(An Autonomous College under VTU)

Department of Computer Science and Engineering

III to VIII Semester

Scheme – 2021

Outcome-based Education and Choice-based Credit System

VISION

Create **globally competent professionals** through quality education in the field of Computer Science and Engineering.

MISSION

M1: Empowering students by imparting knowledge, latest technologies through practical approach and academic professionalism to fulfill the needs of the industry.

M2: Developing Technical proficiencies, communication skills and teamwork among the students.

M3: Inculcating ethics, social behavior, and universal human values for sustainable societal growth and environmental protection.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Apply the Computer Science and Engineering technical knowledge to fulfil the organizational needs.

PEO2: Inculcate proficiency, good communication skill, team building and problem-solving abilities.

PEO3: Pursue higher studies, research and to become entrepreneurs with good work ethics and professional behaviour.

PROGRAM OUTCOMES (POs)

Graduates of the Computer Science and Engineering Programme will be able to achieve the following POs:

PO1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals, and Computer Science and Engineering principles to the solution of complex problems in Computer Science and Engineering.

PO2: Problem Analysis

Identify, formulate, research literature, and analyze complex Computer Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions

Design solutions for complex Computer Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Computer Science and Engineering problems.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Computer Science and Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Computer Science and Engineering practice.

PO7: Environment and Sustainability

Understand the impact of the professional Computer Science and Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the Computer Science and Engineering practice.

PO9: Individual and Teamwork

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

Communicate effectively on complex Computer Science and Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage Computer Science and Engineering projects and in multidisciplinary environments.

PO12: Life Long Learning

Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Professional Skills:

Ability to analyse, design and develop computer programs in the areas related to system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2: Problem-Solving Skills:

Ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Foundation of mathematical concepts:

Ability to apply mathematical concepts to solve real world problems using appropriate data structure and suitable algorithms.

Third Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	BSC 21MAT31	Transform Calculus, Fourier Series & Numerical Technique	3	**3:0:0**	3	50	50	100
2	IPCC 21CSI32	Object Oriented Programming using Java	4	**3:0:2**	3	50	50	100
3	IPCC 21CSI33	Logic Design and Computer Organization	4	**3:0:2**	3	50	50	100
4	PCC 21CST34	Data Structures and Applications	3	**3:0:0**	3	50	50	100
5	PCC 21CSL35	Data Structures Lab	1	**0:0:2**	3	50	50	100
6	UHV 21UHV36	Social Connect and Responsibility	1	**0:0:2**	1	50	50	100
7	HSMC 21KSK37/ HSMC 21KBK37	Samskrutika Kannada/ Balake Kannada	1	**1:0:0**	1	50	50	100
8	AEC 21CSL38X	Ability Enhancement Course - III	1	If offered as Theory Course **1:0:0** / If offered as lab. course **0:0:2**	1 / 2	50	50	100
TOTAL			**18**			**400**	**400**	**800**

9	**Scheduled activities for III to VIII semesters**	NMDC 21NS83	National Service Scheme (NSS)	NSS	All students have to register for any one of the course namely National Service Scheme, Physical Education (PE) (Sports and Athletics) and Yoga with the concerned coordinator of the course during the first week of III semester. The activities shall be carried out from (for 5 semesters) between III semester to VIII semester. SEE in the above courses shall be conducted during VIII semester examinations and the accumulated CIE marks shall be added to the SEE marks. Successful completion of the registered course is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the colander prepared for the NSS, PE andYoga activities.
		NMDC 21PE83	Physical Education (PE) (Sports and Athletics)	PE	
		NMDC 21YO83	Yoga	Yoga	

Course prescribed to lateral entry Diploma holders admitted to III semester B.E./B.Tech programs

1	NCMC 21MATDIP31	Additional Mathematics - I	Maths	02	02	- -	- -	- - -	100	- - -	100	0

Fourth Semester B.E.– Scheme

Sl. No.	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	BSC 21CSM41	Mathematical Foundations for Computing	3	2 : 2 : 0 : 0	03	50	50	100
2	IPCC 21CSI42	Design and Analysis of Algorithms	4	3 : 0 : 2 : 0	03	50	50	100
3	IPCC 21CSI43	Computer Networks	4	3 : 0 : 2 : 0	03	50	50	100
4	PCC 21CST44	Operating Systems	3	2 : 2 : 0 : 0	03	50	50	100
5	AEC 21BET45	Biology For Engineers	2	2: 0 : 0 : 0	02	50	50	100
6	PCC 21CSL46	Python Programming Laboratory	1	0 : 0 : 0 : 2	03	50	50	100
7	HSMC 21CIP47	Constitution of India & ProfessionalEthics	1	1 : 0 : 0 : 0	01	50	50	100
8	AEC 21CSL48X	Ability Enhancement Course- IV	1	If offered as theory Course 1 : 0 : 0 : 0 If offered as lab. course 0 : 0 : 2 : 0	1 2	50	50	100
9	UHV 21UHV49	Universal Human Values	1	1 : 0 : 0 : 0	1	50	50	100
10	INT 21INT49	Inter/Intra Institutional Internship	2	Completed during the intervening period of II and III semesters by students admitted to firstyear of BE./B.Tech and during the interveningperiod of III and IV semesters by Lateral entry students admitted to III semester.	3	100	---	100
TOTAL			**22**			**550**	**450**	**1000**

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs												
1	NCMC 21MATDIP41	Additional Mathematics - II	Maths	02	02	--	--	--	100	--	100	0

Fifth Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	HSMC 21CST51	Software Engineering & Project Management	3	3 : 0 : 0 : 0	3	50	50	100
2	IPCC 21CSI52	Database Management Systems	4	3 : 0 : 2 : 0	3	50	50	100
3	PCC 21CST53	Automata Theory and Compiler Design	3	3 : 0 : 0 : 0	3	50	50	100
4	PCC 21CST54	Artificial Intelligence and Machine Learning	3	3 : 0 : 0 : 0	3	50	50	100
5	PCC 21CSL55	Advanced JAVA Programming Lab	1	0:0 : 2 : 0	3	50	50	100
6	AEC 21XX56	Research Methodology & Intellectual Property Rights	2	2: 0 : 0 : 0	3	50	50	100
7	HSMC 21CIV57	Environmental Studies	1	1: 0 : 0 : 0	3	50	50	100
8	AEC 21CS58X/21 CS58LX	Ability Enhancement Course-V	1	If offered as Theory courses 1 : 0 : 0 : 0 If offered as lab. courses 0 : 0 : 2 : 0	1 2	50	50	100
TOTAL			**18**			**400**	**400**	**800**

Ability Enhancement Course - V		
C# and .Net Framework	21CS583	System Programming
Android Programming	21CS584	Microcontroller Programming

Sixth Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	PCC 21CST61	Cloud Computing	3	3 : 0 : 0 : 0	03	50	50	100
2	IPCC 21CSI62	Full Stack Development	4	3 : 0 : 2 : 0	03	50	50	100
3	PCC 21CST63	Computer Graphics and Image Processing	3	3 : 0 : 0 : 0	03	50	50	100
4	PEC 21XX64x	Professional Elective Course-I	3	3 : 0 : 0 : 0	03	50	50	100
5	OEC 21XX65x	Open Elective Course-I	3	3 : 0 : 0 : 0	03	50	50	100
6	PCC 21CSL66	Computer Graphics and Image Processing Laboratory	1	0 : 0 : 2 : 0	03	50	50	100
7	MP 21CSMP67	Mini Project	2	Two contact hours / week for interaction between the faculty and students.	--	100	--	100
8	INT 21INT68	Innovation/Entrepreneurship /Societal Internship	3	Completed during the intervening period of IV and V semesters.	--	100	--	100
TOTAL			**22**			**500**	**300**	**800**

Professional Elective - I		
Precision Agriculture	21CS643	Agile Technology
Human Computer Interaction	21CS644	Data Visualization using Python Programming
Open Electives – I offered by the Department to other Department students		
Introduction to JAVA Programming	21CS653	Introduction to Cyber Security
Introduction to Database Management Systems	21CS654	Introduction to Artificial Intelligence & Expert System

