SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

Department of

CSE

SCHEME AND SYLLABUS

B.Tech. PROGRAMME– 2022 BATCH

With Effective From 2022-23

SCHEME - B.TECH – 2022-23 ONWARDS

I SEM - CHEMISTRY CYCLE

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PREREQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	101-105 & 121-123	22EN1101	LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS	CR	3	-	-	-	3	*	***
2	101-105 & 1 121-123	22EN1102	C PROGRAMMING FOR PROBLEM SOLVING	CR	2	-	2	-	3	*	***
3	101-105 & 121-123	22EN1103	ENGINEERING CHEMISTRY	CR	3	-	2	-	4	*	***
4	101-105 & 121-123	22EN1104	ELEMENTS OF MECHANICAL ENGINEERING	CR	2	-	2	-	3	*	***
5	101-105 & 121-123	22EN1105	INTRODUCTION TO ELECTRICAL ENGINEERING	CR	3	-	-	-	3	*	***
6	101-105 & 121-123	22EN1106	BIOLOGY FOR ENGINEERS	CR	3	-	-	-	3	*	***
7	101-105 & 121-123	22EN1107	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	CR	1	-	-	-	1	*	***
8	101-105 & 121-123	22EN1108	KANNADA KALI / MANASU	CR	1	-	-	-	1	*	***
					18	-	06	-	21		

CR – Credit, AU – Audit, L – Lecture, T – Tutorial, P – Practical, S/P – Seminar/Project, C – No. of Credits

SCHEME – B.TECH – 2022-23 ONWARDS

I SEM – PHYSICS CYCLE

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PREREQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	101-105 & 121-123	22EN1101	LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS	CR	3	-	-	-	3	*	***
2	101-105 & 121-123	22EN1102	C PROGRAMMING FOR PROBLEM SOLVING	CR	2	-	2	-	3	*	***
3	101-105 & 121-123	22EN1109	ENGINEERING PHYSICS	CR	3	-	2	-	4	*	***
4	101-105 & 121-123	22EN1110	ENGINEERING MECHANICS	CR	3	-	-	-	3	*	***
5	101-105 & 121-123	22EN1111	INTRODUCTION TO ELECTRONICS	CR	3	-	-	-	3	*	***
6	101-105 & 121-123	22EN1112	ENGINEERING GRAPHICS AND DESIGN THINKING	CR	2	-	2	-	3	*	***
7	101-105 & 121-123	22EN1113	ENVIRONMENTAL SCIENCE	CR	1	-	-	-	1	*	***
8	101-105 & 121-123	22EN1114	TECHNICAL ENGLISH	CR	1	-	-	-	1	*	***
					18	**-**	**06**	**-**	**21**		

CR – Credit, AU – Audit, L – Lecture, T – Tutorial, P – Practical, S/P – Seminar/Project, C – No. of Credits

SCHEME - B.TECH – 2022-23 ONWARDS
II SEM - CHEMISTRY CYCLE

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PREREQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	101-105 & 121-123	22EN1201	SINGLE AND MULTIVARIATE CALCULUS	CR	3	-	-	-	3	*	***
2	101-105 & 1 121-123	22EN1202	PYTHON PROGRAMMING FOR PROBLEM SOLVING	CR	2	-	2	-	3	*	***
3	101-105 & 121-123	22EN1103	ENGINEERING CHEMISTRY	CR	3	-	2	-	4	*	***
4	101-105 & 121-123	22EN1104	ELEMENTS OF MECHANICAL ENGINEERING	CR	2	-	2	-	3	*	***
5	101-105 & 121-123	22EN1105	INTRODUCTION TO ELECTRICAL ENGINEERING	CR	3	-	-	-	3	*	***
6	101-105 & 121-123	22EN1106	BIOLOGY FOR ENGINEERS	CR	3	-	-	-	3	*	***
7	101-105 & 121-123	22EN1107	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	CR	1	-	-	-	1	*	***
8	101-105 & 121-123	22EN1108	KANNADA KALI / MANASU	CR	1	-	-	-	1	*	***
					18	-	06	-	21		

CR – Credit, AU – Audit, L – Lecture, T – Tutorial, P – Practical, S/P – Seminar/Project, C – No. of Credits

SCHEME – B.TECH – 2022-23 ONWARDS
II SEM – PHYSICS CYCLE

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PREREQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	101-105 & 121-123	22EN1201	SINGLE AND MULTIVARIATE CALCULUS	CR	3	-	-	-	3	*	***
2	101-105 & 121-123	22EN1202	PYTHON PROGRAMMING FOR PROBLEM SOLVING	CR	2	-	2	-	3	*	***
3	101-105 & 121-123	22EN1109	ENGINEERING PHYSICS	CR	3	-	2	-	4	*	***
4	101-105 & 121-123	22EN1110	ENGINEERING MECHANICS	CR	3	-	-	-	3	*	***
5	101-105 & 121-123	22EN1111	INTRODUCTION TO ELECTRONICS	CR	3	-	-	-	3	*	***
6	101-105 & 121-123	22EN1112	ENGINEERING GRAPHICS AND DESIGN THINKING	CR	2	-	2	-	3	*	***
7	101-105 & 121-123	22EN1113	ENVIRONMENTAL SCIENCE	CR	1	-	-	-	1	*	***
8	101-105 & 121-123	22EN1114	TECHNICAL ENGLISH	CR	1	-	-	-	1	*	***
					18	**-**	**06**	**-**	**21**		

CR – Credit, AU – Audit, L – Lecture, T – Tutorial, P – Practical, S/P – Seminar/Project, C – No. of Credits

SEMESTER	**I**					
YEAR	**I**					
COURSE CODE	**22EN1101**					
TITLE OF THE COURSE	**LINEAR ALGEBRA & DIFFERENTIAL EQUATIONS**					
SCHEME OF INSTRUCTION	Lecture Hours (L)	Tutorial Hours (T)	Practical Hours (P)	Project Hours (J)	Total Hours	Credits
	3	-	-	-	39	3

COURSE OBJECTIVES:

- Understanding basic concepts of linear algebra to illustrate its power and utility through applications to science and Engineering.
- Apply the concepts of vector spaces, linear transformations, matrices and inner product spaces in engineering.
- The course is discussed with algebraic as well as geometric perspectives.
- Solve problems in cryptography, computer graphics and wavelet transforms.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Apply the abstract concepts of matrices and system of linear equations using decomposition methods	L3
CO2	Implement the basic notion of vector spaces and subspaces	L3
CO3	Apply the concept of vector spaces using linear transforms which is used in computer graphics and inner product spaces	L3
CO4	Applications of linear transforms in computer graphics and imaging	L3
CO5	Applications of orthogonality in various domains	L3

COURSE CONTENT:	
MODULE 1	**8Hrs**
Linear algebra: Introduction - The Geometry of Linear Equations - Row reduction and echelon forms- Rank of a matrix - Gaussian Elimination - Solution sets of linear equations – LU decomposition - Inverse of a matrix by Gauss-Jordan method.	
MODULE 2	**8Hrs**
Vector spaces and subspaces: Linear spaces – Subspaces - Linear independence – Span - Bases and Dimensions -Finite dimensional vector spaces, Fundamental subspaces associated with a matrix.	
MODULE 3	**9Hrs**
Linear transformations and orthogonality: Linear transformations – Basic properties - Invertible linear transformation - Matrices of linear transformations - Vector space of linear transformations – Inner Product, Orthogonal Vectors - Projections onto Lines - Projections and Least Squares - The Gram-Schmidt Orthogonalization process, QR Factorization.	

MODULE 4	7Hrs
Eigenvalues and eigenvectors: Introduction to Eigenvalues and Eigenvectors - Diagonalization of a Matrix- Diagonalization of symmetric matrices - Quadratic forms.	
MODULE 5	**7Hrs**
Differential equations: Linear second order ordinary differential equation with constant coefficients – Solutions of homogenous and non-homogenous equations - Method of undetermined coefficients – method of variation of parameters – Solutions of Cauchy-Euler and Cauchy-Legendre differential equations.	

TEXT BOOKS:

1. D C Lay, S R Lay and JJ McDonald, Linear Algebra and its Applications, Pearson India, Fifth edition.
2. Linear Algebra and its Applications by Gilbert Strang, 4 th Edition, Thomson Brooks/Cole, Second Indian Reprint 2007.
3. Introductory Linear Algebra- An applied first course, Bernard Kolman and David, R. Hill, 9th Edition, Pearson Education, 2011.
4. Thomas' Calculus, George B.Thomas, D.Weir and J. Hass, 2014, 13th edition, Pearson.

REFERENCES:

1. Introduction to Linear Algebra, Gilbert Strang, 5th Edition, Cengage Learning (2015).
2. Higher Engineering Mathematics by B S Grewal, 42 nd Edition, Khanna Publishers.
3. Elementary Linear Algebra, Stephen Andrilli and David Hecker, 5th Edition, Academic Press (2016).
4. Contemporary linear algebra, Howard Anton, Robert C Busby, Wiley 2003.
5. Practical Linear Algebra, Farin and Hansford, CRC Press (2013).

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1103**					
TITLE OF THE COURSE	**ENGINEERING CHEMISTRY**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	3	-	2	-	39(L)+26(P) = 65	4

COURSE OBJECTIVES:

- To provide chemical concepts most relevant to engineering students and demonstrate them in an applied context.
- To expose to the principles required to understand important contemporary topics like alternate energy sources, corrosion control, polymer technology, phase equilibria nanomaterials and green chemistry and catalysis.
- To emphasize on applications of these concepts to real world problems

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Appreciate the basic principles of electrochemistry, use of different types of electrodes in analysis and evaluate cell potential for different cell reactions.	L2
CO2	Know construction, working and applications of various energy storage devices such as batteries, fuel cells and supercapacitors.	L2
CO3	Understand basic principles of corrosion and apply suitable techniques for corrosion control. Also know the technological importance and processes involved in metal finishing.	L3
CO4	Know the synthesis, structure –property relationship and applications of commercially important polymers and polymer composites. Understand properties and applications of nanomaterials. Also learn the principles of green chemistry for a sustainable and eco-friendly world	L3
CO5	Differentiate various instrumental techniques involved in determining chemical reactions	L3

COURSE CONTENT:	
MODULE 1	**8Hrs**
Chemical energy source: Introduction to energy; Fuels - definition, classification, importance of hydrocarbons as fuels; Calorific value-definition, Gross and Net calorific values (SI units). Determination of calorific value of a solid / liquid fuel using Bomb calorimeter. Numerical problems on GCV&NCV. Petroleum cracking-fluidized catalytic cracking. Reformation of petrol. octane number, cetane number, anti-knocking agents, power alcohol, Biodiesel & Biogas. **Solar energy:** Thermal energy: Photovoltaic cells- Introduction, definition, importance, working of PV cell. Solar grade silicon physical and chemical properties relevant to photo-voltaics, doping of silicon by diffusion technique.	

MODULE 2	8Hrs
Energy science and technology: Single electrode potential - Definition, origin, sign conventions. Standard electrode potential- Definition-Nernst equation expression and its Applications. EMF of a cell- Definition, notation and conventions. Reference electrodes– Calomel electrode, Ag/AgCl electrode. Measurement of standard electrode potential. Numerical problems on EMF. Ion-selective electrode- glass electrode **Battery technology:** Basic concepts including characteristics of anode, cathode, electrolyte and separator. Battery characteristics. Classification of batteries–primary, secondary and reserve batteries. State of the art Batteries-Construction working and applications of Zn-air, Lead acid battery, Nickel-Metal hydride and Lithium ion batteries. Introduction to fuel cells, types of fuel cells. Construction, working and application of Methanol-Oxygen fuel cell.	
MODULE 3	**8Hrs**
Corrosion science: Definition, Chemical corrosion and Electro-chemical theory of corrosion, Types of corrosion, Differential metal corrosion, Differential aeration corrosion (pitting and water line corrosion), Stress corrosion. Corrosion control, Metal coatings-Galvanization, Tinning and its disadvantages. Cathodic protection of Corrosion: Sacrificial anode method and current impression method. **Surface Modification Techniques:** Definition, Technological importance of metal finishing. Significance of polarization, decomposition potential and over-voltage in electroplating processes, Electroless Plating. Distinction between electroplating and Electroless plating, advantages of electroless plating. Electroless plating of copper.	
MODULE 4	**8Hrs**
High Polymers: Introduction to polymers, Glass transition temperature, structure and property relationship. Synthesis, properties and applications of Teflon. PMMA. Elastomers - Deficiencies of natural rubber and advantages of synthetic rubber. Synthesis and application of silicone rubber, Conducting polymers-Definition, mechanism of conduction in polyacetylene. Structure and applications of conducting polyaniline. **Nanotechnology:** Introduction, properties, synthesis by sol-gel. Fullerenes, Carbon nanotubes, dendrimers and nano-composites.	
MODULE 5	**7Hrs**
Water Technology: Impurities in water. Hardness of Water: Types of Hardness and determination of total hardness of water by using disodium salt of ethylenediaminetetraacetic acid method, Potable water treatment by Electro dialysis and Reverse Osmosis. Water analysis- Biochemical oxygen demand and Chemical oxygen demand. Determination of COD. Numerical problems on COD. Sewage treatment. **Instrumental Methods of Analysis:** Instrumental methods of analysis, Principles of spectroscopy-Beer's Lamberts law, Difference between spectrometer and spectrophotometer, Potentiometry, Conductometry (Strong acid against strong base, weak acid against strong base, mixture of strong acid and a weak acid against strong base).	

List of Laboratory/Practical Experiments activities to be conduct	26Hrs
Volumetric Analysis and Preparations 1. Evaluation of quality of water in terms of total hardness by Complexometric titration. 2. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample. 3. Determination of Alkalinity of the given water sample 4. Preparation of MgO nanoparticles by solution combustion method (Demonstration experiment) and spectrometric analysis. 5. Electroless plating of copper (Demo experiment) 6. Preparation of Polyaniline (Demo experiment)	

Instrumental methods of Analysis

1. Potentiometric titration–Estimation of FAS using standard $K_2Cr_2O_7$ solution.
2. Conductometric estimation of hydrochloric acid using standard sodium hydroxide solution
3. Determination of viscosity coefficient, surface tension, density of a given liquid
4. Colorimetric estimation of copper in a given solution
5. Determination of Pka of given weak acid.
6. Determination of calorific value of coal/oil using Bomb calorimeter (Group experiment)

TEXT BOOKS:

1. Dr. S. Vairam, Engineering Chemistry, Wiley-India Publishers, 2017
2. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015

REFERENCES:

1. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015
2. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015
3. Dayanada Sagar University laboratory manual
4. J. Bassett, R.C. Denny, G.H. Jeffery, Vogel's, Text book of quantitative inorganic analysis, 4th edition

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1104**					
TITLE OF THE COURSE	**ELEMENTS OF MECHANICAL ENGINEERING**					
SCHEME OF INSTRUCTION	L	T	P	J	TotalHours	Credits
	2	-	2	-	26(L)+26(P) = 52	3

COURSE OBJECTIVES:

The course will enable the students to

- Acquire a basic understanding of renewable energy resources and basic concepts of hydraulic turbines.
- Acquire knowledge of various engineering materials and metal joining techniques.
- Acquire essential knowledge of modern manufacturing tools and techniques.
- Acquire knowledge on basics of refrigeration and air-conditioning.
- Explain about the cooling of electronic devices.
- Acquire knowledge of basic concepts of mechatronics and robotics.
- Explain about the electric and hybrid vehicles.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Describe basic concepts of renewable energy resources and power generation	L2
CO2	Distinguish various engineering materials and metal joining techniques	L2
CO3	Demonstrate different modern manufacturing tools and techniques	L3
CO4	Make use of basic concepts of refrigeration and air-conditioning concepts	L3
CO5	Illustrate essential knowledge of basic concepts of mechatronics and robotics	L2
CO 6	Comprehend the important concepts of electric and hybrid vehicles	L2

COURSE CONTENT:	
MODULE 1 Energy Sources and Power Generation	**10 Hrs**
Review of energy sources: Construction and working of Hydel power plant, Thermal power plant, Nuclear power plant, Solar power plant, Tidal power plant, Wind power plant. Principle and Operation of Hydraulic turbines, Pelton Wheel, Francis Turbine and Kaplan Turbine. Working of Centrifugal Pump & reciprocating pump. **Thermodynamics:** System, boundary, surroundings, types of systems, Zeroth law, First and second laws of thermodynamics, Efficiency, COP, Carnot theorem	
MODULE 2 Engineering Materials and Metal Joining Processes	**10 Hrs**
Metals-Ferrous: Tool steels and stainless steels. Non-ferrous /metals: aluminum alloys. **Ceramics-** Glass, optical fiber glass, cermets. **Composites-** Fiber reinforced composites, Metal matrix Composites.	

Smart materials- Piezoelectric materials, shape memory alloys, semiconductors, and super-insulators. **Metal Joining Processes:** Fitting, Sheet metal, Soldering, brazing and Welding: Definitions. Classification and methods of soldering, brazing, and welding. Brief description of arc welding, Oxy-acetylene welding, Introduction to TIG welding and MIG welding.	
MODULE 3 Modern Manufacturing Tools and Techniques	**12 Hrs**
CNC: Introduction, components of CNC, advantages and applications of CNC, CNC Machining centres and Turning Centers Concepts of Smart Manufacturing and Industrial IoT. **Additive Manufacturing:** Introduction to reverse Engineering, Traditional manufacturing vs Additive Manufacturing, Computer aided design (CAD) and Computer aided manufacturing (CAM) and Additive Manufacturing (AM), Different AM processes, Rapid Prototyping, Rapid Tooling, **3D printing:** Introduction, Classification of 3D printing process, Applications to various fields.	
MODULE 4 Thermal Systems and Management	**10 Hrs**
Heat in Electronic Devices: Modes of Heat Transfer, heat generation in electronics, temperature measurement, heat sink, Cooling of electronic devises: Active, Passive, and Hybrid Cooling. **Refrigeration:** Principle of refrigeration, Refrigeration effect, Ton of Refrigeration, COP, Refrigerants and their desirable properties. Principles and Operation of Vapor Compression and Vapor absorption refrigeration. Applications of Refrigerator. **Air-Conditioning:** Classification and Applications of Air Conditioners. Concept and operation of Centralized air conditioning system.	
MODULE 5 Advanced Technologies	**10 Hrs**
Mechatronics: Introduction, Concept of open-loop and closed-loop systems, Examples of Mechatronic systems and their working principle. **Robotics:** Introduction, Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics in Material Handling, Processing, Assembly, and Inspection. **Electric and Hybrid Vehicles:** Introduction, Components of Electric and Hybrid Vehicles, Drives and Transmission. Advantages and disadvantages of EVs and Hybrid vehicles.	

List of Laboratory/Practical Experiments activities to be conduct
Demonstration on Principle and Operation of any one Turbo-machine
Demonstration on pumps
Visit any one Conventional or Renewable Energy Power Plant and prepare a comprehensive report.
One exercises each involving Fitting and Sheet metal.
One exercises each involving welding and Soldering.
Study oxy-acetylene gas flame structure and its application to gas welding
Demonstration on Principle and Operation of CNC machine.
Demonstration on Principle and Operation of 3D printing process.
Demonstration of anyone Heat transfer application device and prepare a comprehensive report.
Demonstration of anyone air conditioning system.
Demonstration of the machine consists of Gear Trains.
Demonstration of various elements of mechatronic system.
Demonstration of any one model of Robot

TEXT BOOKS:

1. Basic and Applied Thermodynamics, P.K.Nag, Tata McGraw Hill 2nd Ed., 2002
2. Non-Conventional Energy Sources, G.D Rai, Khanna Publishers, 2003
3. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010

4. Thermal Management in Electronic Equipment, HCL Technologies, 2010
5. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1

REFERENCES:

1. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012
2. Turbo Machines, M. S. Govindegowda and A. M. Nagaraj, M. M. Publications 7Th Ed, 2012
3. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
4. Thermal Management of Microelectronic Equipment, L. T. Yeh and R. C. Chu, ASME Press, New York, 2002
5. Fundamentals of Robotics: Analysis and Control, Robert J. Schilling, Pearson Education (US).

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1105**					
TITLE OF THE COURSE	**INTRODUCTION TO ELECTRICAL ENGINEERING**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	3	**-**	**-**	**-**	**39**	**3**

COURSE OBJECTIVES:

This course enables students:

- To impart basic knowledge of electrical quantities such as current, voltage, powerand energy
- To distinguish between passive and active electrical components
- To explain the general structure of electrical power system
- To define basic laws of electric circuit and to solve related problems
- To understand basics of earthing, protective devices and wiring
- To introduce concepts, analogies and laws of magnetic circuits
- To learn the working principle, construction and characteristics of various DC machines
- To study the construction, principle of operation and types of transformers
- To understand the working principles of measuring equipment.

