governing information security.	K2, K4
CO3	Apply cryptographic algorithms, IAM protocols, and cloud security best practices.	K2, K3
CO4	Conduct ethical hacking and penetration testing using industry tools and methodologies.	K2, K3
CO5	Evaluate incident response processes, digital forensics techniques, and emerging trends.	K1, K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Foundations of Cyber Security & Network Defense	**8**
Introduction to Cybersecurity: Cyberspace, CIA Triad (Confidentiality, Integrity, Availability), Threat Landscape, Attack Vectors, Vulnerability vs Exploit, **Risk Management**: Asset Inventory, Risk Assessment (Qualitative & Quantitative), Controls, **Networking Basics**: TCP/IP Model, Common Protocols, Network Attack Vectors (ARP Spoofing, DNS Poisoning, DDoS), **Network Security**: Firewalls (Packet Filter, Stateful, Proxy), IDS/IPS (Signature vs Anomaly-based), Deployment Strategies, **Case Study**: Twitter 2020 Network Intrusion & Mitigation.	
Unit-2: Cyber Crimes, Cyber Law & Application Security	**8**
Cyber Crimes: Types (Targeting Systems, Financial Frauds, Social Engineering, Ransomware), Zero-Day Exploits, **Legal Framework**: IT Act 2000 & Amendments, Reporting Platforms, International Cyber Laws, **Application Security**: OS Hardening (Windows/Linux), Patch Management (CVE Lifecycle), Malware Defenses (AV, EDR, Sandboxing), **Web Application Security**: OWASP Top 10, Secure SDLC, Authentication Flaws, Session Management.	
Unit-3: Cryptography, Identity & Cloud Security	**8**
Cryptography: Symmetric (AES), Asymmetric (RSA, ECC), Hash Functions, Digital Signatures, PKI, Key Management, **Identity & Access Management**: Kerberos, LDAP, OAuth 2.0, SAML, Single Sign-On (SSO), **Cloud Security**: IaaS/PaaS/SaaS, Shared Responsibility Model, Cloud Attack Vectors, **Privacy &**	

Compliance: Data Protection Principles, GDPR Overview, Indian Data Protection Bill.	
Unit-4: Ethical Hacking & Penetration Testing	**8**
Pentesting Methodology: Planning, Reconnaissance (Active/Passive), Scanning (nmap, Nessus), Exploitation (Metasploit), **Post-Exploitation**: Pivoting, Persistence, Credential Harvesting, **Ethics & Reporting**: Rules of Engagement, Documentation, Risk Rating **Case Study**: Equifax 2017 Data Breach.	
Unit-5: Incident Response, Forensics & Emerging Trends	**8**
Incident Response: IR Lifecycle (Preparation, Containment, Eradication, Recovery, Lessons Learned), IR Policy & Playbooks, **Digital Forensics**: Evidence Handling, Disk Imaging (FTK, dd), File Carving, Timeline Analysis, Memory Forensics (Volatility), **Log Analysis & SIEM**: Detecting Indicators of Compromise **Emerging Trends**: IoT Security Challenges, Container Security (Docker/K8s Hardening), AI/ML for Cybersecurity (Anomaly Detection, Automated Triage), **Capstone Practical**: Simulated Breach—Students Perform IR, Forensics & Present Findings.	

Reference Books :

1. **Security Engineering: A Guide to Building Dependable Distributed Systems**
   Ross J. Anderson, 3rd Edition, Wiley, 2020.
2. **Cryptography and Network Security: Principles and Practice**
   William Stallings, 8th Edition, Pearson, 2019.
3. **Computer Security: Principles and Practice**
   William Stallings & Lawrie Brown, 4th Edition, Pearson, 2018.
4. **Penetration Testing: A Hands-On Introduction to Hacking**
   Georgia Weidman, No Starch Press, 2nd Edition, 2017.
5. **Digital Forensics and Incident Response**
   Gerard Johansen, Packt Publishing, 2016.
6. **Data Privacy: Foundations, New Developments and the GDPR**
   Paul Voigt & Axel von demBussche, Springer, 2017.
7. **Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance**
   Tim Mather, Subra Kumaraswamy&Shahed Latif, O'Reilly Media, 2020.

KCSE-521	Software Engineering	3L:0T:0P	3 Credits

Course Outcomes:

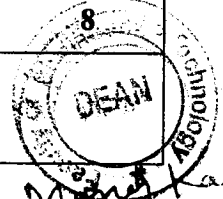
On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Explain various software characteristics and analyze different software Development Models	K1, K2
CO2	Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards	K1, K2
CO3	Compare and contrast various methods for software design.	K2, K3
CO4	Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing	K3
CO5	Manage software development process independently as well as in teams and make use of Various software management tools for development, maintenance and analysis.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction	**8**
Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	
Unit-2: Software Requirement Specifications (SRS)	**8**
Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	
Unit-3: Software Design	**8**
Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	
Unit-4: Software Testing	**8**
Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, TopDown and Bottom- Up Testing Strategies: Test Drivers and Test Stubs, Structural	



Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	
Unit-5: Software Maintenance and Software Project Management	**8**
Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	

Reference Books:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, "Software Engineering", Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

KCSE-551	Database Management System Lab	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand and apply oracle 11 g products for creating tables, views, indexes, sequences and other database objects.	K2, K4
CO2	Design and implement a database schema for company data base, banking data base, library information system, payroll processing system, student information system.	K3, K5
CO3	Write and execute simple and complex queries using DDL, DML, DCL and TCL.	K4, K5
CO4	Write and execute PL/SQL blocks, procedure functions, packages and triggers, cursors.	K4, K5
CO5	Enforce entity integrity, referential integrity, key constraints, and domain constraints on database.	K3, K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

DETAILED SYLLABUS

1. Installing oracle/ MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL:
   (a) Writing basic SQL SELECT statements.
   (b) Restricting and sorting data.
   (c) Displaying data from multiple tables.
   (d) Aggregating data using group function.
   (e) Manipulating data.
   (f) Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files
12. Mini project (Design & Development of Data and Application) for following :
    a) Inventory Control System.
    b) Material Requirement Processing.
    c) Hospital Management System.
    d) Railway Reservation System.
    e) Personal Information System.
    f) Web Based User Identification System.
    g) Timetable Management System.
    h) Hotel Management System