Seventh Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	PCC 21CST71	Cryptography & Network Security	3	3 : 0 : 0 : 0	3	50	50	100
2	PCC 21CST72	Advanced Computer Architecture	2	2 : 0 : 0: 0	3	50	50	100
3	PEC 21XX73X	Professional elective Course-II	3	3 : 0 : 0 : 0	3	50	50	100
4	PEC 21XX74X	Professional elective Course-III	3	3 : 0 : 0 : 0	3	50	50	100
5	OEC 21XX75X	Open elective Course-II	3	3 : 0 : 0 : 0	3	50	50	100
6	Project 21CSP76	Project work	10	Two contact hours /week for interaction between the faculty and students.	3	100	100	200
		TOTAL	**24**		-	**350**	**350**	**700**

Professional Elective - II			
21CS731	Object Oriented Modelling & Design	21CS733	Big Data Analytics
21CS732	Blockchain Technology	21CS734	Internet of Things
Professional Elective - III			
21CS741	Deep Learning	21CS743	Robotic Process Automation
21CS742	Advanced Computer Networks	21CS744	Open-Source Technology
Open elective Course-II			
21CS751	R Programming	21CS7543	Digital Marketing
21CS752	Introduction to Machine Learning	21CS754	Data Science & Visualization

Eight Semester B.E. – Scheme

Sl. No.	Course Code		Course Name	Total Credits	L:T:P:S (Hrs/Week)	Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	Seminar 21CSM81		Technical Seminar	01	One contact hour /week for interaction between the faculty and students.	--	100	--	100
2	INT 21INT82		Research Internship/ Industry Internship	15	Two contact hours /week for interaction between the faculty and students.	03 (Batch wise)	100	100	200
3	NCMC	21NS83	National Service Scheme (NSS)	0	Completed during the intervening period of III semester to VIII semester.	--	50	50	100
		21PE83	Physical Education (PE) (Sports and Athletics)						
		21YO83	Yoga						
TOTAL				**16**		-	**250**	**150**	**400**

III SEMESTER
COURSE SYLLABUS

TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21MAT31	3:0:0:0	03	CIE:50 SEE:50	03 Hours	BSC

Course Objectives:

The goal of the course Transform Calculus, Fourier series and Numerical techniques

- To have an insight into solving ordinary differential equations by using Laplace transform techniques
- Learn to use the Fourier series to represent periodical physical phenomena in engineering analysis.
- To enable the students to study Fourier Transforms and concepts of infinite Fourier Sine and Cosine transforms and to learn the method of solving difference equations by the ztrans form method.
- To develop proficiency in solving ordinary and partial differential equations arising in engineering applications, using numerical methods

Module-I

Laplace Transform: Definition and Laplace transforms of elementary functions (statements only). Problems on Laplace's Transform of e^{at}f (t), t^nf(t) , $f(t)$. Laplace transforms of Periodic functions (statement only) and unit-step function – problems. Inverse Laplace transforms definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) problems. Laplace transforms of derivatives, solution of differential equations.

08 Hours

Self-study: Solution of simultaneous first-order differential equations.

Module-II

Fourier Series: Introduction to infinite series, convergence and divergence. Periodic functions, Dirichlet's condition. Fourier series of periodic functions with period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis.

08 Hours

Self-study: Convergence of series by D' Alembert's Ratio test and, Cauchy's root test.

Module-III

Infinite Fourier Transforms: Infinite Fourier transforms definition, Fourier sine and cosine transforms. Inverse Fourier transforms, Inverse Fourier cosine and sine transforms. Problems.

Z-Transforms: Difference equations, z-transform-definition, Standard z-transforms, Damping and shifting rules, Problems. Inverse z-transform and applications to solve difference equations.

08 Hours

Self-Study: Initial value and final value theorems, problems.

Module-IV

Numerical solutions of simultaneous first order differential equations: Picards method, Taylor's series method and **Runge-Kutta method. (No derivations of formulae).**

Second-order differential equations: Runge-Kutta method and Milne's predictor and Corrector method. (No derivations of formulae).

08 Hours

Self-Study: Solution of Laplace's equation using standard five-point formula.

Module-V

Calculus of Variations: Functionals, Euler's equation, Problems on extremals of functional. Geodesics on a plane, Variational problems.

08 Hours

Self- Study: Hanging chain problem**.**

Teaching-Learning Process for all modules

Chalk and Talk/PowerPoint presentation/YouTube videos.

Course Outcomes:

After successfully completing the course, the students will be able

CO1: To solve ordinary differential equations using Laplace transform.

CO2: Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.

CO3: To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations

CO4: To solve mathematical models represented by initial or boundary value problems involving ordinary differential equations

CO5: Determine the extremals of functionals using calculus of variations and solve problems Arising in dynamics of rigid bodies and vibrational analysis.

Text Books:

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2018.

[Text 1:21.1, 21.2, 21.3, 21.4, 21.5, 21.7, 21.9, 21.10,21.12, 21.14, 21.15, 21.17]

(RBT Levels: L1, L2 and L3)

[Text 1: 9.3, 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.11]

(RBT Levels: L1, L2 and L3)

[Text 1: 22.1, 22.2, 22.4, 22.5, 23.1, 23.2, 23.3, 23.5, 23.6, 23.7, 23.15, 23.16, 31.1, 31.2]

(RBT Levels: L1, L2 and L3)

[Text 1: 32.1, 32.11, 32.12. Text 2: 21.3]

(RBT Levels: L1, L2 and L3)

[Text 1: 35.1, 35.2, 35.3, 35.4, 35.5]

(RBT Levels: L1, L2 and L3)

2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed. (Reprint),2016.

Reference Books:

1. **B.V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed.
2. **Srimanta Pal & Subodh C.** Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Reprint, 2016.
3. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, Latest edition.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – HillBook Co.Newyork, Latest ed.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. **H.K.K. Dassnd Er. Rajnish Verma:** "Higher Engineering Mathematics" S.Chand Publication(2014).
7. **James Stewart: "**Calculus" Cengage publications, 7th edition, 4th Reprint 2019.

E-Resources:

1. http://.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

Quizzes

Assignments

Seminars

OBJECT ORIENTED PROGRAMMING USING JAVA (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSI32	3:0:2:0	04	CIE:50 SEE:50	03 Hours	IPCC

Course Objectives:

This course will enable the students to:

- Learn the basic concepts of object-oriented programming.
- Understand the basics of JAVA Programming using classes and objects.
- Gain the knowledge of Inheritance and Interfaces.
- Expose to the concepts of Packages and Exceptions that occur while programming in JAVA.
- Acquire the knowledge of multi-threaded programming and string handling in JAVA.

Module – I

Introduction to Object Oriented Concepts: Procedure Oriented Programming, Object-oriented Programming, Comparison of Object-Oriented Language with C. Introduction to Java, Java Buzzwords, The Byte code, Java Development Kit (JDK), Data types, Variables and arrays, Operators, Control statements, Simple Java programs.

08 Hours

Module – II

Classes, Methods: Classes fundamentals, Declaring objects, Reference variables, this keyword, garbage collection. **Methods:** Method Prototyping, Member functions and Data members, Constructors, Objects and methods, Method Overloading, Objects and arrays, Access modifiers, Setters and getters, Nested classes.

08 Hours

Module – III

Inheritance, Interfaces: Inheritance basics, using super, creating multi-level hierarchy, method overriding, using Abstract classes, using final, **Interfaces**: Defining an Interface, Implementing an Interface, Nested Interfaces, Applying an Interface, variables in Interface, Interfaces can be extended.

08 Hours

Module – IV

Packages, Exceptions: Access Protection, Importing Packages. **Exceptions**: Exception handling fundamentals, Exception types, uncaught exceptions, using try and catch, using multiple catch clauses, nested try statements, throw, throws, finally, Java's built-in exceptions.

08 Hours

Module – V

Multi-Threaded Programming, String Handling: What are threads? How to make the classes threadable, Extending threads, Implementing runnable, Synchronization. **String Handling**: String Constructors, String Operations, Character Extraction, String Comparison.