COURSE OUTCOMS:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Explain the basic knowledge about the Electric and Magnetic circuits.	L2
CO2	Analyze the working of various Electrical Machines.	L3
CO3	Applying basic laws and determine various circuit parameters in AC and DCCircuits.	L3
CO4	Explain the construction, basic principle of operation, applications and determineperformance parameters of various measuring instruments.	L2
CO5	Outline the knowledge of Green Energy, Electrical Safety Rules & standards course.	L3

COURSE CONTENT:	
MODULE 1	**8Hrs**
ELECTRICAL CIRCUIT CONCEPTS: Voltage and current sources: independent, dependent, ideal and practical; V-I relationships of resistor, ohm's law, inductor, and capacitor; types of electrical circuits, voltage and current divider rule, Kirchhoff's laws, Peak, average and rms values of ac quantities; apparent, active and reactive powers; phasor analysis, Power factor, impedance and admittance, power and energy in electrical elements, introduction to3 phase systems.	

MODULE 2	8Hrs
MAGNETIC CIRCUIT CONCEPTS: Basics of magnetic circuits, laws of magnetism, magnetic field, magnetic lines of force, permeability, Electromagnetic Fields: Relation between field theory and circuit theory; numerical on capacitance calculations, Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Self and Mutual inductance of simple configurations.	
MODULE 3	**8Hrs**
DC MACHINES AND TRANSFORMERS: DC Machines: Basic principles of electromagnetic energy conversion, Construction, operation, characteristics, performance, of dc generators and motors, testing of dc machines, applications, Transformers: Construction, working principle, equivalent circuit, voltage regulation, efficiency, Auto-transformers.	
MODULE 4	**8Hrs**
SI units, systematic and random errors in measurement, expression of uncertainty - accuracy and precision index, propagation of errors. General working principles and construction of indicating instruments. Electro-magnetic Instruments for the measurement of current, voltage, power and energy. Instruments for the measurementof power factor, frequency, Potentiometers. CRO, Calibration of instruments; importance, procedures and standards.	
MODULE 5	**7Hrs**
POWER STATION PRACTICES, ECONOMICS, AND GREEN ENERGY CONCEPTS: Energy generation-Conventional generation of electrical energy using thermal, hydro, nuclear and, non-conventional sources of energy; overview on green energy technology, load forecasting, electricity tariffs, power factor improvement, power plant economics, Overview on electrical safety standards in industries	

TEXT BOOKS:

1. D.P.Kothari and I.J. Nagrath, "Basic Electrical Engineering", 4th Edition, Tata McGrawHill, 2010
2. B.L Thereja and A.K Thereja, "A text book of Electrical Technology (Vol III)(Transmission, distribution, and Utilization)", 23rd Edition, S Chand and Company

REFERENCES:

1. Clayton Paul, Syed A Nasar and Louis Unnewehr, 'Introduction to ElectricalEngineering', 2nd Edition, McGraw-Hill, 1992
2. P.S. Dhogal, 'Basic Electrical Engineering – Vol. I& II', 42nd Reprint, McGraw-Hill, 2012.
3. K Sawhney, A course in Electrical and Electronic Measurements andInstrumentation Dhanpat Rai & Co. (P) Limited January 2015
4. NPTEL - https://nptel.ac.in/courses/108/108/108108076/

****

SEMESTER	**I**					
YEAR	**I**					
COURSE CODE	**22EN1102**					
TITLE OF THE COURSE	**C PROGRAMMING FOR PROBLEM SOLVING**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	2	**-**	**2**	**-**	**26(L)+26(P) = 52**	**3**

COURSE OBJECTIVES :

- To develop student competence in writing clear, correct, and maintainable programs that implement known algorithms.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Express algorithms learned implicitly in school explicitly in algorithmic form and calculate the number of basic operations (exact or upper bound).	L3
CO2	Trace the execution of short programs/code fragments involving fundamental programming constructs.	L4
CO3	Write a short program/code fragment for a given task using fundamental programming constructs.	L3
CO4	Debug a short program/code fragment with fundamental programming constructs manually, and debug more complex code using a modern IDE and associated tools.	L4
CO5	Design a large program, conduct a personal code review, and contribute to a small-team code review focused on common coding errors and maintainability using a provided checklist.	L3

COURSE CONTENT:

MODULE 1	**7 Hrs**
Basics and overview of C: Introduction to Problem Solving using Algorithms and Flowchart: Key features of Algorithms: Sequence, Decision, Repetition with examples. Background, structure of C program, keywords, Identifiers, Data Types, Variables, Constants, Input / Output statements, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions. Conditional Branching Statements-if and switch statements, iterative statements (loops)-while, for, do-while statements, Loop examples, Nested loops, break, continue, go to statement.	
MODULE 2	**5 Hrs**
Arrays: Introduction, declaration & initialization of array, reading and writing array elements, Operations on array: Traversal, searching, sorting. Declaration and Initialization of two-dimensional arrays. Matrix Operations (addition, subtraction, multiplication, transpose) using two-dimensional array.	

Strings: definition, declaration, initialization, and representation. String handling functions and character handling functions.

MODULE 3 **6 Hrs**

Pointers: Definition and declaration and initialization of pointers. Accessing values using pointers. Accessing array elements using pointers.

Functions: Definition and declaration. Built-in functions and User-defined functions. Categories of functions with example. Pointers as function arguments, array as function argument, Call-by-value and call-by-reference. Recursion.

MODULE 4 **4 Hrs**

Structures: Purpose and usage of structures. Declaration of structures. Assignment with structures. Structure variables and arrays. Nested structures. Student and employee database implementation using structures.

Unions: Declaration and initialization of a union. Difference between structures and unions. Example programs.

MODULE 5 **4 Hrs**

Memory allocation in C programs: Dynamic memory allocation, memory allocation process, allocating a block of memory, releasing the used space, altering the size of allocated memory.

Files: Defining, opening and closing of files. Input and output operations.

List of Laboratory/Practical Experiments activities to be conducted

1. Design a C program to Swapping of two numbers. (Simple Expressions).

2. Design a C program to find the simple interest as per the below conditions
(Simple expressions, Integer division issues (data loss), Explicit typecasting, when p, t, r are integers and si is float.

3. Design a C program to find the largest of 3 numbers.
a) Using if and no else. (Conditionals)
b) Using nested if. (conditionals and Boolean expressions)
c) Using Ladder if else if
d) Using Ternary operator.

4. Design a program that takes three coefficients (a, b, and c) of a Quadratic equation (ax2+bx+c=0) as input and compute all possible roots.

5.Design a C program to read the vehicle type (Use c or C for car, b or B for bus, t or T for Tempo for vehicle type) and Duration of customer vehicle parked in parking slot. Parking fare is calculated as per the rates given below: print the total parking charges.

Vehicle	First Rate	Second Rate
Car	Rs 20/hr for first 2hr	Rs 30/hr for next
Bus	Rs 40/hr for first 2hr	Rs 50/hr for next
Tempo	Rs 30 /hr for first 2hr	Rs 40/hr for next

6. a Write a program to calculate the factorial of a given number.
b Write a program using four functions to check if the given number is a palindrome.

7.a Sum of natural numbers (sum(n) = n + sum(n-1);).
b. Write a program to calculate Power of a number ($b^n = b * b^{n-1}$).

8. a. Write a program to calculate nth fibonacci number given first two numbers in the series.

Inputs	N	Output
0,1	3	2
1,5	4	11
2,4	7	42
8,1	5	19
3,5	6	34

b. Write a program to calculate GCD of two numbers.

9. Write a program to emulate a calculator with the following operations: Addition, Subtraction, Multiplication, Division – using functions, switch and break.)

10. Write a program using four functions to compute the sine of a value using Taylor's series approximation - pass by value.

11. Write a program to find the sum of n different using four functions and arrays.
Use the following function prototype:
void input(int n, int a[n]);
int add(int n, int a[n]);
void output(int n, int a[n],int sum) and main().

12. Write a program to add two matrices using separate function for input, add matrices, display matrix and main function.

13. String handling:
a) Write a function to reverse the string in reverse and display it. (Strings))
b) Write a function to concatenate the two strings without using strcat.(Strings)
c) Write a function to find the length of the string.

14. Write a program using Bubble sort technique to sort an array of integer elements (Sorting technique, Const array arguments.)

15. Write a program to search an array of elements of data type requested by the user for a given item using binary search algorithm. (Searching technique, Const array arguments).

16. Write a program with functions to add and multiply two complex numbers. Define a structure Complex to represent a complex number. The main function should call other functions for the purposes of input, computations and display. (Structs as arguments).

17. Define a structure, student, to store the following data about a student: rollno (integer), name (string) and marks(integer) . Your program must contain the following functions: (Array of Structures).

- A function to read the students data.
- A function to display records of each student.
- A function to sort the records of student Rank Wise
- A function print all students details
- A function to search student details by Rollno
- A function to print the names of the students having the highest test score

TEXT BOOKS:

1. Brian W. Kernigham and Dennis M. Ritchie, (2012) “The C Programming Language”, 2nd Edition, PHI.
2. ReemaThareja, "Programming in C". Oxford University Press, Second Edition, 2016

REFERENCES :

1. R. S Bichkar, “Programming with C and Data Structure”, University Press, 2014
2. Behrouz A. Forouzan, Richard F. Gilberg, “Computer Science - A Structured Approach Using C”,Cengage Learning, 2007
3. Brian W. Kernigham and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, PHI, 2012
4. Vikas Gupta, “Computer Concepts and C Programming”, Dreamtech Press 2013.

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1106**					
TITLE OF THE COURSE	**BIOLOGY FOR ENGINEERS**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	3	-	-	**-**	**39**	**3**

COURSE OBJECTIVES:

- To introduce students to basics modern biological concepts with an emphasis on how bio-processes are analogous to engineering field, as a multidisciplinary field.
- To make students understand basic engineering principles imminently run physiological processes particularly about engineering designs and solutions are arrived citing body functional examples.
- To motivate students of engineering that many bio-solutions could be foundational to design, develop better processes, products and useful to achieve quality of life.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Student appreciates and explains the biological mechanisms of living organisms from the perspective of engineers and find solutions to solve bio-engineering problems with appropriate tools.	L2
CO2	Explain optimal designs in engineering that are bio-mechanical in nature and build and use by observing and understanding bio-physiological processes involved in sensing, locomotion, and knowledge application of range of bio-chemicals.	L3
CO3	Demonstrate that bio-chemical, bio-sensory, bio-processes could be path-finders to optimise similarities for functional aspects of electronic, computer, mechanical, electrical machines	L3

COURSE CONTENT:	
MODULE 1	**8 Hrs**
Biomimetics: Biology for Engineers, Body Fluid: Blood- Mechanics of heart, Blood pressure, Life molecules: Water, Carbohydrates, Proteins, Lipids and Nucleic acids, Biomimetics: Bio-processes - engineering analogies	
MODULE 2	**8 Hrs**
Bioenergy: Unit of life: Human and Plant cell, Metabolism: Enzymes as Bio-catalysts and physiological entities, Development- Bioenergy from Sun-Photosynthesis	
MODULE 3	**8 Hrs**
Biomechanics (Human Body Movement Mechanics): Normal Human Movement: Force-Vector of Body; Movement Angles; Muscle contraction -Relaxation; Posture – Static & Dynamic; Ideal and abnormal posture, Practical: Stepping-Lifting-Sit-Stand.	

MODULE 4	8 Hrs
Bioelectronics: Brain & Computer: Senso-neural networks, IoT as applied to biology, Bionic Eye: Mechanism of Vision, Electronic Nose: Bio-olfactory mechanisms (Science of smell), Impulses: Cardiac and Nerve, Biological Clock, Circadian rhythm	
MODULE 5	**7 Hrs**
Biopharma: Metabolic syndromes, Cancer and its diagnostics, Lab on a chip, Bio-Sensors, Drug Discovery	

REFERENCES:

- Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M,L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson. "Biology: A global approach", , Global Edition, 10/E, 2014
- David Nelson, Michael Cox. "Lehninger Principles of Biochemistry". W H Freeman & Company, Seventh Edition, 2017.
- Janine M Benvus. "Biomimicry: Innovation inspired by Nature". William Morrow Paperbacks, 2002.
- Lecture Notes, PPT slides by course instructor.

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1107**					
TITLE OF THE COURSE	**CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	1	**-**	**-**	**-**	**13**	**1**

COURSE OBJECTIVES:

This course enables students:

- To provide basic information about Indian constitution.
- To identify individual role and ethical responsibility towards society.

COURSE OUTCOMS:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Understand state and central policies, fundamental duties.	L2
CO2	Understand Electoral Process, special provisions.	L2
CO3	Understand powers and functions of Municipalities, Panchayats and Cooperative Societies.	L2
CO4	Understand Engineering ethics and responsibilities of Engineers	L2

COURSE CONTENT:	
MODULE 1:	**7Hrs**
Introduction to the Constitution of India, the making of the constitution and salient features of the constitution. Preamble to the Indian constitution fundamental rights & its limitations. Directive principles of state policy & relevance of directive principles state. Policy fundamental Duties.	
MODULE 2	**6Hrs**
Union Executives – President, Prime Minister, Parliament, Supreme Court of India. State Executives – Governor Chief Minister, State Legislature High Court of State. Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st amendments. Special provision for SC & ST, special provision for Women, children & backward classes, Emergency provisions. Powers and functions of municipalities, panchyats and co – operative Societies.	

TEXT BOOKS:

1. Brij Kishore Sharma,"Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.
2. Durga Das Basu: "Introduction to the Constitution on India", (Students Edn.) PrenticeHall, 19th / 20th Edn., 2001.

REFERENCES:

1. M.V. Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1109**					
TITLE OF THE COURSE	**KANNADA KALI**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	1	**-**	**-**	**-**	**13**	**1**

COURSE OBJECTIVES:

This course enables students:

- To introduce Kannada language & culture to Non – Kannada speakers.
- To train them to communicate in colloquial Kannada with connivance.

COURSE OUTCOMS:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	The learners can communicate in Kannada & acquaint themselves with Kannada culture.	L2

COURSE CONTENT:	
MODULE 1:	**7Hrs**
Introduction to Karnataka & Kannada Culture, Evolution of Kannada. Introduction to Kannada Alphabets. Introduction to Kannada Numbers.	
MODULE 2	**6Hrs**
Kannada words, sentences & phrase making for colloquial communication.	

REFERENCES:

1. Kannada Kali –Dr. Lingadevaru Halemane
2. Kannada Paatagalu– Editor: Dr. Chandrashekara Kambara.
3. SLN Sharma & K Shankaranarayana "Basic Grammar", Navakarnataka Publications.
4. Spoken Kannada. Publication: Kannada Sahitya Parishat Bengaluru.

****

SEMESTER	**II**					
YEAR	**I**					
COURSE CODE	**22EN1201**					
TITLE OF THE COURSE	**SINGLE AND MULTI VARIABLE CALCULUS**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	3	-	-	-	39	3

COURSE OBJECTIVES:

- To analyze and solve constrained and unconstrained optimization problems.
- To understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of a rate of change.
- To find volumes of solids by calculating appropriate double integrals in rectangular and polar coordinates.
- To relate rectangular coordinates in 3-space to spherical and cylindrical coordinates.
- To evaluate triple integrals and use them to find volumes in rectangular, cylindrical and spherical coordinates.
- To evaluate line integrals of curves and vector fields and interpret such quantities as work done by a force.
- To use Green's theorem to evaluate line integrals along simple closed contours on the plane.
- To apply Stoke's theorem to compute line integrals along the boundary of a surface.
- To apply Divergence theorem to evaluate surface integral.
- To have a good foundation of Sequences of Bounded, Monotonic and Convergence.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Understand basic calculus concept such as limit, continuity and derivatives	L2
CO2	Compute partial derivatives and use it to give polynomial approximation of functions in several variables	L3
CO3	Apply calculus concepts to solve real-world problems such as optimization and related rates problems	L3
CO4	Evaluate integrals of functions or vector-related quantities over curves, surfaces, and domains in two- and three-dimensional space	L5
CO5	Apply Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, or Divergence Theorem to evaluate integrals	L3
CO6	Distinguish between the concepts of sequence and series, and determine limits of sequences and convergence and approximate sums of series	L3

COURSE CONTENT:	
MODULE 1	**9Hrs**
Differential Calculus: Functions of two or more variables: Definition, Region in a plane, Level curves, Level surfaces, Limits, Continuity, Partial derivatives, Differentiability, Gradients, Directional derivatives, Normals to level curves and tangents, Extreme values and saddle points, Lagrange multipliers. **Self-Learning Component** : Single variable calculus	
MODULE 2	**9Hrs**
Integral calculus: Double integral and iterated integrals - Cartesian and polar coordinates, Volume of solids of revolution, Triple integral, Change of variables, Multiple integrals in cylindrical and spherical coordinates.	
MODULE 3	**9Hrs**
Vector Calculus: Line Integrals, Vector Fields, Work, Circulation and flux, Path independence, Potential functions, and Conservative fields, Green's theorem in the plane, Surface area and surface integrals, Surface area of solid of revolution, Parametrized surfaces, Stokes' theorem, The Divergence theorem.	
MODULE 4	**6Hrs**
Sequence and Series I: Sequences of real numbers and their convergence criteria, Infinite series, Sequence of partial sums, Tests for convergence/divergence - n^{th} term test, Boundedness and monotonicity, Integral, Condensation, Comparison, Ratio and root tests	
MODULE 5	**6Hrs**
Sequence And Series II: Alternating series, Absolute and conditional convergence, Rearrangement theorem, Power series, Taylor and Maclaurin series (one and two variables)	

TEXT BOOKS:

1. Thomas' Calculus, George B. Thomas, D. Weir and J. Hass, 2014, 13th edition, Pearson.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 2015, 10th Edition, Wiley India.

REFERENCES:

1. Higher Engineering Mathematics, B.S. Grewal, 2015, 43rd Edition, Khanna Publishers.
2. Higher Engineering Mathematics, John Bird, 2017, 6 th Edition, Elsevier Limited.
3. Calculus: Early Transcendentals, James Stewart, 2017, 8 th edition, Cengage Learning.
4. Engineering Mathematics, K.A. Stroud and Dexter J. Booth, 2013, 7 th Edition, Palgrave Macmillan.
5. Basic Multi Variable Calculus, Marsden, Tromba and Weinstein, W.H. Freeman, Third Edition

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1109**					
TITLE OF THE COURSE	**ENGINEERING PHYSICS**					
SCHEME OF Instruction	L	T	P	J	Total Hours	Credits
	3	-	2	-	39(L)+26(P)=65	4

COURSE OBJECTIVES:

- To introduce the basic concepts of Quantum mechanics which are essential in understanding and solving problems in engineering,
- To understand Band structure of solids, Semiconductors and electrical conductivity of SC's, and their applications.
- To explain semiconductor devices like LED, Photodiode and Solar cell and Semiconductor BJT.
- To review different types of Engineering materials –Electronic, electrical, mechanical and Magnetic materials and Dielectric material Properties and their applications in Science and Engineering.
- Classify the magnetic materials based on susceptibility and their temperature dependence
- To understand different crystal systems and determine structure by miller-indices
- To explain Thin-film Phenomena, Thin-film fabrication Process and their applications in engineering.
- To learn how to fabricate Nano materials by using Top-down and Bottom–up approach& To review Nano science and technology and its practical applications in biology, engineering and medicine.