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (MySQL , SQL server , Oracle ,MongoDB ,Cubrid ,MariaDBetc)

DEAN

KIT-551	Data Analytics Lab	0L:0T:4P	2 Credits

Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	Demonstrate proficiency in using R programming for data loading, exploration, and visualization.	K3
CO2	Preprocess and transform raw data using R to make it suitable for analysis, including handling missing values and outliers.	K3, K4
CO3	Implement statistical models, clustering algorithms, and classification techniques on real-world datasets using R.	K3, K4
CO4	Evaluate and interpret the performance of machine learning models using appropriate metrics and visualization tools.	K5
CO5	Design and execute a mini-project that applies the complete data analytics lifecycle to a real-world problem, culminating in a comprehensive report and presentation.	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

DETAILED SYLLABUS

1. Introduction to R and Data Handling

- Install R and RStudio
- Load datasets from CSV/Excel
- Explore data types, structures (vectors, lists, matrices, data frames)
- Perform basic descriptive statistics (mean, median, mode, sd, etc.)

2. Data Visualization using R

- Create bar charts, histograms, pie charts, boxplots, scatterplots
- Use ggplot2 and base plotting system
- Visualize missing data and distributions

3. Data Preprocessing

- Handle missing data, outliers
- Data transformation and normalization
- String manipulation and factor handling

4. Regression & Classification Models

- Linear regression and multiple regression
- Logistic regression
- Evaluate model accuracy using confusion matrix, ROC curve

5. Clustering Techniques

- K-means clustering with visualization
- Hierarchical clustering with dendrograms

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- Cluster performance analysis using silhouette scores

6. Association Rule Mining

- Use Apriori algorithm using arules package
- Generate and visualize rules
- Market Basket Analysis

7. Time Series Analysis

- Plot and decompose time series data
- Apply moving average and exponential smoothing
- Build basic ARIMA model

8. Mini Project (2–3 weeks)

- Apply end-to-end data analytics pipeline on real-world dataset (e.g., COVID-19 trends, e-commerce behavior)
- Use R for cleaning, modeling, and visualization
- Prepare a report and presentation

Suggested Datasets

Iris, Titanic, Boston Housing, Air Quality, Customer Segmentation, Online Retail, COVID-19 time series, Social media sentiment data

Tools Used: R (mandatory), Python (optional), RStudio, Jupyter Notebook, Hadoop (intro), Excel (optional)

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KNC-501/ KNC-601	Constitution of India	2L:0T:0P	0 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Identify and explain the fundamental features, Preamble, Fundamental Rights, Duties, and Directive Principles of the Indian Constitution.	K1, K2
CO2	Differentiate and analyze the structure and functions of the Union and State Executives, including Parliament, the President, Governor, and Prime/Chief Ministers.	K2, K4
CO3	Describe and compare the sources of law, court hierarchy, and alternative dispute-resolution mechanisms within the Indian legal system.	K2, K4
CO4	Apply constitutional provisions on elections, emergencies, and amendments to case scenarios, and analyze their procedural implications and limitations.	K3, K4
CO5	Develop and evaluate models for engineers' roles in business organizations and e-governance, and propose innovative governance solutions at Union, State, or local levels.	K3, K5. K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction and Basic Information about Indian Constitution	**8**
Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India	
Unit-2: Union Executive and State Executive	**8**
Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts	
Unit-3: Introduction and Basic Information about Legal System	**8**
The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign	

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Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace.	
Unit-4: Election provisions, Emergency provisions, Amendment of the constitution	**8**
Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.	
Unit-5: Business Organizations and E-Governance	**8**
Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.	

Pedagogy: Lecture, Problem based learning, Group discussions, Visual media, Films, Documentaries, Debate forums.

Suggested Readings:

1. Brij Kishore Sharma: Introduction to the Indian Constitution, 8th Edition, PHI Learning Pvt. Ltd.
2. Granville Austin: The Indian Constitution: Cornerstone of a Nation (Classic Reissue), Oxford University Press.
3. S.G Subramanian: Indian Constitution and Indian Polity, 2nd Edition, Pearson Education 2020.
4. Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.
5. Madhav Khosla: The Indian Constitution, Oxford University Press.
6. PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
7. V.K. Ahuja: Law Relating to Intellectual Property Rights (2007)
8. Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88
9. P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi
10. Executive programme study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1, 4 and 36). https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf
11. Handbook on e-Governance Project Lifecycle, Department of Electronics & Information Technology, Government of India, https://www.meity.gov.in/writereaddata/files/eGovernance_Project_Lifecycle_Participant_Handbook-5Day_CourseV1_20412.pdf
12. Companies Act, 2013 Key highlights and analysis by PWC. https://www.pwc.in/assets/pdfs/publications/2013/companies-act-2013-key-highlights-and-analysis.pdf

Referred Case Studies:

- Keshavanand Bharati V. State of Kerala, AIR 1973 SC 1461.
- Maneka Gandhi V. Union of India AIR, 1978 SC 597.
- S.R. Bammai V. Union of India, AIR 1994 SC 1918.
- Kuldip Nayyar V. Union of India, AIR 2006 SC312.

- A.D.M. Jabalpur V. ShivkantShakla, AIR 1976 SC1207.
- Remshwar Prasad V. Union of India, AIR 2006 SC980.
- Keshav Singh in re, AIR 1965 SC 745.
- Union of India V. Talsiram, AIR 1985 SC 1416.
- Atiabari Tea Estate Co.V. State of Assam, AIR 1961SC232.
- SBP & Co. Vs. Patel Engg. Ltd. 2005 (8) SCC 618.
- Krishna Bhagya Jala Nigam Ltd. Vs. G. Arischandra Reddy (2007) 2 SCC 720.
- Oil & Natural Gas Corporation Vs. Saw Pipes Ltd. 2003 (4) SCALE 92 – 185.