08 Hours

Lab Programs

1. A. Develop a Java program for an advanced arithmetic calculator that takes two integer operands and an operator from the user. The program should be capable of performing addition, subtraction, multiplication, and division. Ensure that the program handles input validation, including checking for the validity of the operator and non-negative values for the operands. After each calculation, ask the user if they want to perform another operation and provide a history of previous calculations upon request.

   B.Write a Java program to generate the first 'n' terms of the Fibonacci series and determine the following:

   1. Calculate the sum of all even terms in the series.
   2. Find the product of all odd terms in the series.
   3. Check and display the largest prime number within the series.
   4. Calculate the average of the entire series.

   A. Develop a Java program showcasing method overloading with a base class "Phone" containing the dial () method, and two subclasses "Camera Phone" and "Smartphone" that inherit from the base class and enhance its features. The program should demonstrate and print the results of these enhancements.

   B. Develop a Java program illustrating constructor overloading for calculating the area of a rectangle and a circle using appropriate constructors.

2. A. Create a Java program with a vehicle hierarchy, including Vehicle, Car, Sportscar, and Truck classes. Implement methods for starting and stopping in the base class and specialized methods for accelerating, adding turbo boost, and loading cargo in the subclasses, with appropriate method overrides.

B. Create a Java program that models electronic devices (e.g., smart phones, laptops, and tablets) using a common interface for power management. The program should allow users to interact with the devices and control their power state.

3. A. Develop a Java program that emulates a library system. Create two packages, `library` and `patron`. In the `library` package, define a `Book` class with a private title field. In the `patron` package, implement a `Patron` class that can borrow books. Demonstrate the use of packages, access protection, and class imports. Ensure that the book title remains inaccessible from outside the `library` package due to the `private` access modifier. Create a scenario where a patron, Alice, borrows a book from the library.

   B. Develop a Java lab program that handles exceptions for division by zero and invalid input. Use `try-catch` blocks to catch `Arithmetic Exception` for division by zero and `Input Mismatch Exception` for non-integer input and provide user-friendly error messages.

4. A. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

   B. Design a Java lab program to demonstrate string handling, including creating strings using constructors and literals, concatenating strings, extracting characters at a specified index, and comparing strings for equality.

Course Outcomes:

After studying this course, students will be able to

CO1: Demonstrate a strong understanding of the fundamental concepts of object-oriented programming, including classes, objects, encapsulation, and abstraction.

CO2: Implement object-oriented design principles in their code.

CO3: Design class hierarchies, implement interfaces, and apply polymorphism effectively in their Java applications.

CO4: Apply knowledge of organizing code into packages and handle exceptions for modularity and maintainability.

CO5: Demonstrate the programs by using multithreaded concepts & string handling.

Text Books:

1. Herbert Schildt, “Java the Complete Reference”, 7th Edition, TataMcGrawHill, 2013, ISBN 13:978-0072263855, (Chapters 1-11).

Reference Books:

1. E Balagurusamy, “Programming with Java-A primer”, 2nd Edition, Tata McGraw Hill companies, 2009, ISBN-13:978-9351343202.

E-Resources:

1. www.geeksforgeeks.org/java/
2. www.tutorialspoint.com/java/

ANALOG AND DIGITAL ELECTRONICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSI33	3:0:2:0	04	CIE:50 SEE:50	03 Hours	IPCC

Course objectives:

This course will enable students to:

- Explain the use of PN junction Diode, special purpose Diodes.
- Understand the operation of transistor under different biasing conditions.
- Illustrate combinational circuits and Karnaugh map simplification of Boolean expressions.
- Study the working of sequential circuit and VHDL implementation of digital circuit.
- Study of digital logic families and circuit implementation of programmable devices.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain the different concepts of Linear Algebra & Signal Processing.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
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 improvethe students' understanding.
9. Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and have discussions on the that topic in the succeeding classes.
10. Give Programming Assignments.

Module-I

Diodes and Applications: Semiconductors: Charge carriers, Hall effects. Diode: P-N Junction, Current Equation, Equilibrium condition, Forward & Reverse biased junction, Junction-capacitance breakdown characteristic, I-V Characteristics of a diode, Review of half-wave and Full-wave rectifiers, Zener diodes, Clamping and Clipping circuit. Special Diodes: LED, Photodiode, Schottky diode, Tunnel diode, their characteristics and applications

08 Hours

Module-II

Transistors and Biasing: Bipolar junction transistors Transistor construction, operation, amplification action, common base, common emitter, common collector configuration, dc biasing of BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Field effect transistor (MOSFET): Device structure and

its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits.

08 Hours

Module-III

Combinational Logic and Karnaugh Maps: Combinational Logic: MSI devices like Magnitude comparator, Multiplexers, De-multiplexers, Decoders, and Encoders. Multiplexed display, half and full adders, subtractors, serial and parallel adders, BCD adder.

Karnaugh maps: minimum forms of switching functions, two and three variable Karnaugh maps, four variable Karnaugh maps, determination of minimum expressions using essential prime implicants, Quine-McClusky Method: determination of prime implicants.

08 Hours

Module-IV

Sequential Logic and VHDL: Sequential Logic and Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter. VHDL description of combinational circuits, VHDL Models for multiplexers, VHDL Modules.

08 Hours

Module -V

Memory & Programmable Logic Devices: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLAand PAL

08 Hours

Teaching-Learning Process: PPT Method, Chalk-Talk, NPTEL Video Lectures.

Laboratory Component:

1.To Plot V-I characteristics of P-N junction diode and Zener diode.

1. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridgerectifiers.
2. To determine voltage gain, current gain, input impedance and output impedance and frequency response ofR-C coupled common emitter amplifier.
3. To Plot input /output characteristics of MOSFET and determine MOSFET parameters at a given operatingpoint.
4. Given a 4-variable logic expression, simplify it using appropriate technique and implement the same usingbasic gates.
5. Given a 4-variable logic expression, simplify it using appropriate technique and realize the simplified logicexpression using 8:1 multiplexer IC.

6. Design and implement code converter I) Binary to Gray (II) Gray to Binary Code
7. Given a 4-variable logic expression, simplify it using appropriate technique and simulate the same in HDLsimulator
8. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gate
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.

Text Books:

1. S. Salivahanan and S. Arivazhagan , Analog and Digital Electronics, First Edition McGraw-Hill, 2019.
2. 2.RP Jain and Kishor Sarawadekar, Modern Digital Electronics, Fifth Edition, McGraw Hill, 2022.
3. U. A. Bakshi A. P. Godse, Analog and Digital Electronics, Technical Publications, First edition, 2019.

Reference Books:

1. Anil K Maini, Varsha Agarwal, Electronic Devices and Circuits, Wiley, 2012.
2. Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.
3. M. Morris Mani, Digital Design, 4th Edition, Pearson Prentice Hall, 2008.
4. David A. Bell, Electronic Devices and Circuits, 5th Edition

DATA STRUCTURES AND APPLICATIONS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST34	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PCC

Course Objectives:

This course will enable students to:

- Get knowledge on pointers, structures, Unions and Dynamic Memory allocation
- Illustrate linear representation of data structures: Stack, Queues, Lists.
- Demonstrate sorting and searching algorithms.
- Get knowledge on non-linear data structures Trees.
- Apply suitable data structure during application development/Problem Solving

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain evolution of communication technologies.
3. Encourage collaborative (Group) Learning in the class
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze 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 every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-I

Introduction: Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Pointer as function arguments, Functions returning pointers.

08 Hours

Module-II

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion** - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Binary Search.

Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Programming Examples.

08 Hours

Module-III

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists and header linked lists. Linked Stacks and Queues. Programming Examples.

08 Hours

Module-IV

Circular lists and it's basic operations: Circular Singly and Doubly linked lists; Basic operations: Insert, Delete and Display. Applications of linked lists: Addition of long positive integers using circular list, Adding Polynomials. Hashing: Hash tables, Hash function, and Overflow handling: Open Addressing, Chaining.