COURSE OUTCOMEs:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Describe the concepts of Quantum mechanics and applications of Schrodinger time independent wave equation in one dimension	L1
CO2	Illustrate Semiconductors, Semiconductor devices like Photo diode, LED, Solar cell and BJT and its applications	L3
CO3	Distinguish the different engineering materials such as Electronic, electrical and mechanical materials properties and their applications in engineering	L2
CO4	Apply the concept of magnetism to magnetic data storage devices.	L3
CO5	Classify Lattice parameters of different crystalline solids by using X-ray diffraction methods and its applications in science and engineering.	L2

CO6	Interpret Basic concepts of thin films and thin film deposition processes and their applications leads to Sensors and engineering devices	L3
CO7	Categorize Nano materials, Properties, and fabrication of Nano materials by using Top-down and Bottom –up approach's - Applications for Science and technology	L2

COURSE CONTENT:	
MODULE 1	**8Hrs**
Quantum Mechanics: Foundations of quantum theory, wave function and its properties, de-Broglie hypothesis, Heisenberg uncertainty principle, one dimensional time independent Schrodinger wave equation, eigen values and eigen functions, applications: one dimensional motion of an electron in a potential-well. **LASER PHYSICS:** Introduction to lasers, conditions for laser action, requisite of a laser system principle, construction and working of Nd-YAG and semiconductor laser, application of lasers in defense (LASER range finder), engineering (data storage) and applications of LASERS in medicine.	
MODULE 2	**8Hrs**
Semiconductor Physics: Band structure, Fermi level in intrinsic and extrinsic semiconductors, Density of energy states in conduction and valence bands of a semiconductor (Mention the expression), Expression for concentration of electrons in conduction band (Derivation), Hole concentration in valance band (Mention the expression), Intrinsic carrier concentration, Conductivity of semiconductors, Hall effect, Numericals. **Semiconducting devices for optoelectronics applications**: - Principle and working of LED, photodiode, Solar cell, BJT.	
MODULE 3	**8Hrs**
Dielectrics: Introduction – Dielectric polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant - Types of polarizations: Electronic, Ionic and Orientation polarizations (qualitative) – Lorentz Internal field (Expression only) – Claussius - Mossoti equation (derivation) – Applications of Dielectrics – Numericals. **Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials - Engineering applications.	
MODULE 4	**8Hrs**
Crystallography: Lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, Packing fraction for SCC, BCC and FCC crystal systems. Introduction to Miller Indices. Determination of Crystal structure by Miller Indices. Expression for Inter-planar distance. X-ray diffraction, Bragg's law and Determination of Crystal structure by Powder method. Numericals. **Mechanical Engineering Materials** – mechanical properties: stress- strain curve for different materials. Introduction to Tensile strength, Compressive strength, Ductility, Toughness, Brittleness, Impact strength, Fatigue, Creep. Testing of engineering materials: Hardness Tests: Brinell and Vickers hardness test.	
MODULE 5	**7Hrs**
Thin films technology: Introduction to thin-films-Advantages of thin-films over bulk materials. Thin film deposition processes- Physical vapour deposition (Thermal evaporation technique, and sputtering technique) process, Applications of Thin films.	

Nano Science &technology: Introduction to Nano materials, Classification of nano materials, Size dependent properties of materials, Top-down and Bottom-up approach- Ball-milling and Photolithography, Process. Fundamental Principles of Biophysics & Applications of Nano technology in Biology and Engineering.

List of Laboratory/Practical Experiments activities to be conduct

1. I-V characteristics of a Zener Diode
I–V Characteristics of a Zener diode in forward and reverse bias condition (Module 2)

2. Planck's constant
Measurement of Planck's constant using LED (Module 2)

3.**Transistor characteristics**
Input and output characteristics of a NPN transistor in C-E configuration (Module2)

4. Dielectric constant
Determination of dielectric constant of a dielectric material (Module 2)

5. Torsional Pendulum
Determination of moment of inertia of a circular disc using torsional pendulum

6. **Diffraction grating**
Determination of wavelength of a laser light using diffraction grating (Module 4)

7. LCR series and parallel resonance
Study the frequency response of a series and parallel LCR circuit (Module 3)

8. Band gap energy
Determination of energy gap of an intrinsic semiconductor (Module 2)

TEXT BOOKS:

1. S. M. Sze, Semiconductor devices, Physics and Technology, Wiley. Publishing
2. Engineering Physics (2019), DSU Pearson, New Delhi.

REFERENCES:

1. M. Young (1977), Optics & Lasers An Engineering Physics approach, Springer
2. K.L. Chopra, Thin film Phenomena, McGraw Hill, New York.
3. S. O. Pillai (2018), Solid State Physics, revised edition, New Age International Publishers, New Delhi
4. M N Avadhanulu, P G Kshirsagar, TVS Arun Murthy (2018), A textbook of Engineering Physics, S Chand, New Delhi.

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**222EN1110**					
TITLE OF THE COURSE	**ENGINEERING MECHANICS**					
SCHEME OF Instruction	L	T	P	J	TotalHours	Credits
	3	-	-	-	39	3

COURSE OBJECTIVES:

The course will enable the students to

- Explain different types of forces, equilibrium conditions and related theorems
- Illustrate Couples and equivalent force couple system and related problems
- Explain concepts of friction and their relevance in Engineering problems
- Describe centroid, center of gravity, moment of inertia and mass moment of inertia and their relevance in Engineering problems
- Describe Trusses and its classification
- Determine axial forces in members of Planar determinate Truss
- Illustrate various concepts in dynamics and related problems

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Understand free body diagrams and principle of statics	L2
CO2	Analyze structures using concept of equilibrium conditions considering effect of frictional forces	L4
CO3	Describe the centroid and moment of inertia of composite geometrical sections	L2
CO4	Calculate axial forces in members of determinate truss	L3
CO5	Demonstrate plane kinematics and kinetics of particles/rigid bodies	L3

COURSE CONTENT:	
MODULE 1	**9 Hrs**
Introduction to Engineering Mechanics: Introduction to Engineering Mechanics, Force Systems Basic concepts, Particle Equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Resultant- Moment of Forces and its Application; Couples and Resultant of force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium.	
MODULE 2	**7 Hrs**
Friction : Introduction, Types of friction, Limiting friction, Cone of Friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, Ladder friction, related problems.	
MODULE 3	**8 Hrs**
Centroid, Centre and gravity and Moment of inertia: Introduction, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia Definition, Moment of inertia of plane sections from first principles, Theorems of moment of	

inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder and Prism.	
MODULE 4	**7 Hrs**
Analysis of Truss: Introduction, Classification of trusses, Equilibrium in two and three dimension; Method of Sections; Method of Joints; To determine if a member is in tension or compression; Simple Trusses; Zero force members.	
MODULE 5	**8 Hrs**
Dynamics: Introduction, Rectilinear motion; Plane curvilinear motion (rectangular path, and polar coordinates); Projectile motion, Basic terms, general principles in dynamics; Types of motion, motion and simple problems; D Alembert's principle and its applications in plane motion and connected bodies.	

TEXT BOOKS:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall publications.
2. A Nelson (2009), Engineering Mechanics: Statics and dynamics, Tata McGraw Hill publications.

REFERENCES:

1. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill publications.
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications.
5. H.J. Sawant, S.P Nitsure(2018), Elements of Civil Engineering and Engineering Mechanics, Technical Publications.

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1111**					
TITLE OF THE COURSE	**INTRODUCTION TO ELECTRONICS**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	3	**-**	**-**	**-**	**39**	**3**

COURSE OBJECTIVES:

This course enables students:

- To introduce the concepts of fundamentals of semiconductor devices with the basic knowledge of the flow of current in semiconductor devices such as diodes and transistors
- To Explain the characteristics of various semiconductor devices and the concept of Integrated circuits
- To understand the principles of electronic circuits for operations of energy conversions from AC to DC, noise removal and building the required power supply
- To understand how a particular electronic device can increase the power of a signal and also to be acquainted with gain calculations
- To implement the Boolean functions and to realize basic logic gate operations and logic functions
- To understand the basics of communication system, to modify the characteristics of carrier signals according to the information signals
- To study the fundamentals of electromagnetic waves
- To identify and understand the different blocks present in transmitter and receiver.
- To describe various parameters of Op-Amp, its characteristics and specifications.
- To understand the various applications of Op-Amp.

COURSE OUTCOMS:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Explain the fundamentals of semiconductor devices, analog and digital circuits	L2
CO2	Design and analyze the behavior of analog and digital circuits.	L3
CO3	Outline the overview of communication systems and oscillators.Solve various kinds of numerical problems.	L3
CO4	Develop the analog and digital circuits using simulation tool	L3

COURSE CONTENT:	
MODULE 1	**8Hrs**
Semiconductor Diodes: Semiconductor materials- intrinsic and extrinsic types, Ideal Diode. Terminal characteristics of diodes: p-n junction under open circuit condition, p-n junction under forward bias and reverse bias conditions, p-n junction in breakdown region, Zener diode, Series voltage regulator, Rectifier Circuits: Half wave and full wave, Reservoir and smoothing circuits.	

MODULE 2	8Hrs
Transistors: Introduction, Transistor construction, operation and characteristics; Configuration types: Common base and common emitter configuration, Active region operation of transistor, Transistor amplifying action, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias, Transistor as a switch: cut-off and saturation modes. Field Effect Transistors: Construction and characteristics of n-channel JFET, Types of power amplifiers: Class A operation, Class B operation, Class AB operation.	
MODULE 3	**8Hrs**
Operation Amplifier: Ideal Op-amp, Differential amplifier: differential and common mode operation common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non-inverting amplifier, comparator, summing amplifier, integrator, differentiator. The concept of positive feedback, Oscillator circuits using op amps: RC phase shift oscillator, wein bridge oscillator.	
MODULE 4	**8Hrs**
Communication system: The radio frequency spectrum, electromagnetic waves, A simple CW transmitter and receiver, modulation, demodulation, AM transmitter, FM transmitter, Tuned radio frequency receiver, Superheterodyne receiver. RF amplifiers, AM demodulators.	
MODULE 5	**7Hrs**
Digital circuits: Logic functions, Switch and lamp logic, logic gates, combinational, Logic, bistables/flipflops, application of Flip flops, Integrated circuit logic devices:introduction to Microprocessor and microcontrollers (Architecture), Related Problems.	

TEXT BOOKS:

1. Electronic Devices and Circuit Theory: Robert L Boylestad and Louis Nashelsky, Pearson Education, Eleventh Edition, 2013.
2. Electronic Circuits: Fundamentals and applications, Michael Tooley, Elsevier, Third edition, 2006.

REFERENCES:

1. David A Bell, Electronic Devices and Circuits, PHI, 5th edition, 2007.
2. Millman & Halkias, Electronics Devices and Circuits, McGraw Hill, second edition, 2010
3. Modern Digital and Analog Communication Systems by B.P.Lathi. Oxford University Press, Fourth edition, 2010
4. NPTEL- https://nptel.ac.in/courses/122/106/122106025/
   Virtual Labs- http://vlabs.iitkgp.ac.in/be/

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1112**					
TITLE OF THE COURSE	**ENGINEERING GRAPHICS & DESIGN THINKING**					
SCHEME OF Instruction	L	T	P	J	Total Hours	Credits
	2	**-**	**2**	**-**	**26(L)+26(L)**	**3**

COURSE OBJECTIVES:

- To create awareness and emphasize the need for Engineering Graphics & design thinking
- To learn using professional CAD software for construction of geometry
- To understand the concepts of orthographic and isometric projections
- To construct orthographic projection of points, lines, planes and solids
- To construct development of surfaces of solids
- To construct isometric projections of planes and solids
- To create simple engineering 3D components
- To work in a team for creating conceptual design of products
- To learn application of design methods and tools on real world problem

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Explain usage of instruments, dimensioning & tolerances, conventions and standards related to working drawings	L1
CO2	Construct points, lines, planes and solids using orthographic projections principles	L3
CO3	Construct & understand development of lateral surfaces of solids	L3
CO4	Construct geometries of planes and solids using isometric projection principles	L3
CO5	Apply the design thinking principles and recognize the significance of innovation	L3
CO6	Design various part models related to engineering field using AutoCAD modelling software	L3

COURSE CONTENT:	
MODULE 1	**4 Hrs**
Introduction to engineering graphics: Fundamentals, Drawing standard - BIS, dimensioning, Lines, lettering, scaling, symbols, dimensioning & tolerances, conventions, Introduction to orthographic projection. Types of projections & their principles **- (For CIA only)** **Introduction to computer aided drafting software**- Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, coloring, mirror, rotate, trim, extend, break, chamfer, fillet and curves **- (For CIA only)**	

MODULE 2	12 Hrs
Projection of points and lines- Orthographic projections of points in all the quadrants, Orthographic projections of lines- inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. **Orthographic projections of planes** viz triangle, square, rectangle, pentagon, hexagon and circular laminae.	
MODULE 3	**16 Hrs**
Projection of solids & development of surfaces: Projection of simple solids like prisms, pyramids, cylinder & cone when the axis is inclined to one or both of the principal planes by change of position method, Development of lateral surfaces of simple solids – Prisms, pyramids cylinders and cones.	
MODULE 4	**12 Hrs**
Isometric projections: Isometric scale, Isometric projection of hexahedron (cube), regular prisms, pyramids, cylinders, cones and spheres, Isometric projection of combination of two solids Conversion of Isometric Views to Orthographic Views & Conversion of orthographic views to isometric projections.	
MODULE 5	**8 Hrs**
Introduction to design thinking for innovations: A brief history of Design, Engineering Design process, Product development cycle, creation of models and their presentation in standard 3D view. Theory, Practice & Examples in Design thinking, Storytelling, Creativity and Idea Generation, Concept Development, Testing and Prototyping. **(For CIA only)**	

List of Laboratory activities to be conducted
• Manual & Computer Sketching problems for all the modules in sketch book and also take print out of the problems. • Problems to be solved in first quadrant system. • Minor Project for Design thinking in a group of students with VIVA- (Examples on Solid Modeling - Using 3D Modelling Software & Physical Model Prototype). Module1 & 5 – Only For CIA

TEXT BOOKS:

1. "A Textbook of Computer Aided Engineering Drawing", Gopalakrishna, K. R. and Sudheer Gopala Krishna (2017), Subash Publishers, Bangalore, India.
2. "Engineering Design- A Project Based Introduction", C. L. Dym and Patrick Little, John Wiley & Sons (2022)

REFERENCES:

1. "Engineering Drawing", Bhatt N.D., 3rd Edition, Charotar Publishing House, Gujarat, India,(2019)
2. "Engineering Drawing with Introduction to AutoCAD" Dhananjay .A .J, Tata McGraw-Hill Publishing Company Ltd, (2018)
3. "Engineering Design Methods: Strategies for Product Design", N. Cross, John Wiley, 2021.

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22ENN1114**					
TITLE OF THE COURSE	**ENVIRONMENTAL SCIENCE**					
SCHEME OF Instruction	L	T	P	J	Total Hours	Credits
	1	**-**	**-**	**-**	**13**	**1**

COURSE OBJECTIVES:

- To understand the concepts of environment, pollution, energy resources
- To learn water as a resource, rain water harvesting as a method of conversation of water
- To explain solid waste and its management
- To learn environmental Protection Act laws, environmental Impact Analysis and air monitoring

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Critically elucidate the basic concepts that govern environmental quality, ambient air quality standards	L2
CO2	Compare different Energy resource and their environmental implications	L2
CO3	Identify different types of pollution, waste stream	L2
CO4	Identify different natural and manmade disasters and prevention	L2
CO5	Apply the process of environmental impact assessment and implications of Indian Environment Laws	L2

COURSE CONTENT:	
MODULE 1	**3 Hrs**
Definition of environment; Scope and importance of environmental studies; Basic concepts: Xenobiotic, natural & anthropogenic; why are we concerned? Eco-kinetic & Bio-kinetic Properties of a xenobiotic, Dose-Response Relationships; 3 T's, Chronic and acute effects.	
MODULE 2	**4 Hrs**
Pollution: Criteria Air pollutants – Ozone, Particulate Matter, Carbon Monoxide, Nitrogen, Oxides, Sulphur Dioxide, Lead; Acid Rain Cycle. Water as a resource; Lentic and Lotic Water Systems; Rain Water Harvesting; Water Pollution; Noise pollution-sources and effects of noise; Municipal Solid Waste: Hazardous Waste: Electronic Waste: Biomedical Waste; Solid Waste Management: Landfills, composting Process.	
MODULE 3	**2 Hrs**
Energy Types of energy: Conventional sources of energy, fossil fuel, Coal, Solar, wind; Non-conventional Sources of Energy, Biofuels - biomass, biogas.	

MODULE 4	**2 Hrs**
Disasters & Management; Definition, Natural (Earthquakes, landslides, floods), Man-made disasters (biological, chemical, nuclear, radiological explosions) – definition, causes and management and/or mitigation strategies; Bhopal & Chernobyl Disasters.	
MODULE 5	**2 Hrs**
Environmental Impact Assessment (EIA); Air pollution monitoring and Ambient Air Quality Standards (AAQS); Environment Protection Act, 1986.	

TEXT BOOKS:

1. Benny Joseph (2005). "Environmental Studies", Tata McGraw – Hill Publishing Company Limited, New Delhi.
2. R. J. Ranjit Daniels and Jagadish Krishnaswamy (2014). "Environmental Studies" (2014), Wiley India Pvt Limited, New Delhi.

REFERENCE BOOKS:

1. P. Aarne Vesilind, Susan M.Morgan, Thomson (2008). "Introduction to Environmental Engineering" (2008), Thomson learning, Second Edition, Boston.
2. R. Rajagopalan (2005). "Environmental Studies – From Crisis to Cure" Oxford University Press, New Delhi.

****

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE	**22EN1114**					
TITLE OF THE COURSE	**TECHNICAL ENGLISH**					
SCHEME OF Instruction	L	T	P	J	Total Hours	Credits
		-	**2**	**-**	**26**	**1**

COURSE OBJECTIVES:

- To enhance their communicative skills
- To equip students with oral and appropriate written communication skills
- To inculcate students with employability and job search skills
- To achieve proficiency in English
- To create interest among the students about any topic
- To learn the use of body language and improve verbal message
- To acquire skills for placement
- To help them frame their ideas and thoughts in a proper manner.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Make a complete Group Project: Poster Making, Power Point Presentation, Abstract Writing, Project Paper, Facing Viva	L2
CO2	Skit Performance on any social awareness theme in group.	L2
CO3	Learning how to create a Cover Letter, Job Application and Resume.	L3

COURSE CONTENT:	
MODULE 1	**4 Hrs**
Group Project: How to create a Poster & do Power Point Presentation. Learn to write an Abstract & Project Paper. Applying the basic etiquettes while facing Viva.	
MODULE 2	**12 Hrs**
Skit Performance: How to write a script. Use of powerful vocabulary, focus on pronunciation and maintaining the body language.	
MODULE 3	**16 Hrs**
Cover Letter, Job Application and Resume: Learn to create a resume. How to fill a Job Application form & create a proper Cover letter.	

REFERENCES:

- Chauhan, Gajendra S., L. Thimmesha and Smita, Kashiramka (2019) Technical Communication, Cengage Learning, New Delhi.
- Other Resources: Language Lab

****

SEMESTER	**II**					
YEAR	**I**					
COURSE CODE	**22EN1202**					
TITLE OF THE COURSE	**PYTHON PROGRAMMING FOR PROBLEM SOLVING**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	2	**-**	**2**	**-**	**26(L)+26(P)**	**3**

COURSE BJECTIVES:

- To understand basic concepts of computational thinking.
- To introduce python programming for problem solving.
- To introduce different debugging and unit testing tools.
- To solve real world problems using python data structures.
- Learn to handle files and exception handling in python.
- To explore Python's object-oriented features.
- To build Web services and Networked programs in python.
- To train students to design an application as part of the course mini- project using computationalthinking with python.

COURSEOUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Understand basic concepts of computational thinking.	L2
CO2	Outline basic python programming for problem solving.	L2
CO3	Apply computational thinking to solve real world programs using Python	L3
CO4	Build python programs using core data structures like list, dictionaries and tuples	L3
CO5	Implement object oriented concepts using python	L3
CO6	Design applications related to web services and network Programming.	L3

COURSE CONTENT:	
MODULE 1	**5Hrs**
INTRODUCTION: Values, expressions and statements, Conditional execution,Functions, Iterations	
MODULE 2	**6Hrs**
PYTHON DATA STRUCTURES: Python Data Structures: Strings, Arrays, Lists, Tuples, Sets and Dictionaries	
MODULE 3	**5Hrs**
PYTHON OBJECTS: Classes and Objects: Creating classes, Using Objects, Accessing attributes, Classes as Types,Introduction to Multiple Instances, Inheritance.	

MODULE 4	5Hrs
EXCEPTION HANDLING: Try-Except, Exception syntax, examples, Types of exception with except, multiple exceptions with except, Try-Finally, Raise exceptions with arguments, Python built-in exceptions,User-defined exceptions, Assertions	
MODULE 5	**5Hrs**
PYTHON FILES & LIBRARIES: Files: File types, modes, File functions, File attributes, File positions, Looping over file. Basics of NumPy and Pandas	

List of Laboratory/Practical Experiments activities to be conduct

1. Python program to evaluate Values, expressions, and statements, Conditional execution, and Functions Iterations
    a. prompt the user to enter an integer and reverse it. And print the sum of the reversed integer.
    b. Write a python program to find whether a number (num1) is a factor of 255.
    c. Write a python program to find whether a number (num1) is a factor of 255.
    d. Write a program to find the sum of the following series:
        i. 1 + 1/3 + 1/5 + 1/7 + ... up to 'N' terms.
        ii. 1 + x/1! + x3/2! + x5/3! + x7/4 + ... x2n-1/n!
2. Python program to evaluate Python Collections
    a. Write a Python Program to demonstrate the inbuilt functions of Strings, List, and sets.
    b. Write a Python program for counting a specific letter 'o' in a given string; the number of times vowel 'o' appears.
    c. Write a Python Program to find the frequency of each word in given strings/strings
    d. Store the following for 'n' countries, using a dictionary:
        i. Name of a country, country's capital, per capita income of the country.
        ii. Write a program to display details of the country with the highest and second lowest per capita income.
3. Write a python program to create two classes "Python" and "Java" having data members "Version" and "name" and a member function "display()". With the help of the object, print the appropriate messages.
4. Create a class "Employee" with __init__ method to initialize data members: Name, Designation, Ph. No., and a member function display (). Create an instance for the class and display the details of the employee
5. Write an interactive calculator! User input is assumed to be a formula that consist of a number, an operator (at least + and -), and another number, separated by white space (e.g. 1 + 1). Split user input using str.split(), and check whether the resulting list is valid:
    a. If the input does not consist of 3 elements, raise a FormulaError, which is a custom Exception.
    b. Try to convert the first and third input to a float (like so: float_value = float (str_value)). Catch any Value Error that occurs, and instead raise a Formula Error
    c. If the second input is not '+' or '-', again raise a Formula Error
    d. If the input is valid, perform the calculation and print out the result. The user is then prompted to provide new input, and so on, until the user enters quit.