**** (Other relevant case studies can be consulted by the teacher as per the topic).**

Prescribed Legislations:

1. Information Technology Act, 2000 with latest amendments.
2. RTI Act 2005 with latest amendments.
3. Information Technology Rules, 2000
4. Cyber Regulation Appellate Tribunal Rules, 2000

Suggested aid for Students and Pedagogic purpose

- RSTV debates on corporate law, IPR and patent issues
- NPTEL lectures on IPR and patent rights
- Episodes of 10 -part mini TV series "Samvidhan: The Making of Constitution of India" by RSTV.

STUDY & EVALUATION SCHEME
B.Tech 3rd Year/6th Semester (IT branch)
w.e.f. academic Session 2025-26

SEMESTER VI														
S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KCSE-601	Web Technology	PC	3	0	0	20	10	30	-	70	-	100	3
2	KAS-601	Biology for Engineers	BS	3	0	0	20	10	30	-	70	-	100	3
3	KCSE-602	Computer Networks	PC	3	0	0	20	10	30	-	70	-	100	3
4	KCSE-603	Design and Analysis of Algorithm	PC	3	0	0	20	10	30	-	70	-	100	3
5	KCSE-611-S to KCSE-614-S	Departmental Elective-III *	PE	3	0	0	20	10	30	-	70	-	100	3
6	KOE-6**	Open Elective-I	OE	3	0	0	20	10	30	-	70	-	100	3
7	KCSE-651	Web Technology Lab	PC	0	0	2	-	-	-	15	-	35	50	1
8	KCSE-652	Computer Networks Lab	PC	0	0	2	-	-	-	15	-	35	50	1
9	KNC-602/ KNC-601	Essence of Indian Traditional Knowledge/ Constitution of India	MC	2	0	0	20	10	30	-	70	-	100	0
10	KCSE-653	Project-I	PROJ	0	0	4	-	-	-	50	-	100	150	2
Total													950	22

*** Will be offered through SWAYAM-NPTEL.**

Abbreviation Used:

PC: Professional Core Course
PE: Professional Elective Course
OE: Open Elective Course
MC: Mandatory Course

The Mini Project/Internship (4 weeks) will be done during summer break after 6th Semester and will be assessed during VII semester.

DEAN Faculty of Engineering & Technology

B.TECH 3rd YEAR

OPEN ELECTIVE – I COURSES

(Effective from the Session 2025-26)

SEMESTER - VI

KOE-601 – Idea to Business Model

KOE-602 – Quality Control and Reliability

KOE-603 – Embedded Systems

KOE-604 – Introduction to MEMS (Micro-Electro-Mechanical Systems)

KOE-605 – Object-Oriented Programming

KOE-606 – Computer-Based Numerical Techniques

KOE-607 – GIS & Remote Sensing

KOE-608 – Basics of Database Management Systems

KOE-609 – Software Project Management

KOE-610 – Understanding the Human Being Comprehensively – Human Aspirations and Its Fulfillment

KOE-611 – Instrumentation and Process control in Food Industry

KAS-601	Biology for Engineers	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Describe biological systems, cell structures, and biomolecules with IT analogies.	K2
CO2	Explain genetics and information flow in biological systems.	K2
CO3	Identify biological datasets and tools used in bioinformatics.	K3
CO4	Interpret bio-inspired computing techniques like neural networks and GA.	K4
CO5	Propose smart solutions using bio-inspired models for IT and health domains.	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Biological Systems & Analogies to Computing	6
• What is biology? Why should engineers study it? • Cell structure, components, and their computing analogies (CPU = nucleus, storage = DNA, etc.) • Prokaryotes vs Eukaryotes	CO1
Unit-2: Biomolecules & Energy Flow	6
• Basic biomolecules: carbohydrates, proteins, lipids, nucleic acids • Enzymes and catalysis (compared to code execution) • ATP and cellular energy (parallels with power/clock cycles in systems)	CO1, CO2
Unit-3: Genetics and Information Flow	6
• DNA/RNA: structure and function • Central Dogma: Replication, Transcription, Translation • Genetic code: mapping, sequencing, mutations (data transmission analogy) • Basic inheritance: Genes and traits	CO2
Unit-4: Bioinformatics and Computational Biology	6
• Biological data: genome sequences, protein structures • Introduction to biological databases (NCBI, UniProt, GenBank) • Tools: BLAST (demo), DNA to protein tools • Relevance to computing: string matching, pattern recognition	CO3
Unit-5: Bio-Inspired Computing and Applications	6

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KCSE-602	Computer Networks	3L:0T:0P	3 Credits

Course Outcomes:

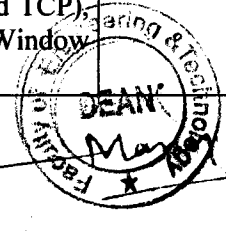
On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission	K1,K2
CO2	Apply channel allocation, framing, error and flow control techniques.	K3
CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.	K2,K3
CO4	Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.	K2,K3
CO5	Explain the functions offered by session and presentation layer and their Implementation.	K2,K3
CO6	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.	K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introductory Concepts & Physical Layer	**8**
Introductory Concepts: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. **Physical Layer:** Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	
Unit-2: Link layer	**8**
Link layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	
Unit-3: Network Layer	**8**
Network Layer: Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, and ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6.	
Unit-4: Transport Layer	**8**
Transport Layer: Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	



Unit-5: **Application Layer**	8
Application Layer: Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts.	

Reference Books:

1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson.
4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann
6. W. A. Shay, "Understanding Communications and Networks", Cengage Learning.
7. D. Comer, "Computer Networks and Internets", Pearson.
8. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill.