08 Hours

Module-V

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples.

08 Hours

Teaching-Learning Process for all modules:

Chalk and Talk, PowerPoint presentation, flip teaching, YouTube videos

Course Outcomes

At the end of the course the student will be able to:

CO1: Explore pointers and heterogeneous data types

CO2: Apply linear data structures, stack and Queue in solving real time scenario

CO3: Develop a solution for the problems by using various operations of singly and doubly linked Lists.

CO4: Analyze usage of circular lists for application-oriented problems.

CO5: Develop a solution for the problems related to non-linear data structures.

Reference Books:

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014. Chapter 1: 1.2; Chapter 2: 2.1 - 2.6; Chapter 3: 3.1 - 3.7; Chapter 4: 4.1– 4.3, 4.7 - 4.8; Chapter 4: 4.4 – 4.5; Chapter 8: 8.1 - 8.2; Chapter 5: 5.1 – 5.3, 5.5, 5.7;

2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
   Chapter 1: 1.1 - 1.4; Chapter 4: 4.1 - 4.8; Chapter 6: 6.1 - 6.3, 6.5-6.14; Chapter 5: 5.1 – 5.9; Chapter 5: 5.10;
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013

4. A M Tenenbaum, Data Structures using C, PHI, 1989
5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

Textbooks:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014

E-Resources:

1) https://www.cs.princeton.edu/
2) https://www.opendatastructures.org/ods-cpp
3) https://www.lib.mdp.ac.in/ebook/DSa
4) https://ww.cs-fundamentals.com/data-structures/introduction-to-datastructures.php
5) https://www.cprogramming.com/algorithms-and-data-structures.html
6) https://online-learning.harvard.edu/course/data-structures-and-algorithms

DATA STRUCTURES LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL35	0:0:2:0	01	CIE:50 SEE:50	03 Hours	PCC

Course objectives:

This course will enable students to experience practically on:

- Pointers, Structures, Unions and Dynamic Memory allocation
- Linear representation of data structures: Stack, Queues, Lists.
- Sorting and Searching techniques.
- Non-linear data structures, Trees.
- Application oriented Problem-Solving techniques and develop the same using different data structure

Lab Programs

1. Design, develop and execute a program in C based on the following requirements: An EMPLOYEE structure is to contain the following members: Employee_Number (an integer), Employee_Name (a string of characters), Basic_Salary (an integer), All_Allowances (an integer), IT (an integer), Net_Salary (an integer). Write a function to read the data of an employee, to calculate Net_Salary and to print the values of all the structure members. (All_Allowances = 123% of Basic, Income Tax (IT) = 30% of the gross salary (gross salary = Basic_Salary + All_Allowance), Net_Salary = Basic_Salary + All_Allowances –IT). Display the above data for at least 5 employees.
2. Write a program to Store Roll number of N students. Perform Insert and delete Roll_No at a given valid position (POS) using pointers. Display the status of array elements at any given point of time. Support the program with functions for each operation.
3. Develop an array implementation on stack and perform Push and Pop operations. Check for overflow and underflow conditions. Demonstrate stack implementation to check palindrome. Display the status of the stack for all the operations performed. Support the program with appropriate functions for each of the above operations
4. Write a Program in C:

   To convert an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with arithmetic operators.

   Evaluate the Suffix (Postfix) expression with single digit operands and operators.
5. Implement Circular QUEUE program in C for rainbow colours (VIBGOYR) and perform Insert and Delete operations. Check for overflow and underflow conditions. Display the status of the Circular QUEUE for all the operations performed. Use pointers and functions.
6. Implement a Menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Avg_Marks
   a. Create N number of Students Data by inserting at end of the list.
   b. Insert and Delete at front of the list
   c. Delete at the end of list
   d. Display the status of SLL
   e. Demonstration stack and queue

f. Exit

7. Design and Develop following operations on Doubly Linked List (DLL) of Employee Data with the fields:SSN, Name, Dept etc.
    a. Create a Node of N Employees Data by inserting in front.
    b. Insert a new node to the right of key value.
    c. Perform Insertion and Deletion at End of DLL
    d. Display the status of DLL and count the number of nodes
    e. Exit
8. Write a program to implement the following operations on SLL/DLL
    a. Sort the list
    b. Reverse the list
    c. Concatenate two list
9. Write a program in C to implement Hashing using Linear probing. Write functions for the following: Insert data in the Hash Table, Delete data in the Hash Table, Search an item in the Hash Table and Display Hash Table.
10. Design and Develop a program in C for the following operations on Binary Search Tree (BST) of Integers.
    a. Create a BST of N Integers
    b. Traverse the BST using Inorder, Preorder and Post Order techniques
    c. Search a KEY element in BST and display the appropriate message

Laboratory Outcomes:

The student should be able to:

1. Analyze and compare various linear and non-linear data structures
2. Apply pointer concept to all the data structures.
3. Code, debug and demonstrate the working nature of different types of data structures and their applications
4. Implement, analyze and evaluate the searching and sorting algorithms
5. Choose the appropriate data structure for solving real world problems

Assessment Details (both CIE and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses

Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination (SEE)		50 marks

SOCIAL CONNECT & RESPONSIBILITIES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21UHV36	0:0:2:0	01	CIE:50 SEE:50	01 Hours	UHV

Course objectives:

This course will enable students to:

- To do a deep dive into societal challenges being addressed by NGO(s), social enterprises & The governmentand build solutions to alleviate these complex social problems through immersion, design & technology.
- Allow students to learn about the plants, its origin and usage in daily life.
- Provide a formal platform for students to communicate and connect to their surroundings.
- Enable to create of a responsible connection with society.
- To create awareness about traditional cooking practices of different regions.

Teaching-Learning Process (General Instructions)

1. The course is mainly activity-based that will offer a set of activities for the student that enables them to connectwith fellow human beings, nature, society, and the world at large.
2. The course will engage students' interactive sessions, open mic, reading groups, storytelling sessions, and semester-long activities conducted by faculty mentors.
3. The students are expected to have the ability to:
   - Understand social responsibility.
   - Practice sustainability and creativity.
   - Showcase planning and organizational skills.

Module-I

Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of B.Tech. students. They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.

04 Hours

Module-II

Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.

03 Hours

Module-III

Organic farming and waste management: usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.

04 Hours

Module-IV

Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices.

04 Hours

Module-V

Food Walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.

03 Hours

Activities

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

Pedagogy

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

Assessment details (Both CIE and SEE)

The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

- Marks allotted for the Activity Completed are out of 50.
- Planning and scheduling the social connect
- Information/Data collected during the social connect
- Analysis of the information/data
- Report writing

Course Outcomes:

CO1: Explain the knowledge about Plant life, its origin, appearance, and usage in daily life and also about planting, and adopting trees.

CO2: Realize the culture, craft forms and history of the city by exploring monuments or architecture.

CO3: Describe the concept of Organic Farming which improves livelihood opportunities and income and also know about waste management which boosts the community's resiliency.

CO4: Provide a formal platform for students to conserve water and connect to their surroundings.

CO5: Recognize the culinary practices and indigenous materials of the typical region used for cooking.

SAMSKRUTIKA KANNADA

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21KSK37	1:0:0:0	01	CIE:50 SEE:50	01 Hours	HSMC

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೊಡುವುದು.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿವಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.

ಘಟಕ -1 ಲೇಖನಗಳು

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ	
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ. 2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	
1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	
1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (course Outcomes):

1. ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಅಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಅಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು ಮೂಡುತ್ತದೆ.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
4. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

ಮೌಲ್ಯಮಾಪನದ ವಿಧಾನ (**Assessment Details- both CIE and SEE**) :

(methods of CIE - MCQ, Quizzes, Open book test, Seminar or micro project)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

Continuous Internal Evaluation:
Three Tests each of **20 Marks (duration 01 hour)**

a. First test at the end of 5th week of the semester
b. Second test at the end of the 10th week of the semester
c. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**
3. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - **Semester End Exam (SEE):**

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.
1. The question paper will have 50 questions. Each question is set for 01 mark.

SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

ಪಠ್ಯಪುಸ್ತಕ :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಕ,
ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

BALAKE KANNADA

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21KBK37	1:0:0:0	01	CIE:50 SEE:50	01 Hours	HSMC

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು (Course Learning Objectives):

- To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement.
- To train the learners for correct and polite conservation.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.
1. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕ್ಕೆಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.
2. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

Module-1

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities
3. Key to Transcription.
4. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - **Personal Pronouns, Possessive Forms, Interrogative words**

Module-2	
1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - **Possessive forms of nouns, dubitive question and Relative nouns** 2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಿಂದ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು **Qualitative, Quantitative and Colour Adjectives, Numerals** 3. **ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ - (ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case**	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
Module-3	
1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - Dative Cases, and Numerals **4. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು - Ordinal numerals and Plural markers** **5. ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು Defective / Negative Verbs and Colour Adjectives**	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
Module-4	
1 ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು **Permission, Commands, encouraging and Urging words (Imperative words and sentences)** 2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು **Accusative Cases and Potential Forms used in General Communication** 3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs 6. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
Module-5	
1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - ifferent types of forms of Tense, Time and Verbs **2.** ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms **3. Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Words in Conversation**	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: **course Outcomes (Course Skill** Set): At the end of the Course, The Students will be able

1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
5. To speak in polite conservation.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Tests each of **20 Marks (duration 01 hour)**

a. First test at the end of 5th week of the semester
b. Second test at the end of the 10th week of the semester
c. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester

7. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

8. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - **Semester End Exam (SEE):**

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

2. The question paper will have 50 questions. Each question is set for 01 mark.
3. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

Textbook :

ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

MASTERING OFFICE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL381	0:0:2:0	01	CIE:50 SEE:50	02 Hours	AEC

Course objectives:

This course will enable students to experience practically on:

- Learn to Create, edit, save and print document with various options available.
- Attain the knowledge about spreadsheet with formulae, create effective charts and analyse data using pivot table and pivot chart.
- Gain Knowledge to Create simple presentations with various options available.
- Acquire Knowledge to Create Database and retrieve required data using Queries.
- Demonstrate the ability to apply application software in an office environment.

Lab Programs

1. Create a Resume, specifying details like Name, Father-name, Mother-name,DOB, Address, Photograph of yours using smart art, Education details in table form, skills learnt,personal strengths, Extra circular activities and Hobbies using Bullets, and projects completed using Numbering and internship undergone specifying organization with hyperlink, and do alignment using justify and also use footers along with page numbers.
2. Write a thank you letter to your professors and send the letter using mail merge. Create an Excel Sheet, it should Contain details of all professors like Name, College name, College address and mail.
3. Create a student table for internal marks, where table should contain student name, Attendance CIE1, CIE2, CIE3 columns, calculate the average of 3 internals that should be listed in final CIE column, percentage and eligibility checking for SEE criteria using formula and function for 20 students. Display the word “Eligible” or “Ineligible” under a column called Description.

Requirements:

a. Average CIE marks should be greater than or equal to 20 to be eligible.
b. A student is eligible only if he/she has an attendance>= 85% else he/she fails even though average CIE marks >=20.
c. Student with 85% and above display a word “Fast Learner” and 40% and below displays a word “Slow Learner”.

4. Create sales report table of 15 salesman of an electronic gadget as product, Specify Quantity, Region, Price and total sales for each product.

Salesman_name

Product

Region

Quantity

price

Total_sale

a. Find the sum of sales for salesman “peter” for the product “Laptop”.
b. Fetch John’s product price
c. Find the average of sales for salesman “Smith” for the product “Mobile”.
d. Fetch row number for the product “Television”.
e. Plot pivot chart.

5. Design a power presentation on new technology (IOT) where slides should include introduction, technologies used, how IOT works, applications of IOT, advantages and Disadvantages of IOT and include Thank you slide at the end. Apply Transitions, Animations, sounds, Action on mouse click and Action on Mouseover.
6. Activate a database package that you are familiar with and create a database file MOTORS. Create a table within this database and use the following structure, set all the fields to their appropriate data types and Vehicle No Plate as primary key.

Field_name

Data type

Vehicle_no

text

Car_model_name

text

Manufactured_date

Date

Country_of_origin

text

Price

Currency

Save the table as CARSTABLE

1. Create a query to retrieve all Toyota vehicles whose price is above $1500. Name the query Toyota.
2. Create a query to retrieve all vehicles manufactured from January 2018 up to June 2018, name that query, date query.
3. Create a query to retrieve all vehicles manufactured in Japan and name that query as Japan.

7. Create a table within STUDENT database and use the following structure:

Field name

Data type

USN

Text

First_name

Text

Sur_name

Text

DOB

Date/Time

Age

Number

Section

Text

Mobile_num

Text

Result

Specifty your own option

Fee_paid

Number

Address

Text

pincode

Number

Specify input and Validation rule for Mobile number,Section. Save the Table as Student_table.

1. Create an input form with ADD and SAVE button to input records into table.
2. Create a Query to retrieve the student who belong to “A” section and Result is “Pass”.
3. Create a Query to retrieve the student who have paid fee more than 50000.
4. Create a Query to retrieve the Student whose address postfix with “India”.
5. Create a Query to retrieve the student whose first name strats with “A”.
6. Create a Query to retrieve the student who have been born between july 2003 to november 2003.

Laboratory Outcomes:

The student should be able to:

CO1: Able to Create, edit, save and print document with list, tables, header, footer, graphic, mail merge, Hyperlink and protect the Document.

CO2: Attain the knowledge about spreadsheet with formulae, create effective charts and analyse data using pivot table and pivot chart.

CO3: Create simple presentations using clip art,Working with Objects, Hyperlinks, Animation, Transition and Slide show and along with various options available.

CO4: Learn to Create Database and retrieve required data using Queries.

CO5: Use Ms Office suite to create applications.

PROGRAMMING IN C++

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL382	1:0:0:0	01	CIE:50 SEE:50	01 Hours	AEC

Course Objectives:

- Understanding about object-oriented programming and Gain knowledge about the capability tostore information together in an object.
- Understand the capability of a class to rely upon another class and functions.
- Understand about constructors which are special type of functions.
- Create and process data in files using file I/O functions
- Use the generic programming features of C++ including Exception handling.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic 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.

Module- I

Introduction to Object Oriented Programming: Computer programming background- C++ overview- First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.

04 Hours

Module -II

Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scoperesolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Functionoverloading.

04 Hours

Module III

Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance- Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.

04 Hours

Module IV

I/O Streams: C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling duringfile operations.

04 Hours

Module V

Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch block-Throw statement- pre-defined exceptions in C++.

04 Hours

Teaching-Learning Process: Chalk and board, MOOC

Course Outcomes :

At the end of the course the student will be able to:

CO1: Able to understand and design the solution to a problem using object-orientedprogramming concepts.

CO2: Able to reuse the code with extensible Class types, User-defined operators andfunction overloading.

CO3: Achieve code reusability and extensibility by means of Inheritance and Polymorphism

CO4: Identify and explore the Performance analysis of I/O Streams.

CO5: Implement the features of C++ including templates, exceptions and file handling forproviding programmed solutions to complex problems.

Textbooks

1. Bhushan Trivedi, –Programming with ANSI C++‖, Oxford Press, Second Edition, 2012. Chapter 1(1.1 to 1.8), Chapter 12(12.5), Chapter 13 (13.6,13.7)
2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010. Chapter6(6.2,6.11),chapter8(8.1to,8.8),Chapter3(3.2,3.3,3.4,3.13,3.14,3.19,3.20),Chapter4(4.3,4.4,4.5,4.6,4.7,4.9), Chapter 13 (13.2 to13.6)

Reference Books

1. Bhave , — Object Oriented Programming With C++‖, Pearson Education , 2004.
2. Ray Lischner, —Exploring C++ : The programmer's introduction to C++‖ , apress, 2010
3. Bhave , — Object Oriented Programming With C++‖, Pearson Education , 2004

Weblinks and Video Lectures (e-Resources):

1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw

Tutorial Link:

1. https://www.w3schools.com/cpp/cpp_intro.asp
2. https://www.edx.org/course/introduction-to-c-3

DATA ANALYSIS AND COMPUTER APPLICATIONS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS383	1:0:0:0	01	CIE:50 SEE:50	01 Hours	AEC

Prerequisites:

Basic knowledge of Computer operation, typing and operating mouse device.