6. Write a Python program to count the number of lines in a text file and read the file line by line and store it into a list as well as find the longest word in the file.
7. Write a Python program to create a list of student details: usn, name dob and email {using dictionary} and write a list to a file.
8. Generate one-hot encodings for an array in numpy.
9. Write a Pandas program to import excel data into a Pandas dataframe and find a list of employees where hire_date is between two specific month and year.

TEXT BOOKS:

1. "Python for Everybody-Exploring Data Using Python 3", Dr. Charles R. Severance,

REFERENCES:

1. "Computer Science Using Python: A Computational Problem- Solving Focus", Charles Dierbach, Introduction John Wiley, 2012.
2. "Introduction to Computation and Programming Using Python", John V Guttag,Prentice Hall of India, 2015.
3. "How to think like a Computer Scientist, Learning with Python", Allen Downey, JeffreyElkner and Chris Meyers, Green Tea Press, 2014.
4. "Learning to Program with Python", Richard L. Halterman, 2011.

****

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

Definitions / Descriptions

Definition of Credit:	
1 Hour Lecture (L) Per Week	01 Credit
1 Hour Tutorial (T) Per Week	01 Credit
1 Hour Practical (P) Per Week	0.5 Credit
1 Hour Project (J) Per Week	0.5 Credit

Course code and Definition:	
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management Courses
IPCC	Integrated Professional Core Course
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
SEC	Skill Enhancement Courses
UHV	Universal Human Value Course
PROJ	Project Work
INT	Internship

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

Implementation of National Education Policy (NEP) 2020 for the B.Tech students of Batch 2022-2026

The implementation of Curriculum follows NEP 2020 and addresses the following features and categories of courses:

1. Student Centric flexible curriculum.
2. Inter-disciplinary Courses,
3. Multi-disciplinary Courses,
4. Ability Enhancement Courses,
5. Skill Enhancement Courses,
6. Value Added Courses,
7. Product Design and Development,
8. Internship (Rural Internship, Industry Internship, Research/Development Internship), and
9. Multiple Exit and Multiple Entry
    - Certificate in Engineering after completion of first year.
    - Diploma in Engineering after completion of second year.
    - Advanced Diploma in Engineering after completion of third year.
    - Degree in Engineering after completion of fourth year.

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

III SEMESTER													
S. N	Course Type	Course Code	Course Name	Teaching Department	Teaching Hours / Week				Examination				Credits
					Lecture	Tutorial	Practical	Project	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	J					
1	BSC	22CS2301	Transforms and Numerical Techniques	MAT	3	0	0	0	03	60	40	100	**3**
2	IPCC	22CS2302	Data Structures	CSE	3	0	2	0	03	60	40	100	**4**
3	IPCC	22CS2303	Digital Logic Design	ECE	3	0	2	0	03	60	40	100	**4**
4	PCC	22CS2304	Discrete Mathematics & Graph Theory	CSE	3	0	0	0	03	60	40	100	**3**
5	PCC	22CS2305	Full Stack Development	CSE	3	0	0	0	03	60	40	100	**3**
6	AEC	22LSXXXX	Liberal Studies	All Dept.	1	0	0	0	01	50	--	50	**1**
7	SEC	22CS23XX	Skill Enhancement Course – I	CSE	1	0	2	0	01	100	--	100	**2**
			Total		**17**	**0**	**06**	**0**		**450**	**200**	**650**	**20**

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

LIBERAL STUDIES LIST - B.TECH PROGRAMME – 2022-23 Batch

Sl. No.	Course Code	Course Title	Offering dept
1	22LS0001	Introduction to Drama	Any department
2	22LS0002	Introduction to Dance	
3	22LS0003	Introduction to Music	
4	22LS0004	Introduction to Photography	
5	22LS0005	Introduction to Japanese language	
6	22LS0006	Law for Engineers	
7	22LS0007	Introduction to Painting	
8	22LS0008	Communication Through Sanskrit	
9	22LS0009	Vedic Mathematics	
10	22LS0010	Fundamentals of Critical Thinking	
11	22LS0011	Introduction to Film Studies	
12	22LS0012	Practicing Yoga & Meditation	
13	22LS0013	Cyber Crimes, Policies & Laws	
14	22LS0014	Holistic Medicine	
15	22LS0015	3 D Modelling using Tinkercad	

Skill Enhancement Course – I	
Course Code	**Course Name**
22CS2306	Linux Programming & Scripting
22CS2307	MATLAB Programming

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

IV SEMESTER													
S. N	Course Type	Course Code	Course Name	Teaching Department	Teaching Hours / Week			Examination					Credits
					Lecture	Tutorial	Practical	Project	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	J					
1	BSC	**22CS2401**	Probability & Statistics	MAT	3	0	0	0	03	60	40	100	**3**
2	IPCC	**22CS2402**	Design and Analysis of Algorithms	CSE	3	0	2	0	03	60	40	100	**4**
3	IPCC	**22CS2403**	Database Management System	CSE	3	0	2	0	03	60	40	100	**4**
4	IPCC	**22CS2404**	Object Oriented Design and Programming	CSE	3	0	2	0	03	60	40	100	**4**
5	PCC	**22CS2405**	Computer Organization and Architecture	CSE	3	0	0	0	03	60	40	100	**3**
6	AEC	**22CS2406**	Special Topics	CSE	0	0	0	4	01	100	--	100	**2**
7	SEC	**22CS24XX**	Skill Enhancement Course – II	CSE	1	0	2	0	--	100	--	100	**2**
			Total		**16**	**01**	**08**	**0**	**14**	**500**	**200**	**700**	**22**

Skill Enhancement Course – II	
Course Code	**Course Name**
22CS2407	IoT Automation
22CS2408	Technical Writing
22CS2409	Open Source Middleware Components

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

TRANSFORMS AND NUMERIAL TECHNIQUES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2301	**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P–J	:	3–0–0–0			

Course Objectives:

This Course will enable students to:

1. **Apply** their knowledge of Laplace transforms and inverse Laplace transforms to proficiently solve linear ordinary differential equations with constant coefficients, facilitating the analysis and modelling of complex systems.
2. **Analyze** periodic functions using Fourier series, assessing the convergence properties and precision of the series expansion, thereby enhancing their ability to understand and manipulate periodic phenomena.
3. **Utilize** complex exponential form, Fourier transforms of basic functions, and Fourier sine and cosine transforms to solve problems involving Fourier integrals, developing proficiency in applying these techniques to various mathematical scenarios.
4. **Employ** numerical methods, including Euler's Method, Runge-Kutta 4th order, Adams-Bashforth, and Adams-Moulton Methods, to solve differential equations and effectively analyze dynamic systems, enabling them to model real-world phenomena and make accurate predictions.
5. **Apply** finite difference methods, including the Crank-Nicolson method and appropriate techniques for hyperbolic PDEs, to effectively solve different types of partial differential equations (PDEs) such as elliptic, parabolic, and hyperbolic equations, enhancing their problem-solving skills in the context of differential equations and their applications.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I: Laplace Transform and Inverse Laplace Transform	**09 Hours**
Laplace Transforms of Elementary functions (without proof), ***(Text Book-1: Chapter 6: 203 to 207).*** Laplace Transforms of $e^{at}f(t), t^n f(t)$ and $\frac{f(t)}{t}$, Periodic functions, Unit step function and impulse functions ***(Text Book-1: Chapter 6:208-230)***. Inverse Laplace Transforms- By the method of Partial Fractions, Logarithmic and Trigonometric functions, Convolution Theorem, Inverse Laplace transform using Convolution Theorem ***(Text Book-1: Chapter 6: 238)***. Solution to Differential Equations by Laplace Transform. ***(Text Book-1: Chapter 238-242)***.	
UNIT – II: Fourier Series	**09 Hours**
Periodic Functions, Trigonometric Series ***(Text Book-1: Chapter 11: 495).*** Fourier series Standard function, Functions of any Period 2L, Even and Odd functions, Half-range Expansions. ***(Text Book-1: Chapter 11: 483-492)*** Practical Harmonic analysis (calculate average power and RMS values of periodic waveforms)	
UNIT – III: Fourier Transform	**06 Hours**
Calculation of Fourier integrals using complex exponential form ***(Text Book-1: Chapter 11: 510).***	

Fourier transform of basic functions ***(Text Book-1: Chapter 11: 510-516).*** Fourier sine and cosine transforms. ***(Text Book-1: Chapter 11: 518-522).***	
UNIT – IV: Numerical Methods for Solving Ordinary Differential Equations	**07 Hours**
Euler's Method-Basic principles of Euler's method for solving first-order ODEs ***(Text Book-1: Chapter 1:10-12).*** Runge-Kutta 4th order ***(Text Book-1: Chapter 21:904).*** Multistep Methods-Explanation of multistep methods (Adams-Bashforth, Adams–Moulton Methods) ***(Text Book-1: Chapter 21:911-913).*** Second-Order ODE. Mass–Spring System (Euler Method, Runge–Kutta Methods) ***(Text Book-1: Chapter 21:916-918).***	
UNIT – V: Numerical Methods for Partial Differential Equations	**08 Hours**
Classification of PDEs (elliptic, parabolic, hyperbolic), ***(Text Book-1: Chapter 21:922-923).*** Finite Difference Methods (Laplace and Poisson Equations), Derivation of finite difference approximations ***(Text Book-1: Chapter 21:923-927).*** Crank–Nicolson Method ***(Text Book-1: Chapter 21:938-941).*** Method for Hyperbolic PDEs ***(Text Book-1: Chapter 21:943-945).***	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Apply** Laplace transforms and inverse Laplace transforms to solve linear ordinary differential equations with constant coefficients, demonstrating proficiency in system analysis and modelling.	L3
2	**Analyze** periodic functions using Fourier series and evaluate the convergence properties and precision of the series expansion.	L2 & L3
3	**Solve** problems involving Fourier integrals by applying complex exponential form, Fourier transforms of basic functions, and Fourier sine and cosine transforms.	L3
4	**Utilize** numerical methods such as Euler's Method, Runge-Kutta 4th order, Adams-Bashforth, and Adams-Moulton Methods to solve differential equations and analyze dynamic systems	L2 & L3
5	**Apply** finite difference methods, including the Crank-Nicolson method and appropriate techniques for hyperbolic PDEs, to solve various types of partial differential equations (PDEs) such as elliptic, parabolic, and hyperbolic equations.	L3

Table: Mapping Levels of COs to POs / PSOs														
COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	1					1					
CO2	3	2	2						1					
CO3	3	2	2	1					1					
CO4	3	2	2	1					1					
CO5	3	2	2	1					1					

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 2015, 10th Edition, Wiley India.

REFERENCE BOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, 2015, 43rd Edition, Khanna Publishers.
2. Higher Engineering Mathematics, John Bird, 2017, 6 th Edition, Elsevier Limited.

E-Resources:

1. https://nptel.ac.in/courses/111106139
2. https://nptel.ac.in/courses/111101164
3. https://nptel.ac.in/courses/111105038

DATA STRUCTURES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2302	**Credits**	:	04

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

Hours / Week	: 03 Hours	**Total Hours**	: 39(Th)+26(P) Hours
L–T–P-J	: 3–0–2-0		

Prerequisites:

Proficiency in a C programming language.

Course Objectives:

This Course will enable students to:

1. **Understand** the basic approaches for analysing and designing data structures.
2. **Introduce** dynamic memory allocation and C language concepts required for building data structures
3. **Develop** essential skills to construct data structures to store and retrieve data quickly and **efficiently**.
4. **Utilize** different data structures that support different sets of operations which are suitable for various applications.
5. **Explore & Implement** how to insert, delete, search and modify data in any data structure- Stack, Queues, Lists, Trees.
6. **Develop** applications using the available data structure as part of the course for mini-project.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teachers can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture methods, but different *types of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, note taking, annotating, and roleplaying.
3. Show ***Video/Animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**08 Hours**
IINTRODUCTION:	

Introduction to Data Structure, Classification, C Structure and Union, Array Definition, Representation, Operations (Insertion, Deletion, Search and Traversal), Two/Multidimensional Arrays, sparse matrix, C Pointers TB1: 1.1, 2.2, 2.5 ; TB2: 1.1, 1.2,1.3.1-1.3.4; RB1: 5.1 – 5.12, 6.4	
UNIT – II	**09 Hours**
INTRODUCTION TO ADT: **Stack:** Definition, Array Representation of Stack, Operations on Stacks. **Applications of Stack:** Expression evaluation, Conversion of Infix to Postfix, Infix to Prefix Recursion, Tower of Hanoi **Queue:** Definition, Representation of Queues, Operations of Queues, Circular Queue. **Applications of Queue:** Job Scheduling, A Maze Problem TB1: 3.1,3.2, 3.3,3.4,3.5 ; TB2: 2.1, 2.2, 2.3, 3.2, 3.3	
UNIT – III	**09 Hours**
DYNAMIC DATA STRUCTURES: **Linked List:** Types, Representation of Linked Lists in Memory. Traversing, Searching, Insertion & Deletion from Linked List. Circular List, Doubly Linked List, Operations on Doubly Linked List (Insertion, Deletion, Traversal). **Applications:** Stack & Queue Implementation using Linked Lists. **Case Study**: Josephus problem. TB2: 4.2,4.3,4.5	
UNIT – IV	**08 Hours**
TREES: Basic Terminology, Binary Trees and their representation, Complete Binary Trees, Binary Search Trees, Threaded Binary Trees, Operations on Binary Trees (Insertion, Deletion, Search & Traversal). TB1: 5.1,5.2,5.3,5.5,5.7 **Applications:** Expression Evaluation **Case Study:** Game Tree TB2: 5.5.3,5.5.4,5.6	
UNIT – V	**05 Hours**
Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees, Red Black Trees, Splay Trees. **Case Study**: B Trees TB1: 10.1,10.2,10.3,10.4, 11.2	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		

1	**Demonstrate** the key C programming concepts such as pointers, structures, unions and arrays data structures to perform operations such as insertion, deletion, searching, sorting, and traversing.	L3
2	**Utilize** the fundamental concepts of stacks and queues to solve the standard applications like tower of Hanoi, conversion and evaluation of expressions, job scheduling and maze.	L3
3	**Implement** Singly Linked List, Doubly Linked List, Circular Linked Lists, stacks and queues using linked list**.**	L3
4	**Develop** critical thinking and problem-solving skills by designing and implementing efficient algorithms for Non-linear tree data structure and perform insertion, deletion, search and traversal **operations** on it.	L3
5	**Apply** advanced techniques, such as balancing algorithms for AVL trees, Splay trees and Red-Black trees to maintain the balance and efficiency of binary trees.	L3

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3												2	
CO2	3		3									2	2	
CO3	3		3									2	2	
CO4	3	2	3									2	2	
CO5	3	2	3									2	2	

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS (TB):

1. Ellis Horowitz, Susan Anderson-Freed, and Sartaj Sahni, "Fundamentals of Data structures in C", 2nd Edition, Orient Longman, 2008.
2. A.M. Tannenbaum, Y Langsam, M J Augentien "Data Structures using C", 1st Edition, Pearson, 2019.

REFERENCE BOOKS:

1. Brian. W. Kernighan, Dennis. M. Ritchie, "The C Programming Language", 2nd Edition, Prentice-Hall, 1988.
2. Gilbert & Forouzan, "Data Structures: A Pseudo-code approach with C", 2nd Edition, Cengage Learning,2014.
3. Jean-Paul Tremblay & Paul G. Sorenson, "An Introduction to Data Structures with Applications", 2nd Edition, McGraw Hill, 2013.
4. R.L. Kruse, B.P. Learly, C.L. Tondo, "Data Structure and Program design in C", 5th Edition, PHI ,2009.

E-Resources:

1. https://nptel.ac.in/courses/106102064
2. https://www.coursera.org/learn/data-structures?specialization=data-structures-algorithms
3. https://www.udemy.com/topic/data-structures/free/
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/data-structures
5. https://cse01-iiith.vlabs.ac.in/
6. https://kremlin.cc/k&r.pdf

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving using group discussion.
2. Role play E.g., Stack, Queue, etc.,
3. Demonstration of solution to a problem through programming.
4. Flip class activity E.g., arrays, pointers, dynamic memory allocation, etc.,

LABORATORY EXPERIMENTS

Total Contact Hours: 26

Following are experiments to be carried out using either C programming language

1. To Implement C programs with concepts of pointers, structures.
2. To implement multidimensional array Matrix Multiplication.
3. To search elements in data structure with different search methods.
4. To implement stack, queue and their variations using arrays.
5. To implement stack, queue and their variations using singly linked lists
6. To implement conversion & evaluation of expression using stacks.
7. To Implement doubly circular Linked Lists and variations and use them to store data and perform operations on it.
8. To Implement Addition/multiplication of 2 polynomial using linked lists

9. To implement binary tree traversal techniques.

OPEN-ENDED EXPERIMENTS

1. A man in an automobile search for another man who is located at some point of a certain road. He starts at a given point and knows in advance the probability that the second man is at any given point of the road. Since the man being sought might be in either direction from the starting point, the searcher will, in general, must turn around many times before finding his target. How does he search to minimize the expected distance travelled? When can this minimum expectation be achieved?
2. The computing resources of a cloud are pooled and allocated according to customer demand. This has led to increased use of energy on the part of the service providers due to the need to maintain the computing infrastructure. What data structure will you use for allocating resources which addresses the issue of energy saving? Why? Design the solution.
3. Mini-Project on applying suitable data structure to a given real-world problem.

DIGITAL LOGIC DESIGN

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2303	**Credits**	:	04
Hours / Week	:	03 Hours	**Total Hours**	:	39(Th) + 26(P) Hours
L–T–P-J	:	3–0–2-0			

Course Learning Objectives:

This Course will enable students to:

1. **Translate** the elements of digital logic functions to digital system abstractions using Verilog.

2. **Illustrate** simplification of Boolean expressions using Karnaugh
3. **Mode**l combinational logic circuits for arithmetic operations and logical operations
4. **Analyse** and model sequestial elements flip-flops, counter, shift registers.
5. **Outline** the concept of Mealy Model, Moore Model and apply FSM to solve a given design problem.