• Neural networks (inspiration from the brain) • Genetic algorithms (evolutionary problem-solving) • Swarm intelligence (e.g., ant colony optimization) • Nature-inspired hardware (neuromorphic chips)	**CO4**
Unit-6: Engineering Applications & Capstone Ideas	**10**
• Smart healthcare: wearables, biosensors, AI in diagnosis • Brain-computer interface (BCI), prosthetics, and robotics • Concept presentations: Design a bio-inspired IT solution	**CO5**

Recommended Reading & Resources

1. **Biology for Engineers** by Wiley / McGraw Hill
2. *"Essential Biology"* by Campbell (selected chapters)
3. NCBI Tutorials: https://www.ncbi.nlm.nih.gov/
4. Bioinformatics for Beginners – YouTube (FreeCodeCamp, Coursera)
5. Tools: BLAST, Swiss-Model, DNA Subway

KCSE-603	Design and Analysis of Algorithm	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.	K4, K6
CO2	Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).	K5, K6
CO3	Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.	K2, K5
CO4	Apply classical sorting, searching, optimization and graph algorithms.	K2, K4
CO5	Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.	K2, K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction	**8**
Introduction: Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	
Unit-2: Advanced Data Structures	**8**
Advanced Data Structures: Red-Black Trees, B Trees, B+ Tree Binomial Heaps, Fibonacci Heaps, Tries, Skip List	
Unit-3: Divide and Conquer & Greedy Methods	**8**
Divide and Conquer with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. **Greedy Methods** with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.	
Unit-4: Dynamic Programming	**8**
Dynamic Programming with Examples Such as Knapsack. All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	
Unit-5: Selected Topics	**8**
Selected Topics: Algebraic Computation, String Matching, Theory of NP- Completeness, Approximation Algorithms and Randomized Algorithms	

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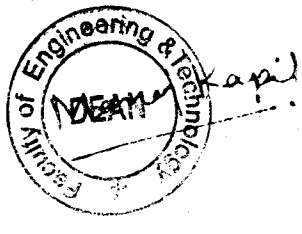
Reference Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
4. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
5. Richard E.Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
6. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
7. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
8. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
9. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
10. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
11. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.



KOE-601	Idea to Business Model	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Enhance creative knowledge of students regarding selection of a business idea and its implementation process.	K2, K3, K6
CO2	Acquire knowledge on entrepreneurship development, its Pro's and con's.	K1, K2, K5
CO3	Acquire basic knowledge on how to become an Entrepreneur.	K1, K2
CO4	Develop knowledge on Production systems and it's sustainability through production, planning and control (PPC)	K2, K4, K5
CO5	Develop appropriate business model and apply in a better way.	K3, K6

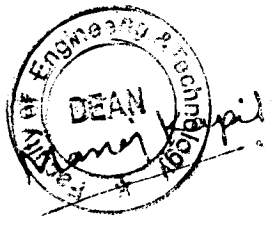
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction	**8**
Search for a business idea- How to choose an idea- Product idea- selection of product- The adoption process- Product innovation- Production , planning and development strategy- New product idea.	
Unit-2: Introduction to Entrepreneurship	**8**
Meaning and concept of entrepreneurship, Difference between Entrepreneurship & wage employment - Functions of an Entrepreneur. - Entrepreneur vs. Manager- role of entrepreneurship in economic development – Barriers to entrepreneurship.	
Unit-3: The Entrepreneur	**8**
Types of entrepreneurs- Competencies required to become an entrepreneur - Creative and Design Thinking, the entrepreneurial decision process- The process of Entrepreneurial development programs (EDP)- Evaluation of EDP - Entrepreneur development training.	
Unit-4: Production system	**8**
Production system- Design of production system- Types of production system- Production, planning & control (PPC) - Steps of PPC.	
Unit-5: Communication	**8**
Communication- Importance of communication system - barriers to communication - listening to people- the power of talk - personal selling - risk taking & resilience - negotiation.	

Reference Books:

1. Entrepreneurship Development- Sangeeta Sharma, Kindle edition
2. Production & operations Management- Kanishka Bedi,
3. Marketing Management- Philip Kotler.
4. The Business Model Book: Design, build and adapt business ideas that drive business growth: Adam Bock , Gerard George



KCSE-651	Web Technology Lab	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understanding fundaments of website development and apply HTL and XML languages for development of websites	K2, K4
CO2	Applying CSS in designing and development of responsive website for compatibility of various devices.	K2, K3, K5
CO3	Understand, analyze and design the role of JavaScript for dynamic web pages.	K2, K4, K5
CO4	Design and deploy different components using Java Bean, Node.js and database tables using MongoDB and produce various results based on given query.	K4, K5
CO5	Design and deploy server-side java application called Servlet & JSP tools to catch form data sent from client, process it and store it on database.	K3, K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

DETAILED SYLLABUS

This lab is based on the Web Technologies. Some examples are as follows:

1. Write HTML program for designing your institute website. Display departmental information of your institute on the website.
2. Write HTML program to design an entry form for student details/employee information/faculty details.
3. Develop a responsive website using CSS and HTML. Website may be for tutorial/blogs/commercial website.
4. Write programs using HTML and Java Script for validation of input data.
5. Write a program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
6. Create a Java Bean for Employee information (EmpID, Name, Salary, Designation and Department).
7. Build a command-line utility using Node.js that performs a specific task, such as converting text to uppercase, calculating the factorial of a number, or generating random passwords.
8. Develop a script that uses MongoDB's aggregation framework to perform operations like grouping, filtering, and sorting. For instance, aggregate user data to find the average age of users in different cities.
9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following:
   (a) Create a Cookie and add these four user id's and passwords to this Cookie.
   (b) Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
10. Create a table which should contain at least the following fields: name, password, email-id, phone number Write Servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
11. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.
12. Design and implement a simple shopping cart example with session tracking API.