Course Objectives:

- Understand the basics of computers and prepare documents and small presentations.
- Attain the knowledge about spreadsheet/worksheet with various options.
- Create simple presentations using templates various options available.
- Demonstrate the ability to apply application software in an office environment.

Module I

Demonstration of the Computers, Characteristics of the Computer System, Components of ComputerSystem

04 Hours

Module II

Operating System & User Interface, Concept of Hardware and Software, Introduction to Word Processing Software

04 Hours

Module III

Working with Multiple Documents in Microsoft Word, Introduction to PowerPoint, and Introductionto Spreadsheets.

04 Hours

Module IV

Basic Excel Formulas and Functions, Data Communication and Computer Network

04 Hours

Module V

LAN, MAN & WAN, Internet and Introduction e-mail and other communication applications

04 Hours

Course Outcomes:

Students are able to

CO1: Demonstrate the components and characteristics of Computer System

CO2: Demonstrate the working of operating System and word processor

CO3: Apply skills of MS Office applications in preparing the documents

CO4: Apply the formulas and functions in MS-Excel sheets and understand the working of computer networks

CO5: Identify different types of networks and communication applications

ADDITIONAL MATHEMATICS-I

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	CourseType

21MATDIP31	**2:2:0:0**	**0**	**CIE : 100**	**--**	**NCMC**

(Common to all lateral entry students of all branches)

Course Objectives:

This course will enable students to understand the basic tools of differential, Integral calculus, vector calculus and linear algebra and become skilled for solving problems in engineering.

Module – I

Differential Calculus-I

Revision of differentiation. Taylor's and Maclaurin's series for functions of one variable- (statements only) - problems. Polar curves-angle between radius vector and tangent andlength ofthe perpendicular from pole on the tangent-(statements only), angle between two polar curves-Problems and pedal equations for polar curves-problems.

04 Hours

Module – II

Differential Calculus-II

Curvature and Radius of Curvature in cartesian, parametric, polar and pedal forms (Formulaeonly)problems. Partial derivatives: -Simple problems, total derivatives, partial derivatives of composite functions-problems.

04 Hours

Module – III

Integral Calculus:

Multiple integrals: Evaluation of double and triple integrals. Evaluation of double integrals by changing the order of integration and changing into polar coordinates.

04 Hours

Module – IV

Linear Algebra:

Rank of the matrix by elementary transformations (Echelon form only), solutions of system of linear equations- Gauss elimination method and Gauss Seidel method. Eigen values and Eigen vectors of a square matrix – problems. Rayleigh's power method to find the largest Eigen value and corresponding Eigen vector – problems.

04 Hours

Module – V

Vector Calculus:

Vector Differentiation**:** Scalar and vector fields**.** Gradient, directional derivative; curl and divergence; solenoidal and irrotational vector fields- problems.

04 Hours

Course Outcomes:

On completion of this course, students will be able to:

CO1: Express the given functions in the series form and determine the characteristics of polar curves.

CO2: Determine the radius of curvature in different curves and finding partial derivatives of the different functions.

CO3: Evaluate the multiple integrals by using various methods.

CO4: Evaluate the system of linear equations and compute Eigen values and Eigen vectors.

CO5: Find the differentiation of scalar and vector point functions.

Text Books:

1. Dr. B.S. Grewal, "Higher Engineering Mathematics" (Chapters 2,4,5,7 & 8), Khanna Publishers, New Delhi, 42nd edition, 2012. ISBN **:** 9788174091956
2. N.P. Bali and Dr. Manish Goyal, "A Text Book of Engineering Mathematics".Laxmi Publications (P) Ltd,New Delhi, 9th edition, 2014. **ISBN:** 9788131808320

Reference :

1. Erwin Kreyszig "Advanced Engineering Mathematics" Wiley Pvt Ltd , New Delhi,India, 9tedition,2011.ISBN 13: 9788126531356
2. H.K. Dass and Er. RajnishVerma, "Higher Engineering Mathematics" S. Chand and Company Private Limited,New Delhi, 3rdrevised edition, 2014. ISBN: 9788121938907

E-Resources:

1. http://bookboon.com/en/essential-engineering-mathematics-ebook
2. https://www.free-ebooks.net/ebook/essential-engineering-mathematics
3. http://www.zums.ac.ir/.../ebooks/mathematics/essential-engineering-mathematic

NATIONAL SERVICE SCHEME (NSS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	CourseType

21NS83	**0:0:3**	**01**	**CIE: 50 SEE:50**	**--**	**NMDC**

Pre-requisites to take this Course:

1. Students should have a service-oriented mind set and social concern.
2. Students should have dedication to work at any remote place, anytime with available resources and proper time management for the other works.
3. Students should be ready to sacrifice some of the time and wishes to achieve service-oriented targets on time.

Corse Objectives: National Service Scheme (NSS) will enable the students to:

1. Understand the community in which they work
2. Identify the needs and problems of the community and involve them in problem-solving
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge infinding practical solutions to individual and community problems
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes
5. Develop capacity to meet emergencies and natural disasters & practice national integration andsocial harmony

Content **26 Hours**

1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.
2. Waste management– Public, Private and Govt organization, 5 R's.
3. Setting of the information imparting club for women leading to contribution in social and economic issues.
4. Water conservation techniques – Role of different stakeholders– Implementation.
5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.
6. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.
7. Developing Sustainable Water management system for rural areas and implementation approaches.
8. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath,Make in India, Mudra scheme, Skill development programs etc.
9. Spreading public awareness under rural outreach programs.(minimum5 programs).
10. Social connect and responsibilities.
11. Plantation and adoption of plants. Know your plants.

12. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).
13. Govt. school Rejuvenation and helping them to achieve good infrastructure.

AND

ONENSS – CAMP @ College /University /Stateor Central GovtLevel /NGO's /General Social Camps Students have to take up anyone activity on the above said topics and have to prepare content for awareness andtechnical contents for implementation of the projects and have to present strategies for implementation of the same. Compulsorily students have to attend one camp.

CIE will be evaluated based on their presentation, approach and implementation strategies.

IV SEMESTER
COURSE SYLLABUS

MATHEMATICAL FOUNDATIONS FOR COMPUTING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSM41	2:2:0:0	03	CIE:50 SEE:50	03 Hours	BSC

Course Objectives:

The goal of the course Mathematical Foundations for Computing- 21CSM 41 is to

- Understand an intense foundational introduction to fundamental concepts in discretemathematics.
- Interpret, identify, and solve the language associated with logical structure, sets, relations and functions, modular arithmetic.
- Have insight into Statistical methods, Correlation and regression analysis. Fitting of curves.
- To develop probability distribution of discrete and continuous random variables, Joint probability distribution occurs in digital signal processing, design engineering and microwave engineering.
- To understand the concept of sampling and inference.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students theoretical and applied mathematical skills
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
    - As an introduction to new topics (pre-lecture activity).
    - As a revision of topics (post-lecture activity).
    - As additional examples (post-lecture activity).
    - As an additional material of challenging topics (pre-and post-lecture activity).
    - As a model solution of some exercises (post-lecture activity).

Module-I

Fundamentals of Logic: Basic connectives and truth tables, Logical equivalence – The laws ofLogic, Logical implication – Rules of Inference. Fundamentals of Logic contd.: The Use of Quantifiers- Quantifiers, Definitions, and the Proofs of Theorems.

08 Hours

Self-study: Problems on Logical equivalence. **(RBT Levels: L1, L2 andL3)**

Module-II

Relations and Functions: Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. Function Composition, and Inverse Functions.