Teaching-Learning Process (General Instructions)
These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, note taking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**08 Hours**

INTRODUCTION:
Number System- Binary, Hexa, Decimal, Octal and its conversion. Canonical Notation - SOP & POS forms, Minimization of SOP and POS forms.
(Text Book-1: Chapter 1: 1.2 to 1.4, Chapter 2: 2.6)
ARITHMETIC CIRCUITS AND VERILOG MODELLING
Adders: Half adder, full adder, Ripple carry adder, parallel adder /subtractor, fast adders-CLA, comparator- 2 bit. Simplification using K-Maps
(Text Book-2: Chapter 5: 5.2, 5.3.3, 5.4,5.5.2, 5.5.3)
Introduction to Verilog, Syntax of Verilog coding, Modelling styles in Verilog, Verilog Operators, Test bench for simulation
(Text Book-3: Chapter 1: 1.1, 1.2.2, 1.3.1, 1.3.2, 1.3.3, 1.4.2, 1.5.1.2, 1.5.2.2, 1.5.3.2, 1.5.4.2, 1.6.2)

UNIT – II	**07 Hours**

Combinational Circuit Building Multiplexers 4:1, 8:1, decoders 3:8, 2:4, demultiplexers 1:4, encoders 8:3, 4:2, code converters- B to G and G to B- Simplification using K-Maps **Verilog for combinational circuits**, if else, case-casex, casez, for loop, generate. ***(Text Book-2: Chapter 6: 6.1, 6.2, 6.3, 6.4, 6.6)***	
UNIT – III	**08 Hours**
Sequential Circuits-1 Basic Latch, Gated latches, Flip Flops SR, D, JK, T, master-slave flip-flops JK, Characteristic equations, 0's and 1's Catching Problem, Race round condition, Switch debounce, shift registers- SISO, SIPO, PISO, PIPO, Setup time, Hold time, Propagation Delay ***(Text Book-2: Chapter 7: 7.1, 7.2,7.3, 7.4,7.5,7.6, 7.8)***	
UNIT – IV	**08 Hours**
Sequential Circuits-2 Binary counters – asynchronous and synchronous, mod-n counter, ripple counter- 4 bit. Verilog blocking and non-blocking, Mealy Model, Moore Model, State machine notation, Construction of Finite State Machine. ***(Text Book-2: Chapter 7: 7.9, 7.11, 7.12.3, 7.12.4, 8.1, 8.2, 8.3, 8.4)***	
UNIT – V	**08 Hours**
Introduction to Electronic Design Automation: FPGA Design Flow, ASIC Design flow, architectural design, logic design, simulation, verification and testing, 3000 Series FPGA architecture. **Applications**: Design 4 Bit ALU, 7 Segment display, Vending Machine, 3 Pipeline. ***(Text Book-4: Chapter 1)***	

Laboratory Experiments

Experiments are conducted using Verilog tool /Kits	
1.	Introduction to Xilinx tool, FPGA flow
2.	Adder – HA, FA using data flow and behaviour modelling styles
3.	Adder – HA, FA using structural modelling style
4.	Combinational designs – I (blocking and non-blocking/looping examples)
a.	Multiplexer: 4:1, 8:1 MUX.
b.	De Multiplexer: 1:4, 1:8 DEMUX.
5.	Combinational designs – II (different types of case statements)
c.	Encoder with and without Priority: 8:3 and 4:2.
d.	Decoder: 3:8 and 2:4.
6.	Design of 4-bit ALU
7.	Flip Flop: D FF, T FF, JK FF
8.	Design of Mod – n Up/Down Counter with Synchronous reset
9.	Design of Mod – n Up/Down Counter with Asynchronous reset.
10.	Design of Universal shift Register using FSM

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Interpret** Boolean Expressions of digital design in simplified form	L2
2	**Build** the various elements of digital logic system with Verilog	L3
3	**Construct** Combinational and Sequential logic circuits	L3
4	**Analyse** the hardware model of a digital system at different levels of abstraction in Verilog	L4
5	**Evaluate** the functionality of digital design by implementing on FPGA kits	L5
6	**Design digital** systems using FSM	L3

Table: Mapping Levels of COs to POs / PSOs

Cos	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	3	2	1	2	3	-	-	-	1	-	1	1	2	1	-
CO3	3	2	3	1	2	-	-	1	1	-	1	1	2	1	-
CO4	3	3	2	3	3	1	-	1	-	1	2	1	2	2	1
CO5	3	3	2	3	3	1	-	-	-	1	-	-	2	2	1
CO6	3	3	3	3	3	2	-	1	2	2	2	2	2	1	2

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. M. Morris Mano Michael D. Ciletti , "Digital Design with an Introduction to the Verilog HDL", 6th Edition, Pearson Education, 2014.

2. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog design", McGraw Hill, 2014.

3. Nazein M. Botros, "HDL programming (VHDL and Verilog)", Dreamtech Press, 2006.

4. Douglas J Smith, "HDL Chip Design", Doone publications 1996.

REFERENCE BOOKS:

1. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2014.

2. Donald D. Givone, "Digital Principles and Design", McGraw Hill, 2015.

3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, 2016.

E-Resources:

1. https://archive.nptel.ac.in/courses/106/105/106105165/
2. https://nptel.ac.in/courses/117105080

Activity Based Learning (Suggested Activities in Class)

1. Design problem solving and Programming using group discussion. E.g., Traffic light controller, Digital Clock, Elevator.
2. Demonstration of solution to a problem through simulation.

DISCRETE MATHEMATICS AND GRAPH THEORY [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – III**			
Subject Code	: 22CS2304	**Credits**	: 03
Hours / Week	: 03 Hours	**Total Hours**	: 39Hours
L–T–P–J	: 3–0–0–0		

Course Learning Objectives:

This Course will enable students to:

1. **Learn** the set theoretic concept and its application in theory of computation.
2. **Determine** the concepts of mathematical induction, recursive relations and their application.
3. **Illustrate** the association of functions, relations, partial ordered set and lattices with problems related to theoretical computer science and network models.
4. **Discuss** the basics of graph theory and its application in computer networks. Learn the concepts of counting techniques and its application.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainmentof the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different type of teaching methods may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** Adopt the Active learning that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinkingskills such as the ability to evaluate, generalize, and analyse information rather than simplyrecall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come upwith their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that possible, it helps improve the students' understanding.

UNIT – I	**08 Hours**
SET THEORY: Sets and subsets, Operations on Sets: Basic set operations, algebraic properties of sets, The Addition Principle **RELATIONS AND ITS PROPERTIES:** Relations and their properties, N-Ary Relations and their applications, Representing relations. ***Textbook – 2: 1.1, 1.2 ; Textbook – 1: 7.1., 7.2, 7.3***	
UNIT – II	**06 Hours**
RELATIONS AND ORDER RELATIONS: Closure of relations, Equivalence Relations, Partial Orderings, Functions, The Growth of Functions. **Self-Study:** Transitive Closure and Warshall's Algorithm. ***Textbook – 1: 7.4., 7.5, 7.6, 3.2***	
UNIT – III	**08 Hours**
MATHEMATICAL INDUCTION AND RECURSION: Mathematical Induction, Recurrence Relations:Rabbits and the Fibonacci Numbers, The Tower of Hanoi, Code word Enumeration, Solving LinearRecurrence Relations **Self-Study:** Basic Connectives and Truth Tables ***Textbook-1: 4.1;6.1, 6.2;*1.1**	
UNIT – IV	**09 Hours**
GRAPH THEORY: Graphs and Graph Models. Graph Terminology and Special Types of Graphs: Basic Terminology, Some Special Simple Graphs, Bipartite Graphs, Complete Bipartite Graphs. Representing Graphs and graph isomorphism: Adjacency lists, Adjacency Matrices, Incidence	

Matrices, Connectivity: Paths, Connectedness in Undirected and Directed Graphs, Vertex and Edge connectivity and their applications. ***Textbook-1: 8.1, 8.2, 8.3, 8.4***	
UNIT – V	**08 Hours**
GRAPHS AND ITS APPLICATIONS: Euler and Hamilton Paths and their applications, Planar Graphs and their Applications, Graph Coloring and its applications. ***Textbook-1: 8.5, 8.7, 8.8***	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Identify** the membership of the Set and Relations and perform basic Algebraic operations	L3
2	**Illustrate** the concept of Mathematical Induction and create linear recurrence relations for the given problem	L4
3	**Construct** different types of graphs based on the properties and the real time applications of graph theoretical concepts	L3
4	**Analyze** the methods for optimizing the solution for graph coloring problem, Eulerian and Hamiltonian circuits/planes	L4

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its applications", Tata McGraw Hill, 2003.
2. Bernard Kolman, Robert C. Busby, Sharon Ross, "Discrete Mathematical Structures", 3rdEdition, PHI 2001.

REFERENCE BOOKS:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", IV Edition, Pearson Education, Asia, 2002.
2. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with applications to computer Science", Tata McGraw Hill, 1987.
3. J K Sharma, "Discrete Mathematics", 3rd edition, 2013, Macmillan India Ltd.

E-Resources:

1. Discrete Mathematics with Algorithms by M. O. Albertson, J. P. Hutchinson - J. 1988,Wiley.
2. Discrete Mathematics for Computer Science, Gary Haggard, John Schlipf, Sue Whitesides,Thomson Brooks/Cole, 2006.
3. http://ocw.mit.edu/courses/mathematics/
4. http://www.nptelvideos.in/2012/11/discrete-mathematical-structures.html
5. http://cglab.ca/~discmath/notes.html
6. https://www.cs.odu.edu/~toida/nerzic/content/web_course.html

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	2					1	1	1		2	2	1
CO2	3	3	2					1	1	1		2	2	1
CO3	3	3	3					1	1	1		1	2	1
CO4	3	3	3					1	1	1		2	2	1
Avg	3	2.5	2.5					1	1	1		1.75	2	1

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion.
2. Demonstration of solution to a problem using graph theory.

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

****
**

FULL STACK DEVELOPMENT

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2305	**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P–J	:	3–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. Understand the major areas and challenges of web programming..
2. To create websites using HTML5, CSS3, JavaScript
3. Front end framework for developing Interactive WebApp using ReactJS
4. Understand server-side scripting language-Node.JS
5. 5. Latest Framework for fast API development using GraphQL

Teaching-Learning Process (General Instructions)

1. These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.
2. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
3. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, focused listening, and formulating questions.
4. To make ***Critical thinking***, ask at least three higher order Thinking questions in the class.
5. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
6. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them
7. Discuss how some ***concept can be applied to the real world*** - and when that's possible.

UNIT – I	**07 Hours**
Markup Language (HTML5): Introduction to HTML and HTML5 - Formatting and Fonts - Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – HTML Forms, Audio ,Video Tag	
UNIT – II	**08 Hours**
CSS3: Levels of style sheets; Style specification formats; Selector forms;Property value forms; Font properties; List properties; Color; Alignment of text;Background images, Conflict Resolution, CSS Box Model .CSS3 features: BoxShadow, Opacity, Rounded corners, Attribute selector.	
UNIT – III	**08 Hours**

JavaScript: Overview of JavaScript; Object orientation and JavaScript; General syntactic, characteristics;Primitives, operations, and expressions; Screen output and keyboard input. Control statements; Arrays; Functions, Constructors; A brief introduction on pattern matching usingregular expressions, DOM Events, JSON	
UNIT – IV	**08 Hours**
Node JS: Introduction to NodeJS, Set up Dev Environment, Node JS Modules, Node Package Manager, File System, Events, Database connectivity using Mongo DB.	
UNIT – V	**08 Hours**
Express.JS: Introducing Express: Basics of Express, Express JS Middleware: Serving Static Pages, Listing Directory Contents, Accepting JSON Requests and HTML Form Inputs, Handling Cookies.	

Course Outcome	Description	Bloom's Taxonomy Level
1	Use the common HTML5 elements(tags) and CSS3 operations(styling properties) to **interpret** the fundamental of web page technologies	**L1,L2**
2	**Apply** Cascading Style Sheets and HTML5 elements for visual presentation and design well-structured web pages.	**L3**
3	**Implement** the JavaScript programming concepts to develop client-side scripts and display the contents dynamically.	**L3**
4	**Develop** dynamic server-side applications by employing Node.js event-driven, non-blocking I/O model and its integration with Mongo dB to work with dynamic schemas.	**L3**
5	Utilize the Node.js framework-Express.js basic concepts , and middleware to **construct** web applications more efficiently and intelligently, enabling faster development and smarter design	**L3**

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1		2		2							2	2	
CO2	2		2		2							2	3	
CO3	2		2		2							2	3	
CO4	3		3		2							2	3	
CO5	3		3		2							2	3	

TEXT BOOKS:

1. Robert W. Sebesta , "Programming the World Wide Web", 7th Edition, Pearson Education, 2008.
2. Basarat Ali Syed," Beginning Node.js ",Apress ,2014

REFERENCES:

1. Lionel Lopez,React Quickstart Step-by-Step Guide to Learning React Javascript Library
2. Kirupa Chinnathambi, JavaScript Absolute Beginner's Guide, 1st Edition, 2017.
3. Robert W Sebesta, Pearson, Programming the World Wide Web, 7th Edition, 2013.
4. Kirupa Chinnathambi, Learning React, 1 Edition, Addison-Wesley Professional
5. Mark Pilgrim,HTML5Up and Running,O'Reilly, 1st Edition, 2012.

E-Resources:

https://www.edureka.co/blog/ebook/web-development-ebook
MOOC:
https://www.coursera.org/learn/server-side-javascript-with-nodejs

Activity Based Learning (Suggested Activities in Class)

1. Hands-on Lab exercises
2. Mini Project
3. Freecode camp/OpenSource Online Coding Boot Camp
4. Coding platform Challenges – Hackerrank, CodeChef
5. Case based learning

LINUX PROGRAMMING AND SCRIPTING [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – III**			
Course Code	: 22CS2319	**Credits**	: 02

Hours / Week	: 02 Hours	**Total Hours**	: 26 Hours
L–T–P–J	: 2–0–0–0		

Course Learning Objectives:

This Course will enable students to:

6. To learn the fundamentals of OS
7. To Know the features of Linux OS and learn the Linux commands
8. To gain knowledge about the Linux networking and Linux administration
9. To understand the fundamentals of Shell scripting & Perl programming.
10. To discuss about the Inter Process Communication.
11. To understand the concept of client server communication by using sockets

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

9. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
10. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
11. Show ***Video/animation*** films to explain functioning of various concepts.
12. Encourage ***Collaborative*** (Group Learning) Learning in the class.
13. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
14. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
15. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
16. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT 1 : INTRODUCTION TO OS & LINUX	**06 Hours**

Operating System Objectives and Functions, The Evolution of Operating Systems developments Leading to Modern Operating Systems, Modern UNIX Systems, Linux, Booting Process of Linux operating system

File System of the Linux, Basic File Attributes, Basic commands, Linux users and group, Permissions for file, directory and users, Filters: cut, tr, grep. Find Command with various options, Filters using Regular Expression: grep & sed, The vi editor

Networking Tools: TCP/IP basics, Resolving IP addresses, ping, telnet and ftp, cron commands

UNIT 2: SHELL PROGRAMMING:	**05 Hours**

Types of Shells, Shell Meta Characters - $#, $*, $?, Shell Variables, Shell Scripts. read, operators, Integer Arithmetic and String Manipulation, Decision Making: if-else-elif-fi, case-esac. Loop Control; while, for, until, break & continue, Functions, I/O Redirection and Piping

UNIT 3: PERL PROGRAMMING	**05 Hours**
Structure of a perl script. Running a perl script. Variables and operators. String handling functions. Default variables - $_ and $. – representing the current line and current line number. The range operator. Chop() and chomp() functions. Lists and arrays, Associative arrays – keys and value functions. Overview of decision making loop control structures – the foreach, perl program examples	
UNIT 4: INTERPROCESS COMMUNICATION	**05 Hours**
The Process, Mechanisms of Process Creation, Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory, Message Queues- Kernel support for messages, Unix system V APIs for messages, client/server example.	
UNIT – V: SOCKETS	**05 Hours**
Introduction to Sockets, Socket Addresses, Socket system calls for connection oriented protocol and connectionless protocol, example client/server programs.	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	Describe the operating system fundamentals, Linux architecture and features of Linux OS, Linux utilities, networking and administration	L2
2	Write Shell Scripts for automation of various tasks	L3
3	Write and resolve programming problems using Perl, and PowerShell	L3
4	Implement Inter-Process communication between processes	L3
5	Design various client server applications using TCP or UDP protocols	L3

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2											
CO2	3	2	3										2	
CO3	3	2	3										2	
CO4	3	2	3										2	

CO5	3	2	3										2	

List of Experiments

1. Study and Practice on various commands like man, passwd, tty, clear, date, cal, cp, mv,ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who

2. Study and Practice on various commands like cat, tail, head , sort, nl, uniq, grep, egrep,fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, tar, cpio

3. Implement in C the following Unix commands using System calls A.cat B.ls .mv

4. Creating shell programs for automating tasks

5. Write perl script to ask from user repeatedly to enter a number, and when the user enters 0, print the total of all numbers entered so far

6. Implement the following IPC forms a) FIFO b) PIPE

7. Write a C program (sender.c) to create a message queue with read and write permissionsto write 3 messages to it with different priority numbers.

8. Write a C program (receiver.c) that receives the messages (from the above message queueas specified and displays them

9. Write client and server programs (using c) for interaction between server and clientprocesses using TCP Elementary functions.

10. Write client and server programs (using c) for interaction between server and clientprocesses using UDP Elementary functions

TEXT BOOKS:

1. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
2. Unix System Programming using C++, T.Chan, PHI.

REFERENCES:

1. Unix Network Programming ,W.R.Stevens,PHI.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, PearsonEducation, 2004.

E-Resources

1. https://archive.nptel.ac.in/courses/117/106/117106113/
2. https://www.learnshell.org/?ref=itsfoss.com
3. https://hackr.io/tutorials/learn-perl
4. https://www.tutorialspoint.com/perl/index.htm

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

PROBABILITY AND STATISTICS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Course Code	:	22CS2401	**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P–J	:	3–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. **Apply** statistical principles and probability concepts to solve complex problems in real-world scenarios involving uncertainty and randomness.
2. **Evaluate** and select appropriate probability distributions and statistical techniques to analyze and interpret data accurately in various applications.
3. **Justify** the use of estimation methods and hypothesis testing techniques for drawing meaningful inferences about population parameters.
4. **Analyze** and interpret sample test results for different statistical relationships, such as means, variances, correlation coefficients, regression coefficients, goodness of fit, and independence, to make informed decisions.
5. **Identify** sample tests using appropriate statistical procedures to investigate the significance of observed data and communicate findings effectively.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I : Probability	**09 Hours**
Definitions of Probability, Addition Theorem, Conditional Probability, Multiplication Theorem, Bayes' Theorem of Probability	

UNIT – II: Random Variables and their Properties and Probability Distributions	**09 Hours**
Discrete Random Variable, Continuous Random Variable, Joint Probability Distributions Their Properties, Probability Distributions: Discrete Distributions: Binomial, Poisson Distributions and their Properties; Continuous Distributions: Exponential ,Normal, Distributions and their Properties.	

UNIT – III: Estimation and testing of hypothesis	**06 Hours**
Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-Biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.	

UNIT – IV: Sample Tests-1	**07 Hours**
Large Sample Tests Based on Normal Distribution , Small Sample Tests : Testing Equality of Means, Testing Equality of Variances, Test of Correlation Coefficient	
UNIT – V: Sample Tests-2	**08 Hours**
Test for Regression Coefficient; Coefficient of Association, 2 – Test for Goodness of Fit, Test for Independence.	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Apply** the principles of probability to solve complex problems in various real-world scenarios.	L2 & L3
2	**Solve** and **compare** different probability distributions, including discrete and continuous random variables, in order to make informed decisions and predictions.	L2 & L3
3	**Apply** statistical estimation techniques, such as maximum likelihood estimation and interval estimation, to draw meaningful inferences about population parameters from sample data.	L3
4	**Examine** hypothesis testing methods, including large and small sample tests, to assess the significance of observed data and draw valid conclusions.	L4
5	**Analyze** statistical relationships and perform sample tests to assess the Equality of means in different populations, Correlation coefficients between variables to determine the strength and direction of the relationship. Independence of variables using appropriate statistical tests to assess the absence of any relationship.	L4

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2		2				1					
CO2	3	2	2		2				1					
CO3	3	2	2						1					
CO4	3	2	2		2				1					
CO5	3	2	2		2				1					

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.

REFERENCE BOOKS:

1. Probability, Statistics and Random Processes T. Veerarajan Tata McGraw – Hill
2. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

E-Resources:

1. https://nptel.ac.in/courses/106104233
2. https://nptel.ac.in/courses/117103067
3. https://nptel.ac.in/courses/103106120
4. https://www.coursera.org/learn/probability-intro#syllabus
5. https://nptel.ac.in/courses/111104073

Activity Based Learning (Suggested Activities in Class)

1. Tools like Python programming, R programming can be used which helps student to develop a skill to analyze the problem and providing solution.
2. Regular Chapter wise assignments/ Activity/Case studies can help students to have critical thinking, developing an expert mind set, problem-solving and teamwork.

Following are Assignments/ Activities Can be carried out using either R programming language or Python Programming or excel solver.

1. There are n people gathered in a room. What is the probability that at least 2 of them will have the same birthday? (Use excel solver, R Programming, Python Programming)
   a. Use simulation to estimate this for various n., and Produce Simulation Graph.
   b. Find the smallest value of n for which the probability of a match is greater than 0.5.
   c. Explore how the number of trials in the simulation affects the variability of our estimates.
2. **Case Study 1: Customer Arrivals at a Coffee Shop**
   a. A coffee shop wants to analyze the number of customer arrivals during its morning rush hour (7:00 AM to 9:00 AM). The shop has been recording the number of customer arrivals every 15 minutes for the past month.
   b. Data: The data consists of the number of customer arrivals recorded at the coffee shop during each 15-minute interval for the past month.
   c. Here is a sample of the data:

Time Interval	ıstomer Arrivals
00 AM - 7:15 AM	**6**
15 AM - 7:30 AM	**4**
30 AM - 7:45 AM	**9**
45 AM - 8:00 AM	**7**
00 AM - 8:15 AM	**5**
15 AM - 8:30 AM	**8**
30 AM - 8:45 AM	**10**
45 AM - 9:00 AM	**6**

analyze the customer arrivals and determine the probability distribution that best fits the data. Specifically, explore both discrete and continuous probability distributions,

including the binomial, Poisson, exponential, and normal distributions.