Note: The instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (Servlet, JSP, Node.js, MongoDB, etc)

KCSE-652	Computer Networks Lab	0L:0T:2P	1 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Simulate different network topologies.	K3,K4
CO2	Implement various framing methods of Data Link Layer.	K3,K4
CO3	Implement various Error and flow control techniques.	K3,K4
CO4	Implement network routing and addressing techniques.	K3, K4
CO5	Implement transport and security mechanisms	K3, K4

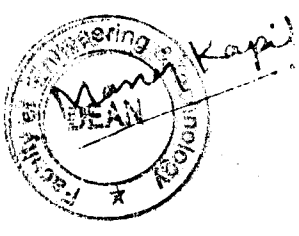
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

DETAILED SYLLABUS

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting.
8. Applications using TCP Sockets like
   (a) Echo client and echo server
   (b) Chat
   (c) File Transfer
9. Applications using TCP and UDP Sockets like
   (a) DNS
   (b) SNMP
   (c) File Transfer
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
    (a) Link State routing
    (b) Flooding
    (c) Distance vector
12. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.
13. Configuration of router, hub, switch etc. (using real devices or simulators)
14. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
15. Network packet analysis using tools like Wireshark, tcpdump, etc.
16. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
17. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (C , C++ , Java , NS3, Mininet, Opnet, TCP Dump, Wireshark etc.



KNC-502/ KNC-602	Essence of Indian Traditional Knowledge	2L:0T:0P	0 Credit

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Recall and explain the theories of state formation, social structures (varṇāśrama, puruṣārtha), and gender roles in ancient India.	K1, K2
CO2	Interpret the evolution of Indian scripts and literature—from Harappan and Brahmi scripts through Vedic, epic, and regional traditions—and analyze their cultural significance.	K2, K4
CO3	Describe major Indian religious and philosophical systems (Pre-Vedic, Vedic, Buddhism, Jainism, āstika/nāstika darśanas) and analyze their influence on social reform movements.	K2, K4
CO4	Apply principles from India's traditional knowledge in science, technology, and resource management (astronomy, metallurgy, water management, medicine) to evaluate their relevance in contemporary practice.	K3, K5
CO5	Evaluate India's cultural heritage and performing arts (architecture, sculpture, dance, theatre, festivals) and design innovative proposals to integrate traditional wisdom into sustainable development and modern governance.	K5. K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Society State and Polity in India	**8**
State in Ancient India: Evolutionary Theory, Force Theory, Mystical Theory Contract Theory, Stages of State Formation in Ancient India, Kingship , Council of Ministers Administration Political Ideals in Ancient India Conditions' of the Welfare of Societies, The Seven Limbs of the State, Society in Ancient India, Purusārtha, Varnāshrama System, Āshrama or the Stages of Life, Marriage, Understanding Gender as a social category, The representation of Women in Historical traditions, Challenges faced by Women. Four-class Classification, Slavery.	
Unit-2: Indian Literature, Culture, Tradition, and Practices	**8**
Evolution of script and languages in India: Harappan Script and Brahmi Script. The Vedas, the Upanishads, the Ramayana and the Mahabharata, Puranas, Buddhist And Jain Literature in Pali, Prakrit And Sanskrit, Kautilya's Arthashastra, Famous Sanskrit Authors, Telugu Literature, Kannada Literature, Malayalam Literature, Sangama Literature Northern Indian Languages & Literature, Persian And Urdu ,Hindi Literature	
Unit-3: Indian Religion, Philosophy, and Practices	**8**
Pre-Vedic and Vedic Religion, Buddhism, Jainism, Six System Indian Philosophy, Shankaracharya, Various Philosophical Doctrines , Other Heterodox Sects, Bhakti	

Movement, Sufi movement, Socio religious reform movement of 19th century, Modern religious practices.	
Unit-4: Science, Management and Indian Knowledge System	**8**
Astronomy in India, Chemistry in India, Mathematics in India, Physics in India, Agriculture in India, Medicine in India ,Metallurgy in India, Geography, Biology, Harappan Technologies, Water Management in India, Textile Technology in India ,Writing Technology in India Pyrotechnics in India Trade in Ancient India/,India's Dominance up to Pre-colonial Times	
Unit-5: Çultural Heritage and Performing Arts	**8**
Indian Architect, Engineering and Architecture in Ancient India, Sculptures, Seals, coins, Pottery, Puppetry, Dance, Music, Theatre, drama, Painting, Martial Arts Traditions, Fairs and Festivals, Current developments in Arts and Cultural, Indian's Cultural Contribution to the World. Indian Cinema	

Pedagogy: Project based learning, Case studies, Group discussion, Presentations

Suggested Text & Reference Books

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. S. Baliyan, Indian Art and Culture, Oxford University Press, India
3. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
4. Romila Thapar, Readings In Early Indian History Oxford University Press , India
5. Fritz of Capra, Tao of Physics
6. Fritz of Capra, The wave of Life
7. V N Jha (English Translation), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation,Velliarnad,Amaku,am
8. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
9. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi,2016
10. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
11. P R Sharma (English translation), Shodashang Hridayam
12. Basham, A.L., The Wonder that was India (34th impression), New Delhi, Rupa & co
13. Sharma, R.S., Aspects of Political Ideas and Institutions in Ancient India(fourth edition), Delhi, Motilal Banarsidass,

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FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 4th Year/7th Semester (IT branch)
w.e.f. academic Session 2026-27

SEMESTER VII

S. No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KCSE-701	Artificial Intelligence	PC	3	0	0	20	10	30	-	70	-	100	3
5	KCSE-711 to KCSE-714	Departmental Elective-IV	PE	3	0	0	20	10	30	-	70	-	100	3
5	KOE-7**	Open Elective-II	OE	3	0	0	20	10	30	-	70	-	100	3
6	KCSE-751	Artificial Intelligence Lab	PC	0	0	2	-	-	-	15	-	35	50	1
7	KCSE-752	Project-I	PC	0	0	10	-	-	-	50	-	100	150	5
9	KCC-751	Internship Assessment/ Mini Project #		-	-	-	-	-	-	100	-	-	100	2
Total													**600**	**17**

#The Mini Project or Internship (5-6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.