Relations: Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions.

Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits.

08 Hours

Self-study: The Pigeon-hole Principle, problems and its applications **(RBT Levels: L1, L2 and L3)**

Module-III

Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form-

$y = ax + b$, $y = ax^b$, $= ax^2 + bx + c$.

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems.

08 Hours

Self-study: Fitting of the curve $y = ax^b$. Angle between two regression lines, problems.**(RBT Levels: L1, L2 and L3)**

Module-IV

Probability Distribution.: Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples.

08 Hours

Self-study: exponential distribution. **(RBT Levels: L1, L2 and L3)**

Module-V

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation.

Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit.

08 Hours

Self-Study: Point estimation and interval estimation **(RBT Levels: L1, L2 and L3)**

Teaching-Learning Process for allmodules: Chalk and Talk/PowerPoint presentation/YouTubevideos.

Course Outcomes:

After successfully completing the course, the students will be able to:

CO1: Apply the concepts of logic for effective computation and relating problems in the Engineering domain.

CO2: Analyse the concepts of functions and relations to various fields of Engineering. Comprehend the concepts of Graph Theory for various applications of Computational sciences.

CO3: Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.

CO4: Apply discrete and continuous probability distributions in analyzing the probability models arising in the engineering field.

CO5: Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

Textbooks:

1. **Ralph P. Grimaldi and B V Ramana**: Discrete and Combinatorial Mathematics- An Applied Introduction, Pearson Education, Asia, Fifth edition – 2007. ISBN 978-81-7758-424-0.
   Text 1: 2.1, 2.2, 2.3, 2.4, .5 Text1: 5.1, 5.2, 5.3, 5.6, 7.1, 7.2, 7.3,7.4, 11.1, 11.2, 11.3
   Text 1: 24.1, 24.4, 24.5, 24.6, 25.12, 25.13, 25.14, 25.16
   Text 1: 26.1, 26.2, 26.7, 26.8, 26.9, 26.10, 26.13, 26.14, 26.15, 26.16
   Text 1: 27.1, 27.2, 27.3, 27.4 27.5, 27.6, 27.7, 27.9, 27.10, 27.11, 27.12, 27.13, 27.14, 27.15,27.16,27.17, 27.18. Text 3: 5.6, 5.7
2. **B. S. Grewal:** Higher Engineering Mathematics B. S. Grewal Khanna Publishers 44th Edition,2017.
3. **Seymour Lipschitz and Marc Lars Lipson:** –Probability‖, (Chapters: 5 and 8), McGraw Hill Education (India) Private Limited, Chennai, Special Indian Edition, 2010,

Reference Books:

1. **Kenneth H. Rosen**: Discrete Mathematics and its Applications, Tata – McGraw Hill, SixthEdition, Sixth reprint 2008. ISBN-(13):978-0-07-064824-1.
2. **C. L. Liu and D P Mohapatra:** Elementary Discrete Mathematics, Tata- McGraw Hill, SixthEdition, ISBN:10:0-07-066913-9.
3. **J.P. Tremblay and R. Manohar:** Discrete Mathematical Structures with Applications to Computer Science, Tata – McGraw Hill, 35TH reprint 2008. ISBN 13:978-0-07- 463113-3.
4. **C. Ray Wylie, Louis C. Barrett:** –Advanced Engineering Mathematics‖ McGraw – Hill 6th Edition 1995.
5. **B. V. Ramana**: Higher Engineering Mathematics, McGraw-Hill 11th Edition,2010
6. **N. P. Bali and Manish Goyal:** A Text-Book of Engineering Mathematics, LaxmiPublications2014

7. **Chandrika Prasad and Reena Garg:** Advanced Engineering Mathematics, KhannaPublishing, 2018

E-Resources:

List of NPTEL videos for various topics of Discrete Mathematical Structures

https://www.youtube.com/watch?v=9AUCdsmBGmA&list=PL0862D1A947252D20&index=10

https://www.youtube.com/watch?v=oU60TuGHxe0&list=PL0862D1A947252D20&index=11

https://www.youtube.com/watch?v=_BIKq9Xo_5A&list=PL0862D1A947252D20&index=13

https://www.youtube.com/watch?v=RMLR2JHHeWo&list=PL0862D1A947252D20&index=14

https://www.youtube.com/watch?v=nf9e0_ylGdc&list=PL0862D1A947252D20&index=15

https://www.youtube.com/watch?v=7cTWea9YAJE&list=PL0862D1A947252D20&index=24

https://www.youtube.com/watch?v=695iAm935cY&list=PL0862D1A947252D20&index=25

https://www.youtube.com/watch?v=ZECJHfsf4Vs&list=PL0862D1A947252D20&index=26

https://www.youtube.com/watch?v=Dsi7x-A89Mw&list=PL0862D1A947252D20&index=28

https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D20

https://www.youtube.com/watch?v=0uTE24o3q-o&list=PL0862D1A947252D20&index=2

https://www.youtube.com/watch?v=DmCltf8ypks&list=PL0862D1A947252D20&index=3

https://www.youtube.com/watch?v=jNeISigUCo0&list=PL0862D1A947252D20&index=4

http://nptel.ac.in/courses.php?disciplineID=111

http://www.class-central.com/subject/math(MOOCs) http://academicearth.org/ VTU EDUSAT PROGRAMME – 20

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

DESIGN AND ANALYSIS OF ALGORITHMS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSI42	3:0:2:0	04	CIE:50 SEE:50	03 Hours	IPCC

Prerequisites:

Data Structures, Algorithms, Algebra.

Course Learning Objectives:

- Explain the methods of analysing the algorithms and to analyze performance of algorithms.
- State algorithm ‘s efficiencies using asymptotic notations.
- Solve problems using algorithm design methods such as the brute force method, greedy method, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking and branch and bound.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Introduce P and NP classes.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students‘ Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
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.

Module-I

Introduction: What is an Algorithm? It‘s Properties. Algorithm Specification-using natural language, using Pseudo code convention, Fundamentals of Algorithmic Problem solving, Analysis Framework-Time efficiency and space efficiency, Worst-case, Best-case and Average case efficiency. **Performance Analysis**: Estimating Space complexity and Time complexity of algorithms. **Asymptotic Notations**: Big-Oh notation (O), Omega notation (Ω), Theta notation with examples, Basic efficiency classes, Mathematical analysis of

Non-Recursive and Recursive Algorithms with Examples.**Brute force design technique**: Selection sort, sequential search, string matching algorithm with complexity Analysis.

08 Hours

Module-II

Divide and Conquer: General method, Recurrence equation for divide and conquer, solving it using Master ‘s theorem., Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum, Binary search, Merge sort, Quick sort. **Decrease and Conquer Approach**: Introduction, Insertion sort, Graph searching algorithms, Topological Sorting. It‘s efficiency analysis.

08 Hours

Module-II

Greedy Method: General method, Knapsack Problem, solving Job sequencing with deadlines Problems. **Minimum cost spanning trees**: Prim‘s Algorithm, Kruskal‘s Algorithm with performance analysis. **Single source shortest paths**: Dijkstra's Algorithm. **Transform and Conquer Approach**: Introduction, Heaps and Heap Sort.

08 Hours

Module-IV

Dynamic Programming: General method with Examples, Multistage Graphs. **Transitive Closure**: Warshall‘s Algorithm. **All Pairs Shortest Paths**: Floyd's Algorithm, Travelling Sales man **Single source shortest paths**: Bellman-Ford Algorithm. **Space-Time Trade-offs**: Introduction, Sorting by Counting, Input Enhancement in String Matching- Harspool‘s algorithm.

08 Hours

Module-V

Backtracking: General method, solution using back tracking to N-Queens problem, Sum of subsets problem. **Branch and Bound**: Assignment Problem, 0/1 Knapsack problem **NP-Complete and NP-Hard problems**: Basic concepts, non- deterministic algorithms, P, NP,NP- Complete, and NP-Hard classes.