3. **Case Study 2: Comparing the Performance of Two Groups**
   a. Suppose you are a data analyst working for a company that manufactures a new energy drink. The marketing team conducted a promotional campaign in two different cities (City A and City B) to determine the effectiveness of the campaign in increasing sales. The sales data for a random sample of customers in each city was collected over a week. Your task is to compare the average sales between the two cities and test whether there is a significant difference in the variance of sales.
   b. **Data**: Let's assume the following sample data for the number of energy drinks sold in each city:

City A: [30, 28, 32, 29, 31, 33, 34, 28, 30, 32]
City B: [25, 24, 26, 23, 22, 27, 29, 30, 26, 24]

perform a two-sample t-test to test the equality of means and a test for equality of variances using Python's SciPy library.

4. **Case study 3:** testing independence between two categorical variables.
   a. Data: Sample of 100 employees, and each employee is classified as either Male or Female. They were asked to rate their job satisfaction on a scale of 1 to 5, where 1 represents low satisfaction and 5 represents high satisfaction. The data is as follows:

Employee	Gender	Job Satisfaction
1	Male	4
2	Female	3
3	Male	2
4	Female	5
...	...	...
100	Female	4

   b. Test for independence between gender and job satisfaction, use the chi-squared test in R.

****

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

DESIGN AND ANALYSIS OF ALGORITHMS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Course Code	:	22CS2402	**Credits**	:	04
Hours / Week	:	03 Hours	**Total Hours**	:	39(Th)+26(P) Hours
L–T–P–J	:	3–0–2–0			

Course Learning Objectives:

This Course will enable students to:

1. **Analyze** the non-recursive and recursive algorithms and to represent efficiency of these algorithms in terms of the standard Asymptotic notations.
2. **Acquire** the knowledge of Brute Force and Divide and Conquer techniques to design the algorithms and apply these methods in designing algorithms to solve a given problem.
3. **Master** the Decrease and Conquer, Transform and Conquer algorithm design techniques, and Time versus Space Trade-offs.
4. **Learn** Greedy method and dynamic programming methods and apply these methods in designing algorithms to solve a given problem.
5. **Understand** the importance of Backtracking and Branch and Bound algorithm design techniques to solve a given problem.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.

7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**08 Hours**

INTRODUCTION:
What is an Algorithm? Fundamentals of Algorithmic Problem Solving.
(Text Book-1: Chapter 1: 1.1 to 1.2)
FUNDAMENTALS OF THE ALGORITHMS EFFICIENCY:
Analysis Framework, Asymptotic Notations and Standard notations and common functions ***(Text Book-2: Chapter 3: 3.1, 3.2)***,
Mathematical Analysis of Non-recursive and Recursive Algorithms,
(Text Book-1: Chapter 2: 2.1, 2.3, 2.4,)

UNIT – II	**08 Hours**

BRUTE FORCE:
Background, Selection Sort, Brute-Force String Matching. TSP
(Text Book-1: Chapter 3: 3.1, 3.2)
DIVIDE AND CONQUER:
General method, Recurrences: The substitution method, The recursion-tree method, The master method.
(Text Book-2: Chapter 4: 4.4, 4.5),
Merge sort, Quick sort, Binary Search, Multiplication of large integers,
Case study: Strassen's Matrix Multiplication.
(Text Book-1: Chapter 4: 4.1 to 4.3, 4.5)

UNIT – III	**06 Hours**

DECREASE & CONQUER:
General method, Insertion Sort, Graph algorithms: Depth First Search, Breadth First Search, Topological Sorting
TRANSFORM AND CONQUER:
Case study: Heaps and Heap sort.

TIME AND SPACE TRADEOFFS:
Input Enhancement in String Matching: Horspool's algorithm, Hashing: Open and Closed hashing.
(Text Book-1: Chapter 5: 5.1 to 5.3, Chapter 6: 6.3 to 6.4, Chapter 7: 7.2 to 7.3)

UNIT – IV	**9 Hours**

GREEDY TECHNIQUE:
General method of Greedy technique, Single-Source Shortest Paths: General method, The Bellman-Ford algorithm, Single-Source Shortest Paths in DAGs, Dijkstra's Algorithm
(Text Book-2: Chapter 24: 24.1 to 24.3).
Minimum Spanning Trees: Prim's Algorithm, Optimal Tree problem: Huffman Trees;
Case study: Kruskal's Algorithm. Fractional Problem
(Text Book-1: Chapter 9: 9.1, 9.2, 9.4).
DYNAMIC PROGRAMMING:

General method, The Floyd-Warshall Algorithm, Johnson's algorithm for sparse graphs ***(Text Book-2: Chapter 25: 25.1 to 25.3)***, The Knapsack problem ***(Text Book-1: Chapter 8: 8.4).***	
UNIT – V	**08 Hours**
LIMITATIONS OF ALGORITHMIC POWER P, NP and NP-complete problems ***(Text Book-1: Chapter 11: 11.3***) **BACKTRACKING:** General method, N-Queens problem, Subset-sum problem. ***(Text Book-1: Chapter 12: 12.1***) **BRANCH AND BOUND:** General method, Travelling Salesman problem, Approximation algorithms for TSP. **Case study:** Knapsack Problem. ***(Text Book-1: Chapter 12: 12.2, 12.3***)	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Exemplify** the algorithm design techniques and standard Asymptotic notations. Analyze non-recursive and recursive algorithms to obtain worst-case running times of algorithms using asymptotic analysis	L3
2	**Interpret** the brute-force, divide-and-conquer paradigms and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.	L3
3	**Demonstrate** the Decrease and Conquer, Transform and Conquer algorithm design techniques and analyze the performance of these algorithms.	L3
4	**Identify and interpret** the greedy technique, dynamic-programming paradigm as to when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms and analyze them	L3
5	**Illustrate** the Backtracking, Branch and Bound algorithm design paradigms and explain when an algorithmic design situation calls for it. Recite algorithms that employ these paradigms. **Summarize** the limitations of algorithmic power.	L3

Table: Mapping Levels of COs to POs / PSOs														
COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3										2		3
CO2	3	3	2									2		3
CO3	3	3										1		3
CO4	3	3	2									2		3
CO5	3	3										1		3

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", 2nd Edition, Pearson Education, 2011.
2. Thomas H. Cormen, Charles E.Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, PHI, 2014.

REFERENCE BOOKS:

1. Horowitz E., Sahni S., Rajasekaran S, "Computer Algorithms", Galgotia Publications, 2001.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai, "Introduction to the Design and Analysis of Algorithms A Strategic Approach", Tata McGraw Hill, 2005.

E-Resources:

1. https://nptel.ac.in/courses/106/101/106101060/
2. http://cse01-iiith.vlabs.ac.in/
3. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
4. https://www.coursera.org/specializations/algorithms

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion. E.g., Fake coin identification, Cabbage puzzle, Konigsberg bridge puzzle etc.,
2. Demonstration of solution to a problem through programming.

LABORATORY EXPERIMENTS

Total Contact Hours: 26

Following are experiments to be carried out using either C programming language or Object-oriented programming language:

1. Apply divide and conquer method and Design a C program to implementation of Binary Search algorithm.
2. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Demonstrate this algorithm using Divide-and-Conquer method.
3. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Demonstrate this algorithm using Divide-and-Conquer method.

4. Incorporate the array data structure and demonstrate whether a given unweighted graph is connected or not using DFS method.
5. Implement the graph traversal technique using BFS method to print all the nodes reachable from a given starting node in an unweighted graph.
6. Compute the Transitive Closure for a given directed graph using Warshall's algorithm.
7. For a given weighted graph, construct an All-Pairs Shortest Paths problem using Floyd's algorithm and implement this algorithm to find the shortest distance and their shortest paths for every pair of vertices.
8. Implement 0/1 Knapsack problem using Dynamic Programming Memory Functions technique
9. Find Minimum Cost Spanning Tree for a given weighted graph using Prim's and Kruskal's algorithm.
10. From a given vertex in a weighted connected graph, determine the Single Source Shortest Paths using Dijkstra's algorithm.
11. Mini project proposal should be submitted and Implementation should be done based on the problem stated in the proposal

Open ended experiments

1. Implement Fractional Knapsack problem using Greedy Method.
2. Implement N-Queens problem using Backtracking technique.
3. implementation of Travelling Sales man problem using Dynamic programming

****

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

SEMESTER – IV

Course Code	:	22CS2403	**Credits**	:	04
Hours / Week	:	03 Hours	**Total Hours**	:	39(Th)+26(P) Hours
L–T–P–J	:	3–0–2–0			

Course Learning Objectives:

This course will enable students to:

1. **Acquire** the concept of databases, Entity-Relationship Model and relational model for creating and designing databases for the real-world scenario.
2. **Develop** queries to extract data from the databases using a structured query language.
3. **Differentiate** SQL and NoSQL.
4. **Demonstrate** the operations on MongoDB, Database connectivity with front end and **Optimize** the Database design using Normalization Concepts.
5. **Understand** the importance of Transaction Management, Concurrency control mechanism and recovery techniques.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods that teachers can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only the traditional lecture method but a different *type of teaching method* that may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, note-taking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain the functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher-order Thinking questions in the class.
6. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the student's understanding.

UNIT – I	**10 Hours**

INTRODUCTION TO DATABASE SYSTEMS :

Introduction, Characteristics of the Database Approach, Advantages of using DBMS Approach, Data Models, Schemas, Instances and Data Independence, Three Schema Architecture, various components of a DBMS.

(Text Book-1: Chapter 1: 1.1 to 1.4, 1.6, Chapter 2: 2.1,2.2, 2.4)

ENTITY-RELATIONSHIP MODEL:

Entity Types , Entity Sets , Attributes and Keys, Relationship types, Relationship Sets , Roles and Structural Constraints; Weak Entity Types; ER Diagrams

(Text Book-1: Chapter 7: 7.3, 7.4, 7.5, 7.7).

UNIT – II	**07 Hours**

RELATIONAL MODEL :
Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update operations and Dealing with Constraint Violations.
(Text Book-1: Chapter 3: 3.1 to 3.3).
SQL –THE RELATIONAL DATABASE STANDARD:
SQL Data Definition and Data types, Specifying constraints in SQL, Basic Queries in SQL-Data Definition Language in SQL, Data Manipulation Language in SQL;
(Text Book-1: Chapter 4: 4.1 to 4.4).

UNIT – III	**08 Hours**

SQL –THE RELATIONAL DATABASE STANDARD:
Additional Features of SQL; Views (Virtual Tables) in SQL; Database Programming Issues and Techniques ;
(Text Book-1: Chapter 4: 4.5; Chapter 5: 5.1 to 5.4).
SQL AND NOSQL DATA MANAGEMENT:
Triggers, Database connectivity using Python, SQL vs NoSQL, Introduction to MongoDB,
(Text Book-1: Chapter 5: 5.2,5.3)(Text Book-2 Chapter 1: 1.1 to 1.5)

UNIT – IV	**07 Hours**

NOSQL DATA MANAGEMENT:
Data Types, Data Modelling, CRUD Operations.
(Text Book-2 Chapter 1: 1.1 to 1.5)
DATABASE DESIGN:
Design Guidelines, Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form;
(Text Book-1: Chapter 14: 14.1 to 14.5)

UNIT – V	**07 Hours**

TRANSACTION MANAGEMENT
The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Concurrency Control Mechanisms; Error recovery methods.
(Text Book-1: Chapter 20: 20.1 to 20.5, Chapter 21: 21.1 to 21.3, Chapter 22: 22.1 to 22.4)

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	**Use** the basic concepts of database management system in the design and creating database blueprint using E-R model and relational model.	L3

2	**Formulate** SQL and NoSQL queries for building structure and unstructured databases	L3
3	**Demonstrate** database connectivity using vendor specific drivers	L3
4	**Apply** normalization techniques to design relational database management system	L3
5	**Adapt** Transaction Management, concurrency control and recovery management techniques in database management system.	L3

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	-	-	-	-	-	2	2	-	2	3	-
CO2	3	2	1	-	3	-	-	-	2	2	-	2	3	-
CO3	2	2	2	-	3	-	-	-	2	2	-	2	3	-
CO4	3	1	2	-	1	-	-	-	2	2	-	2	3	-
CO5	2	1	-	-	-	-	-	-	2	2	-	2	3	-

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Elmasri and Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2021, 2015.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", First Edition, Pearson Education, Inc. 2012.

REFERENCE BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Third Edition, McGraw-Hill, 2003.
2. Silberschatz, Korth and Sudharshan: "Database System Concepts", Seventh Edition, Mc-GrawHill, 2019.
3. C.J. Date, A. Kannan, S. Swamynatham: "An Introduction to Database Systems", Eight Edition, Pearson Education, 2012.

E-Resources:

1. http://nptel.ac.in/courses/106106093/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/lecture-notes/
3. http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHNAN.pdf

4. http://iips.icci.edu.iq/images/exam/databases-ramaz.pdf
5. https://db-class.org/
6. https://www.w3schools.com/mongodb/

Activity Based Learning (Suggested Activities in Class)

1. Database designing and data extraction using group discussion.
2. Collaborative Activity is minor project development with a team of 4 students.

LABORATORY EXPERIMENTS

Total Contact Hours: 26

Following are experiments to be carried out using either oracle or mysql, Mongo Db .

1. Design any database with at least 3 entities and establish proper relationships between them. Draw suitable ER/EER diagrams for the system. Apply DCL and DDL commands.
2. Design and implement a database and apply at least 10 Different DML Queries for the following task.
   a. For a given input string display only those records which match the given pattern or a phrase in the search string. Make use of wild characters and like operators for the same. Make use of Boolean and arithmetic operators wherever necessary
3. Write SQL statements to join table and retrieve the combined information from tables.
4. Execute the Aggregate functions count, sum, avg, min, max on a suitable database. Make use of built in functions according to the need of the database chosen .
5. Retrieve the data from the database based on time and date functions like now(), date(), day(), time() etc., Use of group by and having clauses.
6. Write and execute database trigger. Consider row level and statement level triggers.
7. Write and execute program to perform operations on MongoDb Database.
8. Write and execute program to perform CRUD operations.

Open Ended Experiments

1. Consider the Table "employees", write a SQL query to remove all the duplicate emails of employees keeping the unique email with the lowest employee id,return employee id and unique emails .

   table: employees

employee_id	employee_name	email_id
101	Liam Alton	li.al@abc.com
102	Josh Day	jo.da@abc.com
103	Sean Mann	se.ma@abc.com
104	Evan Blake	ev.bl@abc.com
105	Toby Scott	jo.da@abc.com

2. A salesperson is a person whose job is to sell products or services. Consider the table "Sales" [given below]. Write a SQL query to find the top 10 salesperson that have made highest sale. Return their names and total sale amount.

   Table: sales

TRANSACTION_ID	SALESMAN_ID	SALE_AMOUNT

501	18	5200.00
502	50	5566.00
503	38	8400.00
599	24	16745.00
600	12	14900.00

Table: salesman

SALESMAN_ID	SALESMAN_NAME
11	Jonathan Goodwin
12	Adam Hughes
13	Mark Davenport
59	Cleveland Hart
60	Marion Gregory

OBJECT ORIENTED DESIGN AND PROGRAMMING [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – IV**				
Course Code	: 22CS2404	**Credits**	:	04
Hours / Week	: 03 Hours	**Total Hours**	:	39(Th)+26(P) Hours
L–T–P–J	: 3–0–2–0			

Course Learning Objectives:

This course will enable students to:

6. Understand the basic concepts of object-oriented design techniques.

7. Understand the fundamentals of object-oriented programming with Java.
8. Draw UML diagrams for the software system.
9. Impart basics of multi-threading and database connectivity.
10. Develop GUI using event handling techniques in Java.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods that teachers can use to accelerate the attainment of the various course outcomes.

7. ***Lecture method*** means it includes not only the traditional lecture method but a different *type of teaching method* that may be adopted to develop the course outcomes.
8. ***Interactive Teaching:*** *Adopt* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, note-taking, annotating, and roleplaying.
9. Show ***Video/animation*** films to explain the functioning of various concepts.
10. Encourage ***Collaborative*** (Group Learning) Learning in the class.
11. To make ***Critical thinking***, ask at least three Higher-order Thinking questions in the class.
12. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the student's understanding.

UNIT – I	**8 Hours**

An Overview of Object-Oriented Systems Development: Introduction; Two Orthogonal Views of the Software; Object-Oriented Systems Development Methodology; Why an Object-Oriented? Overview of the Unified Approach. **Object Basics:** Introduction; An Object-Oriented Philosophy; Objects; Objects are Grouped in Classes; **Attributes:** Object State and Properties; Object behaviour and Methods; Object Respond to Messages; Encapsulation and Information Hiding; **Class Hierarchy:** Inheritance; Multiple Inheritance; **Polymorphism;** Object Relationships and Associations: Consumer-Producer Association; Aggregation and Object Containment; **Case Study -** A Payroll Program; Object-Oriented Systems Development Life Cycle: Introduction; Software Development Process; Building High-Quality Software; Object-Oriented Systems Development: A Use Case Driven Approach; Reusability.Software; Object-Oriented Systems Development: A Use Case Driven Approach; Reusability..

UNIT – II	**08 Hours**

Unified Modelling Language: Introduction; Static and Dynamic models; Why Modeling? Introduction to the UML; UML Diagrams; UML Class Diagram; Use-Case Diagram. **Introduction to Java:** Java's Magic: The Bytecode; JVM; **Object-Oriented Programming;**Simple Java programs; Two Control Statements; Lexical Issues; Data Types; Variables,Arrays and String constructors; Operators; Control Statements; Input/Output: I/O Basic; Reading console input Writing Console output.

UNIT – III	**10 Hours**

Introducing Classes: Class Fundamentals; objects; methods; constructors; this Keyword; Garbage Collection; finalize() method; Parameter Passing; Overloading; Access Control Keywords. Inheritance basics; method overriding; abstract classes; Packages and interfaces. Exception handling fundamentals; multiple catch; nested try statements**. Multi-Threaded Programming :**Multi-Threaded Programming: Java Thread Model; The main Thread; Creating a thread and multiple threads; Extending threads; Implementing Runnable; Synchronization; Inter Thread Communication; producer consumer problem consumer problem. **Input/Output**: I/O Basic; Reading console input Writing Console output.

UNIT – IV	**08 Hours**
Event and GUI Programming: Introducing Swing; The Origins of Swing; Swing Is Built on the AWT; Two Key Swing Features; The MVC Connection; Components and Containers; The Swing Packages; A Simple Swing Application; Event Handling; JLabel; JTextField; JButton	
UNIT – V	**05 Hours**
Database Access: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet	

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	**Develop** simple java programs that make use of classes and objects	L3
CO2	**Write** Java application programs using OOP principles and proper program structuring	L3
CO3	**Make use** of inheritance and interfaces to develop java application	L3
CO4	**Model** exception handling, multi threading concepts in java.	L3
CO5	**Create** the Graphical User Interface based application programs by utilizing event handling features and Swing in Java	L3
CO6	**Develop** Java program that connects to a database and be able to perform various operations.	L3

Table: Mapping Levels of COs to POs / PSOs

COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3		3								2	
CO2	3		3		3								2	
CO3	3		3		3								2	
CO4	3		3		3								2	
CO5	3		3		3								2	

TEXT BOOKS:

1. Bahrami A.; Object Oriented Systems Development using the Unified Modeling Language; McGraw Hill; 1999.
2. Schildt; Herbert. Java The Complete Reference; 8th Edition. US: McGraw-Hill Osborne Media; 2011.
3. Jim Keogh; J2EE: The Complete Reference; McGraw Hill Education in 2002.

REFERENCES:

1. Barclay K., J. Savage, Object Oriented Design with UML and Java, Elsevier, 2004.

2. Y. Daniel Liang, Introduction to Java Programming, 7th edition, Pearson, 2013.

E-Resources:

1. The Complete Reference-JAVA:https://gfgc.kar.nic.in/sirmv-science/GenericDocHandler/138-a2973dc6-c024-4d81-be6d-5c3344f232ce.pdf
2. Introduction to Programming using Java:https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf
3. Java language specification: https://docs.oracle.com/javase/specs/jls/se8/jls8.pdf
4. Java Programming Tutorial for Beginners - The Net Ninja
5. "Java Tutorial for Beginners" - Programming with Mosh-https://youtu.be/eIrMbAQSU34?si=XH4NEaZ1OQePurbB
6. "Java Programming Full Course" - freeCodeCamp.org

Activity Based Learning:

1. Interactive Quizzes on online platforms like Quizizz, Kahoot with instant feedback to reinforce learning and engage students actively during lectures.
2. Conducting Debugging Workshops where code snippets with intentional bugs are introduced and ask students to identify and fix the issues. This helps them develop critical debugging skills.
3. Conducting coding challenges based on the topic taught in class.
4. Construct class, use-case, and activity diagrams using on-line tools.