Abbreviation Used:

PC: Professional Core Course
PE: Professional Elective Course
OE: Open Elective Course

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KCSE-701	Artificial Intelligence	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents.	K2
CO2	Understand search techniques and gaming theory.	K2, K3
CO3	The student will learn to apply knowledge representation techniques and problem solving strategies to common AI applications.	K3, K4
CO4	Student should be aware of techniques used for classification and clustering.	K2, K3
CO5	Student should aware of basics of pattern recognition and steps required for it	K2, K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Introduction	**8**
Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.	
Unit-2: Problem Solving Methods	**8**
Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games	
Unit-3: Knowledge Representation	**8**
First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information	
Unit-4: Software Agents	**8**
Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.	
Unit-5: Applications	**8**
AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving, Computer Vision.	

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Reference Books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approachl, Prentice Hall, Third Edition, 2009.
2. I. Bratko, —Prolog: Programming for Artificial Intelligencel, Fourth edition, Addison-Wesley Educational PublishersInc., 2011.
3. M. Tim Jones, —Artificial Intelligence: A Systems Approach (Computer Science) I, Jones and Bartlett Publishers, Inc.; First Edition, 2008
4. Nils J. Nilsson, —The Quest for Artificial Intelligencel, Cambridge University Press, 2009.
5. William F. Clocksin and Christopher S. Mellish, I Programming in Prolog: Using the ISO Standardl, Fifth Edition, Springer, 2003.
6. Gerhard Weiss, —Multi Agent Systemsl, Second Edition, MIT Press, 2013.
7. David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agentsl, Cambridge University Press, 2010.

KCSE-711	Digital Marketing for Engineers	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Explain the fundamentals, concepts, and scope of digital marketing in engineering and technology sectors.	K1, K2
CO2	Apply Search Engine Optimization (SEO), Search Engine Marketing (SEM), and content marketing techniques for online visibility.	K2, K3
CO3	Analyze social media platforms, web analytics, and digital advertising strategies for business growth.	K3, K4
CO4	Design and evaluate email marketing, mobile marketing, and e-commerce campaigns for engineering products and services.	K4, K5
CO5	Develop integrated digital marketing strategies using emerging technologies, analytics, and ethical practices.	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate,K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: INTRODUCTION TO DIGITAL MARKETING Fundamentals of Marketing and Digital Marketing – Traditional vs Digital Marketing – Digital Marketing Ecosystem – Digital Marketing Channels – Consumer Behaviour in Online Environment – Website Fundamentals – Domain, Hosting and CMS – Role of Digital Marketing in Engineering and Technology Industries – Digital Marketing Trends and Opportunities.	8
Unit-2: SEARCH ENGINE OPTIMIZATION AND CONTENT MARKETING Search Engine Fundamentals – SEO Concepts and Techniques – On-page SEO – Off-page SEO – Keyword Research – Link Building – Technical SEO – Search Engine Marketing (SEM) – Google Ads Basics – Content Marketing Strategies – Blogging, Infographics and Video Marketing – Content Planning and Optimization.	8
Unit-3: SOCIAL MEDIA AND ONLINE ADVERTISING Social Media Marketing Concepts – Major Platforms: Facebook, Instagram, LinkedIn, X, YouTube – Social Media Campaign Planning – Influencer Marketing – Online Reputation Management – Display Advertising – Pay-Per-Click (PPC) Advertising – Affiliate Marketing – Remarketing Strategies – Digital Branding and Customer Engagement.	8

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Unit-4: WEB ANALYTICS, EMAIL AND MOBILE MARKETING Web Analytics and Performance Measurement – Google Analytics Fundamentals – Traffic Analysis – Conversion Tracking – KPI Metrics – Email Marketing Campaigns – Marketing Automation – Mobile Marketing – SMS and App-based Marketing – E-commerce Marketing – Customer Relationship Management (CRM) – Data Privacy and Cyber Security in Digital Marketing.	8
Unit-5: EMERGING TRENDS AND DIGITAL MARKETING STRATEGY Artificial Intelligence in Digital Marketing – Chatbots and Automation – Personalization Techniques – Voice Search Optimization – Digital Marketing Strategy Development – Campaign Budgeting and ROI Analysis – Ethical and Legal Issues in Digital Marketing – Case Studies on Engineering and Technology Startups – Future Scope of Digital Marketing.	8

Reference Books:

1. Seema Gupta, Digital Marketing, McGraw Hill Education, 3rd Edition, 2022.
2. Puneet Singh Bhatia, Fundamentals of Digital Marketing, Pearson Education, 2nd Edition, 2021.
3. Ian Dodson, The Art of Digital Marketing, Wiley Publications, 2016.
4. Ryan Deiss and Russ Henneberry, Digital Marketing for Dummies, Wiley, 2020.
5. Damian Ryan, Understanding Digital Marketing, Kogan Page Publishers, 5th Edition, 2020.
6. Philip Kotler, Hermawan Kartajaya and Iwan Setiawan, Marketing 5.0: Technology for Humanity, Wiley, 2021.
7. Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 3rd Edition, 2022.

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KOE-708	Design Thinking	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Develop a strong understanding of the design process and apply it in a variety of business settings.	K6
CO2	Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior.	K4
CO3	Formulate specific problem statements of real time issues and generate innovative ideas using design tools.	K6
CO4	Apply critical thinking skills in order to arrive at the root cause from a set of likely causes.	K3
CO5	Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environments, design mindset. Introduction to elements and principles of design, 13 Musical Notes for Design Mindset, Examples of Great Design, Design Approaches across the world.	
Unit-2:	**8**
Understanding humans as a combination of I (self) and body, basic physical needs up to actualization, prosperity, the gap between desires and actualization. Understanding culture in family society, institution, startup, socialization process. Ethical behavior: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy, and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools- Interviews, empathy maps, emotional mapping, immersion and observations, customer journey maps, and brainstorming, Classifying insights after Observations, Classifying Stakeholders, Do's & Don'ts for Brainstorming, Individual activity- 'Moccasin walk'	
Unit-3:	**8**
Defining the problem statement, creating personas, Point of View (POV) statements. Research- identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation-basic design directions, Themes of Thinking, inspirations and references, brainstorming, inclusion, sketching and	

presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea, introduction to visual collaboration and brainstorming tools - Mural, JamBoard.	
Unit-4:	**8**
Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills- linking ideas, structuring arguments, recognizing incongruences, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism, and politics. Case study on applying critical thinking on different scenarios.	
Unit-5:	**8**
The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams, logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking. Group activity/role plays on evaluating arguments.	

Reference Books:

1. Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey
2. BP Banerjee, Foundations of Ethics and Management, 2005, Excel Books
3. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA
4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA.

DEAN

KCSE-751	Artificial Intelligence Lab	0L:0T:2P	1 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Use of python to understand the concept of AI	K3
CO2	Implementation of Different AI Techniques	K4, K5
CO3	Application of AI techniques in practical Life	K4
CO4	Understanding of Natural Language Tool Kit.	K2
CO5	Practical Application of Natural Language Tool Kit	K4, K5

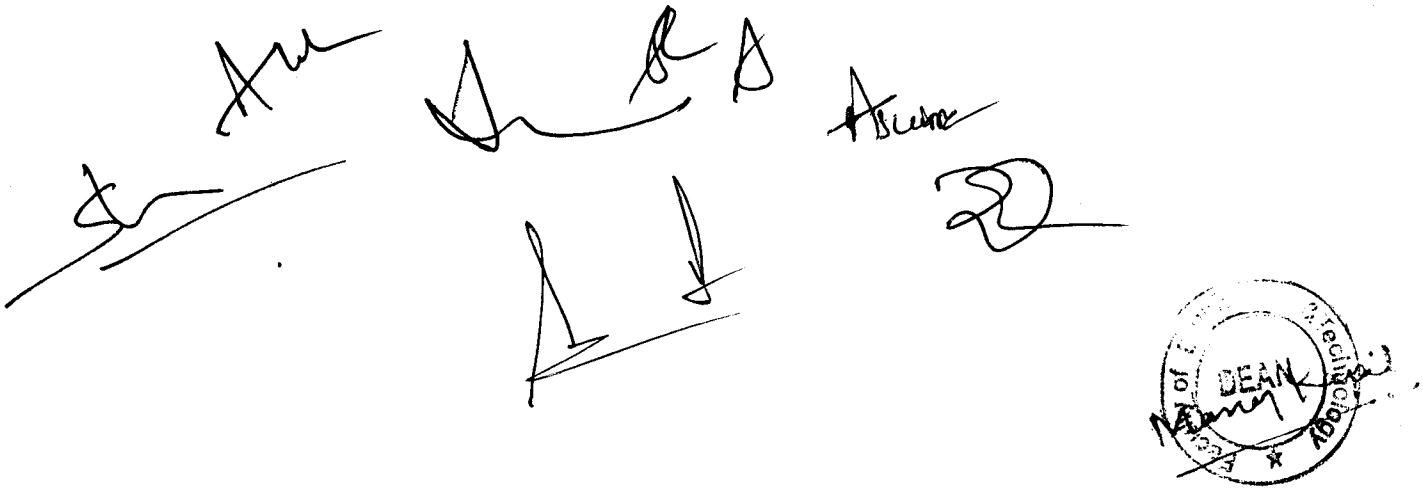
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

DETAILED SYLLABUS

1. Write a python program to implement Breadth First Search Traversal?
2. Write a python program to implement Water Jug Problem?
3. Write a python program to remove punctuations from the given string?
4. Write a python program to sort the sentence in alphabetical order?
5. Write a program to implement Hangman game using python.
6. Write a program to implement Tic-Tac-Toe game using python.
7. Write a python program to remove stop words for a given passage from a text file using NLTK?
8. Write a python program to implement stemming for a given sentence using NLTK?
9. Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK?
10. Write a python program to implement Lemmatization using NLTK?
11. Write a python program to for Text Classification for the give sentence using NLTK

Note: The Instructor may add/delete/modify/tune experiments



FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 4th Year/8th Semester (IT branch)
w.e.f. academic Session 2026-27

SEMESTER VIII														
S. No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
5	KOE-8**	Open Elective-III	OE	3	0	0	20	10	30	-	70	-	100	3
6	KOE-8**	Open Elective-IV	OE	3	0	0	20	10	30	-	70	-	100	3
7	KCSE-851.	Project-II	PC	0	0	18	-	-	-	100	-	200	300	10
Total													**500**	**16**

Abbreviation Used:

PC: Professional Core Course
PE: Professional Elective Course
OE: Open Elective Course
MC: Mandatory Course

Departmental Elective-IV

1. KCSE-711 – Digital Marketing for Engineers
2. KCSE-712 – Green Computing
3. KCSE-713 – Computer Graphics & Animation
4. KCSE-714 – Quantum Computing

Open Elective-II
Separate list is attached (common to all branches)

Open Elective-III
Separate list is attached (common to all branches)

Open Elective-IV
Separate list is attached (common to all branches)

B. TECH. 8th Semester (2026-27)

OPEN ELECTIVE –III

Code	Subject
KOE-801	FUNDAMENTALS OF DRONE TECHNOLOGY
KOE-802	CLOUD COMPUTING
KOE-803	BIO MEDICAL SIGNAL PROCESSING
KOE-804	ENTREPRENEURSHIP DEVELOPMENT
KOE-805	INTRODUCTION TO SMART GRID
KOE-806	QUALITY MANAGEMENT
KOE-807	INDUSTRIAL OPTIMIZATION TECHNIQUES
KOE-808	VIROLOGY
KOE-809	NATURAL LANGUAGE PROCESSING
KOE-810	HUMAN VALUES IN MADHYASTH DARSHAN
KOE-811	BIM FOR SUSTAINABLE BUILDING PLANNING