COMPUTER ORGANIZATION AND ARCHITECTURE [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – IV**					
Course Code	:	22CS2405	**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P-J	:	3–0–0-0			

Course Learning Objectives:

This Course will enable students to:

1. **Understand** the Architecture and programming of ARM microprocessor.
2. **Develop** program using Arm instruction set and appreciate the advanced features provided in the ARM
3. **Understand** the exception handling techniques.
4. **Study in** detail the concept of instruction level parallelism and concepts of pipelining.
5. **Understand** various cache memory mapping techniques and memory Organization.

Teaching-Learning Process

1. ***Lecture method*** along with traditional lecture method, different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *incorporating* brainstorming, discussing, group work, focused listening, formulating questions, note taking, annotating, and roleplaying.
3. Showing ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, asking Higher order Thinking questions in the class in the form of Quiz and writing programs with complex solutions.
6. Showing the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.

UNIT – I	**05 Hours**

An Overview of Computing Systems:
History of Computers, The Computing Device,
The ARM7TDMI Programmers' Model:
Introduction, Data types, Processor Modes, Registers, Program Status Registers, The vector Table.
Assembler Rules and Directives: Structure of Assembly Language Modules, Registers, Directives and Macros.
Loads, Stores and Addressing: LODS and STORES instructions, Operand Addressing , ENDIANNES
Text Book-1: 1.1 to 1.3; 2.1 to 2.6 ; 4; 5.3, 5.4, 5.5

UNIT – II	**05 Hours**

Constants and Literal Pools: The ARM Rotation Scheme, Loading Constants and address into Registers
Logic and Arithmetic: Flags and their Use, Compare instructions, Data Processing Instructions
Loops and Branches: Branching, Looping, Conditional Execution, Straight-Line Coding

Subroutines and Stacks: Stack, Subroutines, Passing parameters to subroutines, The ARM APCS.
(Text Book-1: 6.1 to 6.4; 7.1 to 7.4; 8.2 to 8.6; 10.1 to 10.5

UNIT – III	**05 Hours**

Mixing C and Assembly Language: Inline Assembler Embedded Assembler, Calling Between C and Assembly.

Exception Handling: Interrupts, Error Conditions, Processor Exception Sequence, The Vector Table, Exception Handlers, Exception Priorities, Procedures for Handling Exceptions.
(Text Book-1: 11.1 to 11.8; 14.1 to 14.4

UNIT – IV	**12 Hours**

Pipelining: Basic and Intermediate Concepts
Introduction, The Major Hurdle of Pipelining, How Pipelining Implemented, What makes Pipelining hard to Implement, Extending the MIPS Pipeline to Handle Multicycle Operations, The MIPS R4000 Pipeline, Crosscutting Issues.
Text Book-2: C.1 to C.7

UNIT – V	**12 Hours**

Memory Hierarchy:
Introduction, Cache Performance, Six basic cache Optimizations, Virtual Memory, Protection and examples of Virtual Memory, Fallacies and Pitfalls.
Text Book-2: B.1 to B.6

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	**Apply** knowledge of the internal architecture and organization of ARM microprocessors to utilize their components and functionalities.	L3
2	**Apply** the instruction set of ARM Microprocessor by writing Assembly language programs.	L3

3	**Analyze and compare** the various exception handling techniques.	L4
4	**Examine** the concept of instruction-level parallelism and **analyze** the principles of Pipelining techniques.	L4
5	**Compare** and **Contrast** memory hierarchy and its impact on computer cost/performance.	L4

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		2										2	
CO2	3		3		1								2	
CO3	3	3	1										2	
CO4	3	3	1										2	
CO5	3	3	1										2	

3: Substantial (High) 2: Moderate (Medium) 1: Poor (Low)

TEXT BOOKS:

1. William Hohl, "ARM Assembly Language", 2nd Edition, CRC Press, 2009.
2. John L Hennessy, David A Patterson, "Computer Architecture, A Quantitative Approach", 5th Edition, Morgan Kaufmann publishers, 2012.

REFERENCE BOOKS:

1. David A Patterson, John L Hennessy, "Computer Organization and Design", 4th Edition, Morgan Kaufmann publishers, 2010.
2. Steve Furber, "ARM System-on-chip Architecture", 2nd Edition, Pearson Publications, 2000.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5th Edition, Tata McGraw Hill, 2002.

E-Resources:

1. https://www.udemy.com/topic/arm-cortex-m/
2. https://www.edx.org/school/armeducation
3. https://onlinecourses.nptel.ac.in/noc22_cs93/preview

Activity Based Learning (Suggested Activities in Class)

1. Mini project implementation using Assembly Language Programming.
2. Demonstration of solution to a problem through programming.

SCHOOL OF ENGINEERING
Dayananda Sagar University
Devarakaggalahalli , Harohalli , Kanakapura Road ,
Ramanagar District- 562112

SPECIAL TOPICS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Course Code	:	22CS2406	**Credits**	:	02
Hours / Week	:	04 Hours	**Total Hours**	:	52 Hours
L–T–P–J	:	0–0–4–0			

Course Learning Objectives:

This course will enable students to:

1. To develop problem solving abilities
2. To build the necessary skill set and analytical abilities for developing computer Based solutions for real life problems.
3. To train students in professional skills related to Software Industry
4. To prepare necessary knowledge base for research and development in Computer Science

Following are some of the ways (but not limited to) of delivering the "Special Topics":

1. **Engaging Students in Small Batches (maximum 3/batch) in Projects:** DSU Faculty will define and supervise a project which has a well-defined scope. Students will work from requirements to delivering a prototype.

2. **Delivery from an Industry Expert:** An industry Expert can offer a project for around 20-25 students, clearly defining the scope. The project will have 4-5 sub-modules. Each student group will work on one sub-module from requirements gathering and analysis all the way to a working module. The sub-teams will integrate the modules and will together deliver a working prototype. The industry expert will engage all the teams on one afternoon face to face. One or two SOE faculty will also co- supervise the project.

3. **A Start-up company might have a few project ideas** to try out and they would engage a team of 20-25 students (in 4-5 batches) to work on these project ideas from concept to a prototype, with a close supervision from the start-up company technologist together with DSU faculty.

4. **Testing a new Product**: A Company has come up with a new product and they require a team of 30-40 students to thoroughly test all the features of the product and come up with a validation of the features of the product, a summary of features that fail to work and also a recommendation on a set of features that may have to be added to the product.

5. A professor from an elite university from within India or abroad, **offering a short course** on a domain which is very current and state of art. The content has a built in project component.

6. **Industry Project:** Students in a small team of 4-5 work on a project defined by an industry (including DERBI and AIC) during a semester and successfully complete the project.

7. Summer Internship: A group of students take up Summer Internship at DSU or outside, successfully complete the internship. If done within DSU, a project exhibition will also form a part of evaluation.

8. **Visit to a University Abroad**: A group of students participate in a well structured program in aUniversity abroad and complete all the requirements of the university.

9. Working under a Research professor within DSU or from premium institutes such as IISc, IIT, IIITetc on a specific project/task.

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Identify and formulate problem statement in the interested domain	L2
CO2	Design and evaluate a concept/model/product	L3
CO3	Use the various tools and techniques, coding practices for developing real life solution to the problem	L3
CO4	write effective technical report and demonstrate through presentation	L3

Table: Mapping Levels of COs to POs / PSOs														
COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3							2	2	2		2	2
2		3	3						2	2	2		2	2
3					3				2	2	2		2	2
4								3	2	2	2		2	2

IOT AUTOMATION

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	:	22CS2407	**Credits**	:	02
Hours / Week	:	03 Hours	**Total Hours**	:	26 Hours
L–T–P–J	:	2–0–0–0			

Course Learning Objectives:

This course will enable students to:

1. Basic fundamental concepts of Analog & Digital Circuits, Microprocessor & Microcontroller with the introduction of Embedded Systems, Understand the fundamentals of the Internet of Things and its significance.
2. Demonstration of using Analog & digital Sensors & actuators along with Arduino for data Acquisition
3. Learn the basics of using Tinkercad for IoT simulation.
4. Explore various IoT components, sensors, actuators, and communication protocols.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods that teachers can use to accelerate the attainment of the various course outcomes.

1. ***Real-World Examples:*** *Use* ***real-world examples*** *and scenarios to demonstrate the practical relevance of Java programming concepts which enhances their understanding of how Java is used in real-world applications*

2. ***Interactive Coding Sessions:*** *Conduct* ***Interactive coding sessions*** *where students can code alongside the teacher or participate in coding challenges. This promotes active participation and helps students develop their coding skills*
3. ***Project-Based Learning****: Assign projects or mini-projects that require students to apply Java programming concepts and develop complete applications. This approach fosters independent learning, problem solving skills and a deeper understanding of Java Programming Principles.*
4. ***Active Learning Strategies:*** *Incorporate* ***active learning strategies*** *such as group discussions, problem-solving activities, case studies, and hands-on coding exercises. This allows students to actively engage with the material and apply their knowledge in practical scenarios*
5. ***Collaborative Learning:*** *Encourage students to work in pairs or small groups on programming tasks.* ***Collaborative learning*** *promotes peer-to-peer learning, fosters teamwork, and allows for the exchange of ideas and knowledge.*

UNIT – I	**06 Hours**
Introduction to IoT and Tinkercad: Basics of Analog & Digital Circuits. (using Electronics Workbench Software) Brief History of Microprocessor, Microcontroller, Embedded Systems, Definition and importance of IoT, IoT Components and communication: Sensors and actuators, Communication protocols (WiFi, Bluetooth, MQTT), Trends in the Adoption of IoT in modern applicants, Risks, Privacy, and Security. Sensor Networks, Sensors and actuators, Analog/Digital Conversion ***(Text book-1: Ch 2, Ch 3).***	
UNIT – II	**05 Hours**
Fundamentals of Arduino & raspberry Pi: Architecture of Arduino and raspberry Pi3, basic concepts of Embedded C Programming & Arduino **IoT Data Acquisition:** Analog and digital sensors, reading sensor data using Tinker cad / Electronic Work Bench ***(Text book 1: Ch 4, Ch 5).***	
UNIT – III	**05 Hours**
Using Electronics workbench software designing & debugging of Analog, Digital & mixed Circuits	
UNIT – IV	**05 Hours**
IoT Project Development I: Designing an IoT project concept, Setting up the simulation environment ***IoT Project Development II:*** Implementing the IoT project using Tinkercad, temperature & humidity measurement using Raspberry Pi 3 & DHT11 Sensor using Python Programming.	
UNIT – V	**05 Hours**
IoT Applications and Case Studies: Smart home systems, Industrial IoT, Healthcare applications. ***Final Project and Presentation:*** *Developing an advanced IoT project, Presenting the project and its functionalities*	

List of experiments (Simulation and/or Hardware)

1. Installation of EWB software
2. Controlling blinking of LED using 555 Timer
3. Verification of all Boolean expression using basic gates & universal Gates.
4. Using flipflops for various counters
5. Stop timer using 555 & digital IC's

List of Projects using Tinkercad-IoT (both Simulation & Hardware _using Arduino & Raspbery Pi3)

1. Smart Parking system.
2. Smart Notice Board for announcement in classroom
3. Sensing temperature & displaying the same on LCD.
4. 4-way traffic light designing & automating.
5. Sun tracking solar Panel.
6. Generating National anthem of Bharath using Arduino

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	**Identification** of different Analog & Digital circuits, study on the various controllers	L2
CO2	**Utilize** the Features & Architecture of Arduino & raspberry Pi3 for reading data from sensors	L3
CO3	**Analyze** the working of Electronic Workbench Software tool to design analog, digital & mixed circuits	L4
CO4	**Examine** problem-solving and critical thinking skills for IoT applications	L4
CO5	**Design** Smart circuits in real time environment using Arduino & Raspberry Pi	L6

Table: Mapping Levels of COs to POs / PSOs

Cos	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	2	-	1	1	-	-	-	-	-	-	2	-
CO2	2	1	1	-	1	1	-	-	-	-	-	-	2	1
CO3	3	1	2	-	1	1	-	-	-	-	-	-	1	1
CO4	3	2	3	-	2	1	-	-	-	-	-	-	2	2

CO5	3	2	3	-	2	1	-	-	-	-	-	-	2	2

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things" by David Hanes, et al.

E-Resources:

1. Online tutorials and documentation on Tinkercad and Arduino.

Tinkercad: www.tinkercad.com/circuits

Activity Based Learning (Suggested Activities in Class)

1. Using Hardware components Lab exercises and assignments to assess practical skills
2. Mid-term project to gauge project development abilities
3. Class participation and discussions on IoT concepts and trends

****

COMMUNICATION THROUGH SANSKRIT

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22cs2313	**Credits**	:	01
Hours /Week	:	01 Hours	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

12. To understand the basics of a new language like Sanskrit
13. To understand the basic characters, words, sentences etc
14. To understand the grammar to some extent with terminologies like shabda, vachana, vibhakti etc
15. To understand the process of formation of simple sentences.
16. To translate from English to Sanskrit and vice-versa for better communication
17. To practice speaking in Sanskrit.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

17. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
18. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
19. Show ***Video/animation*** films to explain functioning of various concepts.
20. Encourage ***Collaborative*** (Group Learning) Learning in the class.
21. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.

UNIT 1: Introduction to Sanskrit language	**03 Hours**
Introduction to Sanskrit, characters, formation of words, learning numbers, ‘a’ karanta, ‘aa’ karanta, ‘i’ karanta, ‘ee’ karanta and ‘u’ karanta, pullinga (masculine) and streelinga (feminine) words.	

UNIT 2: Various shabdaha	**03 Hours**
Running different anta shabdaha for eight vibhaktis and three vachanas**.**	

UNIT 3: Basic lessons from Text book	**03 Hours**
Basic words, formation of sentences, translation to English from Sanskrit and vice versa. The sentence formation with vibhakti and vachana. Exercises and activities.	

UNIT 4: Simple sentence formation	**02 Hours**
Formation of sentences in Sanskrit, Strike conversation with friends, parents, seniors, bus conductor, auto river, vegetable vendor etc.	
UNIT 5: Practice communication in Sanskrit	**02 Hours**
Initiation of communication in Sanskrit, translation between languages.	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Know** a new language	
2	**Understands** the characters, words and sentences	
3	**Learns** grammatical / syntax rules and regulations	
4	Gets information on shabda, vachana, vibhakti etc	
5	Communicate in Sanskrit	

TEXT BOOKS:

1. "Sanskrit Bharati" – 'Sanskritam Vadatu', Gandhi Vidya Sansthanam, Rajghat, Varanasi
2. Infant Reader, "Sanskrita Baladarshaha" Published by R S Vidyadhar & Sons, Book sellers and Publishers, Kalpathi, Palakkad -678003.

REFERENCE BOOKS:

1. Sabda Manjari, **Published by R S Vidyadhar & Sons, Book sellers and Publishers, Kalpathi, Palakkad -678003.**

****

INTRODUCTION TO FILM STUDIES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2316	**Credits**	:	01
Hours /Week	:	01 Hours	**Total Hours**	:	13 Hours
L–T–P-J	:	1–0–0-0			

Course Learning Objectives:

This Course will enable students to:

1. **Acquire** fundamental knowledge of the principles of critical analysis of film as a text (With the overview of Indian cinema after Independence)
2. **Develop** analytical and interpretative minds, and transform them into spoken and written modes of expression i.e., Debates, group discussions, writing, reviews, and scripts
3. **Apply** the writing strategies for writing film reviews.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.

Module – I	**07 Hours**

History and Scope of Indian Cinema- the Beginnings (1896-1912)- The Silent Era (1913-1930), Growth of the Industry (1931-1947)-Post-Independence- Indian Cinema-Film aesthetics: Realism, Authorship, Language of the Film (Film, Language & Montage), Narrative Comprehension – Representations and Debates -Film and other arts- Career Prospects in Indian Cinema.

Module – II	**06 Hours**

Basic Frame- Shot-Scene-Sequence-Visual Grammar- Pioneers of film, Silent to audio era- The language of Cinema-Camera- Cinematography – Important functions and terms of Cinematography. –Science and Art of Lighting- Different Lightings-Cinematographic tools-Editing- What is a script? – Thinking process- Theatre Directions- Creating and Developing a script- Adapting a script- Character spin-off- Creating a sequel- Characterization- Qualities of a scriptwriter- Themes and social Obligations- Hands-on Experience.

Course Outcome	Description
At the end of the course the student will be able to:	
1	**Acquire** fundamental knowledge of the principles of critical analysis of film as a text (With the overview of Indian cinema after Independence)
2	**Develop** analytical and interpretative minds, and translate them into spoken and written modes of expression i.e. Debates, group discussions, writing, reviews, and scripts
3	**Develop** communicative competence – Competence in speaking and writing from different domains and **applying** an interdisciplinary approach in perception and expression.

TEXT BOOKS:

1. Saran, Renu. "History of Indian Cinema". Diamond Books, 2012. Print.
2. Valicha, Kishore. "The Moving Image: A study of Indian Cinema". Orient Longman Limited, 1988. Print.
3. Vasudevan, Ravi. "The Melodramatic Public: Film form and Spectatorship in Indian Cinema". Orient Black Swan, 2012. Print.
4. Jain, Manju. "Narratives of Indian cinema". Primus Books, 2009. Print.

REFERENCE BOOKS:

1. Dwyer, Rachel. "Cinema India: The Visual Culture of Hindi film". Rutgers University Press, 2002. Print.
2. Corrigan, Timothy. "A Short Guide to Writing About Film". 9th Edition, Pearson Global Edition. Print.
3. Joseph M. Boggs and Dennis W. Petrie. "The Art of Watching Films". Boston: McGraw-Hill, 2008. Print.
4. Richard, Barsam. "Looking at movies: An introduction to film". New York: W.W. Norton & Co., 2007. Print.
5. James, Monaco. "How to read a film: Movies, Media and Multimedia: Language, History, Theory". New York: Oxford University Press, 2000. Print.

****

INTRODUCTION TO THE JAPANESE LANGUAGE

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2310	**Credits**	:	01
Hours /Week	:	01 Hours	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. To learn the hiragana and katakana writing systems.
2. To learn and understand the culture of Japanese society.
3. To understand simple sentences and basic Japanese grammar.
4. To acquire the ability to communicate in Japanese.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.

UNIT – I: Basics of the Japanese language	**13 Hours**

Hiragana/Katakana: Reading and writing hiragana and katakana.

Kanji Characters: understanding the idea of a pictogram (as opposed to a phonogram), reading and writing the kun- and on- readings of some commonly used kanji: Days of the week characters, numbers and a few others.

Verbs, particles and sentence structure: Sentence structure, particles, combining multiple particles, question and answer form, polite vs standard form.

Vocabulary:

Asking for directions, making purchases at shops, asking for something to be done and other phrases useful during travel to Japan as well as other basic phrases.

Basics of Japanese culture:

1. Basics of Japanese standards for politeness and societal norms.
2. Formal introductions, awareness of different social situations and the norms followed in such situations, formalities such as exchanging business cards and senpai-kouhai relationships.

3. Formal, polite form of self-introduction, common greetings and responses.

Course Outcome	Description
At the end of the course the student will be able to:	
1	**Demonstrate** a basic understanding of the Japanese language.
2	**Demonstrate** an understanding of basic Japanese cultural norms.
3	**Apply** the Japanese language in simple, polite tongue.
4	**Demonstrate** the ability to read Hiragana and Katakana characters, as well as a few Kanji characters.

TEXT BOOKS:

2. Japanese for busy people - I, revised 3rd edition, The Association for Japanese-Language Teaching (AJALT), Kodansha USA, 2020.