OPEN ELECTIVE –IV

Code	Subject
KOE-812	ELECTRIC VEHICLES
KOE-813	PROJECT MANAGEMENT
KOE-814	COMPUTERIZED PROCESS CONTROL
KOE-815	DATA WAREHOUSING & DATA MINING
KOE-816	DIGITAL AND SOCIAL MEDIA MARBETING
KOE-817	MODELING OF FIELD-EFFECT NANO DEVICES
KOE-818	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS
KOE-819	BIG DATA
KOE-820	HUMAN VALUES IN BUDDHA AND JAIN DARSHAN
KOE-821	HUMAN VALUES IN VEDIC DARSANA
KOE-822	BUILDING SERVICES INSTALLATION, SAFETY & PRACTICES

DEAN

KOE-804	Entrepreneurship Development	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Explain the fundamentals of entrepreneurship, small scale industries, and their role in economic development.	K2
CO2	Understand project identification, project formulation, feasibility analysis, and project financing methods.	K2
CO3	Apply basic accounting, financial management, production planning, and marketing concepts in entrepreneurial activities.	K3
CO4	Analyze project planning, financial control, risk analysis, and economic evaluation techniques used in enterprises.	K4
CO5	Discuss legal provisions, government policies, and the role of support agencies for entrepreneurship and small scale industries.	K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

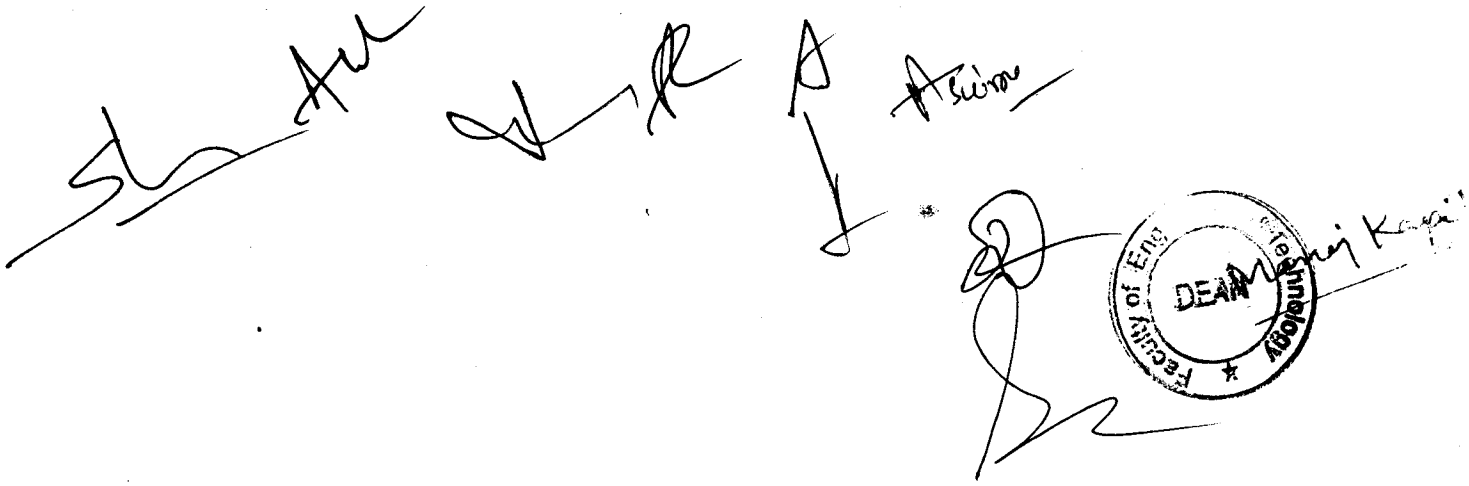
Content	Contact Hours
Unit-1:	**8**
Entrepreneurship- definition. growth of small scale industries in developing countries and their positions visa-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.	
Unit-2:	**8**
Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.	
Unit-3:	**8**
Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies. .	
Unit-4:	**8**
Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.	

DEAN

Unit-5:	8
Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.	

Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India



KOE-813	Project Management	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Discuss complete structure of project management and analyze the scope of project planning.	K2
CO2	Identify different project selection methods.	K2
CO3	Explain the importance of procurement and its techniques.	K2
CO4	Define the guidelines required for project control and its controlling techniques.	K2
CO5	Outline the basic idea of projects and its initial management.	K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Introduction: Characteristics of a project types of projects, Project Management Body of Knowledge (PMBOK), role of project manager and his qualities, project organization and benefits, idea generation, needs of society, import substitution, project lifecycle, project charter, project sponsor. **Project Planning**: Customer needs, stake holder concept, project scope, feasibility study and report, baseline plan, SWOT analysis, project organization structure and hierarchy, project teams, formation, attitude and aptitude.	
Unit-2:	**8**
Structure: Project selection methods, breakeven analysis, DCF methods, project implementation, estimation, cost, price, value, scheduling, bar charts, network diagrams, PERT and CPM, schedule crashing, simple introduction to risk management, probability in project management, decision trees.	
Unit-3:	**8**
Procurement: Vendor selection methods, JIT, supply chains, quality, quality circles, quality control and quality assurance, cause and effect analysis, ISO and concepts of total quality management and six sigma, resource planning and allocation; availability and constraints of resources, resource leveling and crashing.	
Unit-4:	**8**
Project Control: Project scope, project change request, and control of schedule, resources, cost and quality, project communications, channels, means, meetings, project reports, project audits Project evaluation, project close-out reports, guidelines, audit reports, maintenance and shutdown projects, plant turn- around and brief introduction to replacement analysis.	
Unit-5:	**8**

Projects: Contour maps, sitemaps, plant layout, suitability of project site, preparation of site, selection and leasing of construction equipment special considerations in selection and location of projects, safety, health, human and environment al factors, project finance, international projects, joint ventures, collaborations, impact of culture, implementation, and handing over of projects.	

Reference Books:

1. Kamaraj Ramakrishna, "Essentials of Project Management", PHI Learning, New Delhi, 2010.
2. Prasanna Chandra, "Projects – Planning, analysis, selection, implementation and review", Tata McGraw-Hill, New Delhi, 2010.
3. Chitkara, "Construction Project Management", Tata McGraw- Hill, New Delhi.
4. Harold Kerzner, "Project Management", Wiley, New York.
5. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
6. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.