****

LAW FOR ENGINEERS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2311	**Credits**	:	01
Hours /Week	:	01 Hours	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. The aim of the course is providing general exposure to the students about the elementary knowledge of law that would be of utility in their profession; to enable

the students to appreciate the importance of law and its impact on business and society.
Teaching-Learning Process (General Instructions) These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes. 1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes. 2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying. 3. Show ***Video/animation*** films to explain functioning of various concepts. 4. Encourage ***Collaborative*** (Group Learning) Learning in the class. 5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class. 6. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

Module I: Introduction to Law	**02 Hours**
Define Law, Need for law, objects & Branches of law, Constitutional Law with emphasis on Fundamental Rights, Directive Principles of State Policy and Fundamental Duties	
Module II: General Principles of Contract under Indian Contract Act, 1872	**03 Hours**
Indian Contract Act 1872, Essentials of valid contract act (Sec 10), Kinds of contracts ; types of offer, acceptance, free consent, coercion, undue influence, Breach of contract, remedies of breach of contract.	
Module III: Law Relating to Intellectual Property	**04 Hours**
Concept of Property, Types of Property; Introduction to IPR; Types of IPR: Copyrights, Patents, Trademarks, Designs, Trade Secrets, Infringement of IPRs.	
Module IV: Privacy in Governance and Transparency Confidentiality in Government	**04 Hours**
Right to Information Act, 2005, Offences and penalties under the Information Technology Act 2000, Industrial Disputes Act, 1947; The Employees' State insurance act, 1948, Payment of Wages Act, 1936.	

Course Outcome	Description
At the end of the course the student will be able to:	
1	To present a problem oriented in depth knowledge of Laws for

	Engineers.
2	To address the underlying concepts and methods behind Laws for Engineers.
3	Understand the Indian Legal System and Basics of different laws
4	Understand, explore, and acquire practical insight of legal system and its application in engineering profession

TEXT BOOKS:

1. M.P. Jain (2005), Indian Constitutional Law, Wadhwa & Co.
2. Agarwal H.O. (2008), International Law and Human Rights, Central Law Publications.
3. S.K. Kapur (2001), Human Rights under International Law and Indian Law, Central Law Agency.
4. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing.

REFERENCE BOOKS:

1. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
2. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
3. K.M. Desai (1946), The Industrial Employment (Standing Orders) Act
4. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House

****

INTRODUCTION TO MUSIC

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2308	**Credits**	:	01
Hours/Week	:	01 Hours	**Total Hours**	:	13 Hours
L–T–P	:	1–0–0			

Course Learning Objectives:

This Course will enable students to:

1. To understand the basic terminologies of Music
2. Appreciate the importance of Music in Engineers Life.
3. Apply Music knowledge in carrying out projects related to signal processing.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.

Module-1: Basic Terminologies of Music	**07 Hours**
Define Music, Types of Music, Types Musical Instruments, Music Terminologies: Raag, Taal, Shruthi, Swara, Vaadi Swara, Samvaadi Swara, Varjitha Swara, Shudha/Komala/ Teevra Swara, Aaroha, Avaroha, Pakkad, Lakshana Geethe, Swara Geethe, Chota Khyal.	
Module-2: Raag	**05 Hours**
Raag Bhoop: Introduction to raag bhoop, Swara geethe, Chotha Khyal Raag Saranga: Introduction to Raag Saranga, Swarageethe. Lakshanageethe	
Module-3: Taal	**01 Hours**
Introduction to Taal: Teental and Ektal with details	

Course Outcome	Description
At the end of the course the student will be able to:	
1	Classify types of Music
2	Rephrase the Terminologies of Music
3	Take part in performances in Music by involving in Singing, Helping Singers, organizing the event.

****

VEDIC MATHEMATICS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2314	**Credits**	:	01
Hours /Week	:	01 Hours	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. **Remembering (Knowledge)**: identify key numerical patterns and properties in Vedic Mathematics.
2. **Understanding (Comprehension)**: interpret the relationship between conventional arithmetic and Vedic methods.
3. **Applying (Application):** Utilize Vedic techniques to perform rapid mental calculations for addition, subtraction, multiplication, and division and apply Vedic methods to solve real-life mathematical problems and puzzles.
4. **Analyzing (Analysis):** Analyse the advantages and limitations of Vedic Mathematics in comparison to traditional methods, differentiate between various Vedic sutras and their specific applications.
5. **Creating (Synthesis)**: Design innovative approaches by combining multiple Vedic sutras to solve complex mathematical problems.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.

UNIT 1: Basic Operations of Mathematics	**07 Hours**

Basic addition and subtraction, Addition of 1, 11, 111, 1111,11111,……., Addition of 0.1, 0.11, 0.111, 0.1111, 0.11111,……., Multiplication of two numbers near the base & sub-base, Multiplication of two numbers whose sum of digits in unit place is 10 and sum of the digits in ten's place is 10, Multiplication of a number by 9,99,999,9999,99999,999999……., Division of a number by 9,99,999,9999,99999,999999, Multiplication of two numbers by vertically and crosswise method.	
UNIT 2: Square & Cube of a Number	**06 Hours**
Square of a number ending with '5', Square of 1, 11, 111, 1111, ……..,Square of a number near the base, Square of a number near sub-base, Cube of a number, Square root of a perfect square……., Cube root of a perfect cubic number.	

Course Outcome	Description
At the end of the course the student will be able to:	
1	Develop enhanced mental calculation abilities. They will learn techniques to perform calculations like addition, subtraction, multiplication, and division mentally and quickly.
2	Understanding of Ancient Mathematical Concepts: Provides insight into the mathematical knowledge and practices of ancient India.
3	Stimulate mental agility and improve cognitive skills, as participants engage in exercises that require mental gymnastics.

TEXT BOOKS:

1. "Vedic Mathematics" by Bharati Krishna Tirthaji, Motilal Banarsidass Publishers, ISBN: 978-8120801646.

REFERENCE BOOKS:

3. Magical World of Mathematics, V G Unkalkar, Vandana Publishers, 2017, ISBN:819026608.
4. The Teaching of Vedic Mathematics- Dr. S. K. Kapur, Lotus Press, 2016, ISBN: 9788183820431.
5. Vedic Mathematics Made Easy" by Dhaval Bathia, ISBN: 978-8129116116.

****

INTRODUCTION TO DRAMA
[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III					
Course Code	:	22CS2306	**Credits**	:	01
Hours /Week	:	01 Hour	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. Students will learn about theatre and performing arts and transform simple stories into wonderful scripts.
2. Students will be equipped with key critical thinking skills, performance skills, speaking and writing skills.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I: Introduction to Drama	**03 Hours**

Drama, as an artistic medium, has the power to transcend boundaries and ignite conversations that delve deep into the core of human existence. In the realm of liberal studies, drama serves as a transformative tool, challenging societal norms and exploring various perspectives on critical issues. By harnessing the raw emotions, complex characters, and thought-provoking narratives, drama enriches the study of liberal arts by encouraging active engagement, fostering empathy, and promoting a nuanced understanding of the world we inhabit.

UNIT – II: Embracing Critical Thinking	**03 Hours**

Drama within the framework of liberal studies provides a platform for critical thinking. Through the portrayal of multifaceted characters and intricate storylines, students are

exposed to a multitude of viewpoints, forcing them to question their own beliefs and biases. The analysis of themes, subtext, and dramatic techniques encourages students to think critically about social, political, and moral dilemmas presented in the performances. This process nurtures an intellectual curiosity that transcends the boundaries of the stage and expands into the wider world.
UNIT – III: Fostering Empathy and Understanding **03 Hours**
One of the fundamental tenets of liberal studies is to cultivate empathy and understanding. Drama achieves this by allowing students to embody diverse characters and experience life through their perspectives. By engaging in improvisation, role-playing, and character analysis, students gain a deeper understanding of different cultural, historical, and social contexts. This immersive experience fosters empathy by bridging the gap between personal experiences and the experiences of others, cultivating a sense of shared humanity and interconnectedness.
UNIT – IV: Social Commentary and Advocacy **02 Hours**
Drama within liberal studies serves as a vehicle for social commentary and advocacy. By exploring social issues such as discrimination, inequality, and justice, drama becomes a powerful tool for initiating conversations and inspiring action. Through the examination of theatrical texts and the creation of original performances, students develop the skills to articulate their perspectives and communicate their ideas effectively. This process empowers them to become advocates for change and contribute to a more inclusive and just society.
UNIT – V: Collaboration and Communication Skills **02 Hours**
Drama requires collaborative efforts and effective communication among actors, directors, designers, and technicians. In the context of liberal studies, drama serves as a microcosm of the real world, where teamwork and effective communication are essential. Students learn to listen actively, express their ideas clearly, and negotiate differing opinions to achieve a common goal. These skills are transferable to various aspects of life, empowering students to become effective collaborators, leaders, and active participants in their communities.

Course Outcome	Description
At the end of the course the student will be able to:	
1	**Understand** the elements of drama performance.
2	**Analyse** the structure, form, and conceptual ideas of drama techniques.
3	**Express** drama as a means of creating and communicating meaning.

TEXT BOOKS:

1. Sohini Roychowdhury, Indian Stage Stories Connecting Civilizations (A Telling of the Story of Indian Stage and how it connects to the World), SHUBHI PUBLICATIONS, GURGAON 2023.

****

FUNDAMENTALS OF CRITICAL THINKING [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – III**					
Course Code	:	22CS2315	**Credits**	:	01
Hours /Week	:	01 Hour	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. To enable framework to think critically about core subjects for better decisions with fewer mistakes.
2. To motivate and inculcate transformational learning in an ongoing basis towards inclination to shift their thinking of project work in a research framework with effective team work.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I: Etymology and Definitions, Needs, enablement of knowledge and methods	**03 Hours**
UNIT – II: Common denominators	**02 Hours**
UNIT – III: Tests and values	**02 Hours**
UNIT – IV: Process of identifying key findings from research survey in problem solving	**02 Hours**
UNIT – V: Problem-solving approaches	**02 Hours**
UNIT – VI: Case study – Scenario Presentations in Jigsaw learning method	**02 Hours**

Course Outcome	Description
At the end of the course the student will be able to:	
1	Recognize relevant definitions of knowledge and methods to articulation of ideas and identify diverting Arguments.
2	To develop a systematic approach for to enable quality of thinking and what they design and produce in articulating assumptions, selecting appropriate hypothesis and methods of experiments through critical thinking dispositions

REFERENCE BOOKS:

1. ID2_W Baytiyeh, H. and M.K. Naja. 2017. "Students' Perceptions of the Flipped Classroom Model in an Engineering Course: A Case Study." *European Journal of Engineering Education* 42 (6): 1048-1061. doi: 10.1080/03043797.2016.1252905.
2. ID9 Chang, P. and D. Wang. 2011. "Cultivating Engineering Ethics and Critical Thinking: A Systematic and Cross-Cultural Education Approach Using Problem-Based Learning". *European Journal of Engineering Education* 36 (4): 370–390. doi: 10.1080/03043797.2011.596928
3. Godfrey, P., R. Deakin Crick and S. Huang. 2014. "Systems Thinking, Systems Design and Learning Power in Engineering Education." *International Journal of Engineering Education* 30 (1): 112–127.
4. *Conducting Research Literature Reviews: From the Internet to Paper: Arlene Fink - UCLA, Los Angeles, USA: 5th edition:*

CYBER CRIME, POLICIES, LAWS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2318	**Credits**	:	01
Hours /Week	:	01 Hour	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. Understand Cybercrime Fundamentals.

2. Explore Cybercrime Investigation Techniques.
3. Discuss Cybersecurity Incident Response.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I: Introduction to Cyber Security	**02 Hours**
Basic Cyber Security fundamentals, Types of Cyber Attacks, The 7 layers of Cyber Security, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, types of active attacks, passive Attacks, Software attacks, hardware attacks, Cyber Threats-, Cyber Crime, Cyber terrorism, Cyber Espionage.	
UNIT – II: Cyberspace and the Law & Cyber Forensics	**04 Hours**
Introduction, Cyber Security Regulations, Roles of International Law, Cyber forensics, Digital forensics lifecycle: Types of forensics investigation, challenges in computer forensics.	
UNIT – III: Cybercrime: Mobile and Wireless Devices	**03 Hours**
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era.	
UNIT – IV: Cyber Security: Organizational Implications	**04 Hours**
Drama within liberal studies serves as a vehicle for social commentary and advocacy. By exploring social issues such as discrimination, inequality, and justice, drama becomes a powerful tool for initiating conversations and inspiring action. Through the examination of theatrical texts and the creation of original performances, students develop the skills to articulate their perspectives and communicate their ideas effectively. This process empowers them to become advocates for change and contribute to a more inclusive and just society.	

Course Outcome	Description
At the end of the course the student will be able to:	
1	Analyse cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
2	Interpret and forensically investigate security incidents.
3	Apply policies and procedures to manage Privacy issues.

TEXT BOOKS:

1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes,Computer Forensics and Legal Perspectives, Wiley
2. B.B.Gupta,D.P. Agrawal, Haoxiang Wang, Computer and CyberSecurity: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018.

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup.

INTRODUCTION TO PAINTING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2312	**Credits**	:	01
Hours /Week	:	01 Hour	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. Introduction to canvas.
2. Acrylica colour and water colour.
3. Opaque colour and transparent colour.
4. Painting on canvas.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
2. Show ***Video/animation*** films to explain functioning of various concepts.
3. Encourage ***Collaborative*** (Group Learning) Learning in the class.

UNIT – I:	**07 Hours**
Introduction to canvas, Study water, Transparent –painting method, Wet paper spreading method, Basic study about "Opaque Colour" painting, Painting on canvas, Simple landscape painting, Indian traditional painting using opaque colours.	
UNIT – II:	**06 Hours**
Study of difference between opaque colour and transparent painting, use different materials on canvas like Sponge, Hard brush, Plastic etc.., Creative art on canvas, Study of Acrylic paint, Indian –Tribe art (Warli art), Semimodern painting on canvas.	

Course Outcome	Description
At the end of the course the student will be able to:	
1	Canvas introduction, study of water colour, wet paper spreading, Painting on canvas, simple landscape painting.
2	Difference between transparent colour and opaque colour, Indian tribe art, semimodern painting, use of different method and Materials on canvas.

Importance of Painting and Benefits of learning:

1. Increases creativity.
2. Helps reduce stress.
3. Subtly impact on subconscious mind and helps to get clarity.
4. Activate right brain.
5. Improves communication and management skills.

****

Practicing Yoga & Meditation

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2317	**Credits**	:	01
Hours/Week	:	01 Hour	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. Promoting positive health and holistic wellness.
2. Imparting skills to introduce Yoga awareness for health among general public.
3. To enable students to become competent and committed professionals willing to perform as Yoga performer.
4. To make student to use competencies and skills needed for becoming effective Yoga individual.

5. To enable student to understand the type of Yoga.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I: Introduction to Yoga and Yogic Practices	**02 Hours**
Yoga: Etymology, definitions, aim, objectives and misconceptions, Yoga: Its Origin, history and development, Rules and regulations to be followed by Yoga Practitioners, Introduction to major schools of Yoga (Jnana, Bhakti, Karma, Patanjali, Hatha), Introduction to Yoga practices, Introduction to Surya Namaskar.	

UNIT – II: Foundation of Yoga and Meditation	**02 Hours**
Yoga, Diet and Nutrition Practical – I (Yogasana and Meditation I Practical II (Shatkarma, Pranayam and Meditation II)	

UNIT – III: Types & techniques of Meditation II	**02 Hours**
Meditation • Meditation- Introduction, definition • Concentration and meditation • OM Meditation **Types of Meditation** • Tantra: Yantra and Mantra for meditation • Japa (chanting) meditation • AjapaJapa Meditation • Shoonya Meditation • Yoga Nidra	

UNIT – IV: Relationship between Meditation & Yoga (Mental Health Aspects)	**02 Hours**
Yoga and Mental Health • Define mental health, Holistic health, Medical & Yogic perspective **Mental Hygiene** • Mental Hygiene and roll of yoga in mental hygiene	

- Relationship between mind and body

Meditation – Yoga

- Swara yoga – the balance of life
- The mind and personality

Yoga & Stress Management

- Human Psyche: Yogic and modern concept, Behaviour and consciousness frustration, Conflicts.
- Concept of stress according to modern science and yoga
- Stress and Personality
- Role of yoga in life management

UNIT – V: Yogasana, Pranayam and Meditation Practical's	**3+2 Hours**

Yogasanas

- **Standing Asana:** Tadasana, Trikonasana, Urdhahastotanasana, Vrikshasana, Ardhchakrasna, Padhastanasana, Ashwasthasana.
- **SittingAsana:** Padmasana, Vakrasana, Ardhamatsyendrasana, Janusirsasana, Paschimottanasana, Vajrasana, Ushtrasana, Shasankasana, Gomukhasana ,Mandukasana, Bhadrasana, Singhasana.
- **Prone Lying Asana:** Bhujangasana, Shalabhasana, Dhanurasana, Makarasana
- **Supine Lying Asana:** Pawanmuktasana and its variation, setubandhasana, sarvangasana, Ardhahalasana, Uttanpadasana, Halasana, Naukasana , Cakrasana , Markatasana, Shavasana.

Surya Namaskar

- Surya Namaskara.

Pranayama

- Breath Awareness.
- Yogic Breathing.
- Nadishodhan Pranayama.
- Suryabhedi.
- Ujjayi.
- Shitali.
- Sitkari.
- Bhastrika.
- Bhramari.

Bandha and Mudra

- JalandharaBandha, UddiyanaBandha, MulaBandha, Tri Bandha.
- Yoga Mudra, Shanmukhi Mudra, shambhavi mudra, VipareetKarni Mudra.

Course Outcome	Description
At the end of the course the student will be able to:	

1	Development of relaxation techniques.
2	Improved concentration and cognitive function.
3	Promotion of overall health and well-being.

Text Book and Reference Book:

1. Concentration and Meditation by swami SivanandaSaraswati
2. Yoga and Kriya by Swami SatyanandaSaraswati
3. Yoga &Mental Health by R. S. Bhogal
4. Yoga & Modern Psychology by KaivalyadhamAsharam
5. Yoga for Stress Management by Sri Venkatkrishnan
6. Yoga for Stress Relief by Swami Shivapramananda
7. Yoga Nidra by Swami StyanandaSaraswati
8. Certification of Yoga Professionals – Official Guid book

****

INTRODUCTION TO DANCE

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2307	**Credits**	:	01
Hours/Week	:	01 Hour	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. To understand the elements of dance performance.
2. To interpret the elements of dance movement music, and conceptual ideas that together compose dance performances.
3. To analyse the structure, form, and conceptual ideas of dance techniques.
4. To understand and perform the basic Modern Dance concepts.
5. To gain knowledge in Classic/Semi Classic/Western Dance and various dance forms.
6. To Understand intermediate level dance technique.
7. To gain a critical understanding of dance as a form of human cultural expression.
8. To express dance as a means of creating and communicating meaning.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
2. Show ***Video/animation*** films to explain functioning of various concepts.
3. Encourage ***Collaborative*** (Group Learning) Learning in the class.

UNIT – I: Introduction to Dance & Elements of dance performance.	**02 Hours**
UNIT – II: Composing dance	**02 Hours**
UNIT – III: Dance Techniques with dance movement music & understanding the modern dance	**03 Hours**

UNIT – IV: Dance Formation & Knowledge on Classic/Semi Classic/Western Dance and various dance forms.	**03 Hours**
UNIT – V: Choreographic Principles & Understanding dance as the important skill of creating and communicating meaning	**03 Hours**

Course Outcome	Description
At the end of the course the student will be able to:	
1	An introduction to the history and cultural context of different dance styles, helping students appreciate the cultural significance of dance forms.
2	Develop a fundamental understanding of dance techniques, including posture, alignment, balance, and coordination.
3	Increased self-confidence and self-esteem through the mastery of dance movements and the ability to perform in front of others.

****

INTRODUCTION TO DRAMA

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Course Code	:	22CS2306	**Credits**	:	01
Hours /Week	:	01 Hour	**Total Hours**	:	13 Hours
L–T–P–J	:	1–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. Understanding Camera Basics: Teach students the fundamental components of a camera, including its settings, modes, and functions, helping them become comfortable with their equipment.
2. Mastering Technical Skills: Provide comprehensive knowledge about exposure (aperture, shutter speed, ISO), focus, white balance, and other technical aspects to ensure students can control the outcome of their photographs effectively.
3. Lighting Mastery: Cover the principles of natural and artificial lighting, including how to manipulate and control light for different effects, moods, and subjects.
4. Visual Storytelling: Train students to use photography as a means of storytelling by capturing a series of images that convey a narrative, emotion, or theme.
5. Genre Exploration: Introduce students to various photography genres such as portrait, landscape, macro, street, wildlife, and more, allowing them to discover their interests and strengths.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**07 Hours**

The purpose of conducting photography class was to educate the students about basics of photography and its scope relating to their career opportunities.

UNIT – II	**06 Hours**
A detailed introduction about camera, lens, types of photography was thought in the class. Students were thought about essentiality of natural light.	

Course Outcome	Description
At the end of the course the student will be able to:	
1	Demonstrate a solid understanding of camera settings, exposure (aperture, shutter speed, ISO), focus, and other technical aspects of photography.
2	Ability to work with different lighting conditions and manipulate light effectively to achieve desired effects.
3	Demonstrate competence in a specific photography genre (portrait, landscape, macro, etc.).

****