08 Hours

Teaching-Learning Process for all modules

1. Chalk & board, Active Learning, MOOC, Problem based Learning.
2. Laboratory Demonstration.

PRACTICAL COMPONENTS

1. Using the random number generator. Demonstrate using C/Java how the brute force method works along with its time complexity analysis: worst case, average case and best-case Sort a given set of n integer elements using selection sort method and compute its time complexity. Run the program for

varied values of n>100 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated.

2. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 100, and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/Java how the divide-and-conquer method works along with its time complexity analysis: worst case,
   average case and best case.
3. Write & Execute C/Java Program to solve Knapsack problem using Greedy method.
4. Write & Execute C/Java Program to find shortest paths to other vertices from a given vertex in a weighted connected graph, using Dijkstra's algorithm.
5. Write & Execute C/Java Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your
   program.
6. Write & Execute C/Java Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
7. Write C/ Java programs to Solve All-Pairs Shortest Paths problem using Floyd's algorithm.
8. Write C/ Java programs to Solve 0/1 Knapsack problem using Dynamic Programming method.
9. Design and implement C/Java Program to find a subset of a given set S = {Sl, S2,…, Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S = {1, 2, 5, 6, 8} and d= 9, there are two solutions {1, 2, 6} and {1, 8}. Display a suitable message, if the given problem instance doesn't have a solution.
10. Design and implement C/Java Program to implement N queens using backtracking principle.

Course Outcomes:

At the end of the course the student will be able to:

CO 1: Analyze the performance and efficiency of the algorithms using asymptotic notations and analyze mathematically the complexity of the algorithm.

CO 2: Apply and analyze divide and conquer approaches, decrease and conquer approaches in solving the problems

CO 3: Apply the appropriate algorithmic design technique: greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem.

CO 4: Utilize dynamic programming approache to solve problems and improve an algorithm time efficiency.

CO5: Design and develop solutions for backtracking problems, branch and bound methods and other NP problems.

Suggested Learning Resources:

Textbooks

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009. Pearson.

   Textbook 1: Chapter 1 (Sections 1.1,1.2), Chapter 2(Sections 2.1,2.2,2.3,2.4), Chapter 3(Section3.1,3.2) Chapter 4 (Sections 4.1,4.2,4.3), Chapter 5(Section 5.1,5.2,5.3) Chapter 9(Section 9.1,9.2,9.3,9.4), Chapter 6(section 6.4) Chapter 8(Sections 8.2,8.4), Chapter 7 (Sections 7.1,7.2) Chapter 12 (Sections 12.1,12.2) Chapter 11(11.3)
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
3. Chapter 1(section 1.1,1.2,1.3), Chapter 3(Sections 3.1,3.3,3.4,3.5,3.6) Chapter 5 (Sections 5.1,5.2,5.4,5.9) Chapter 7 (Sections 7.1,7.2,7.3,7.4,7.5) Chapter 11 (Section 11.1) Chapter 4(Sections 4.1,4.3,4.5)

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

Weblinks and Video Lectures (e-Resources):

1. http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html
2. https://nptel.ac.in/courses/106/101/106101060
   http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html
3. http://cse01-iiith.vlabs.ac.in/http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course= Intro To Algorithms

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

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

COMPUTER NETWORKS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSI43	3:0:2:0	04	CIE:50 SEE:50	03 Hours	IPCC

Course Objectives:

- Understand the networking fundamentals, with a specific focus on the physical layer aspects.

- Recognize the data link design issues and various data link protocols used for data transmission.
- Familiarize the design, working and implementation of Internet protocols as well as routing protocols responsible for network layer communication.
- Understand the concept of Remote Procedure Call(RPC)and its application in network environments.
- Explain the functionality and significance of name servers in the DNS infrastructure.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
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.

Module-I

Introduction and Physical Layer: Network hardware, Network software, Reference models -OSI, TCP/IP; Example networks –Internet; Wireless LANs - 802.11.

Physical Layer - Guided transmission media, Wireless transmission, Switching – Circuit switches, Packet switching. **08 Hours**

Module-II

Data Link Layer and Medium Access Control Sub Layer

Data Link Layer: Data link layer design issues, Error detection and correction - CRC, Hamming codes; Elementary data link protocols, Sliding window protocols.

Medium Access Control Sub layer: ALOHA, Carrier sense multiple access protocols, Collision free protocols, Ethernet.

08 Hours

Module-III

Network Layer: Network layer design issues, Routing algorithms - Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Broadcast routing, Multicast routing, Congestion control algorithms, Network layer in the internet - The IP version 4 protocol, IP addresses, IP version 6, Internet control protocols, OSPF, BGP.

08 Hours

Module-IV

Transport Layer: UDP–Segment header, Remote procedure call, Real-time transport protocols; TCP–service model, Protocol, Segment header, Connection establishment, Connection release, Sliding window, Timer management, Congestion control.

08 Hours

Module-V

Application Layer: Domain Name System (DNS) - Name space, Domain resource records, Name servers; Electronic mail - Architecture and services, User agent, Message formats, Message transfer, The World Wide Web - Architectural overview, HTTP, FTP.

08 Hours

Teaching-Learning Process Chalk & board, Active Learning, MOOC, Problem based learning.

Lab Programs

1. Study and submission of Report on Network Hardware Components, Network cables and Servers.
2. Implement the following data link layer framing methods Using Java.
   i. Character count
   ii. Character stuffing
   iii. Bit stuffing
3. Design and develop a Java program to compute checksum for the given frame 1101011011using CRC-12, CRC-16, and CRC-CCIP. Display the actual bit string transmitted. Suppose any bit is inverted during transmission. Show that this error is detected at the receiver's end.
4. Implement Dijkstra's algorithm to compute the shortest path from Source to Destination in the network using Java
5. Implementation of Basic Network Commands and Network Configuration Commands using Command Prompt.
6. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped using NS2.
7. Build a LAN with Hubs and Switches and perform Simulation of LAN using packet Tracer

8. Build a Multi-LAN with Router Configuration and perform Simulation of Multi-LAN using packet Tracer.
9. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion using NS2.
10. Implementation of RIP using Packet Tracer
11. Simulation of OSPF Protocol using Packet Tracer
12. Configure and simulation of a VLAN using Packet Tracer

Course outcome

At the end of the course the student will be able to:

CO1: Gain Knowledge on the principles and standards of Reference Models, types of network topologies, Functions of layers and protocols.

CO2: Analyze Sub netting and routing algorithms for finding optimal paths in networks.

CO3: Develop and Solve problems related to flow control, error control and congestion control in data transmission.

CO4: Simulate the Network Topologies using the Packet Tracer Tool to analyze packet Transmission.

CO5: Apply Ethical principles and standards for developing network-based solutions.

Suggested Learning Resources:

Text Books:

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, Pearson, 5th Edition,2015.Ch 3.1 to 3.4 , Ch 4.1 to 4.3, Ch 5.1 to 5.3 & 5.6, Ch 6.4 & 6.5,Ch 7.1 to 7.3

Reference Books:

1. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 5th Edition, 2013.James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson,7th Edition, 2017.

E-Resources:

1. https://archive.org/details/Data.Communications.and.Networking.5th.Edition

2. https://www.cisco.com/c/en/us/solutions/smallbusiness/resourcecenter/networking/networking-basics.html
3. http://ptgmedia.pearsoncmg.com/images/9780133814743/samplepages/9780133814743.pdf

OPERATING SYSTEMS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST44	2:2:0:0	03	CIE:50 SEE:50	03 Hours	PCC

Description of the course:
This course enable the students to learn concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security. The course will consist of assigned reading, weekly lectures, a CIE and SEE exam, and a sequence of programming assignments. The goal of the readings and lectures is to introduce the core concepts. The goal of the programming assignments is to give students some exposure to operating system code. Students are expected to read the assigned materials prior to each class, and to participate in in-class discussions.

Prerequisite:
Students must be aware of basic computer concepts like what is keyboard, mouse, monitor,input, output, primary memory and secondary memory etc. Students should have the knowledge of Digital logic and its design (Basics will make them understand storing memory and page faults, Difference between ram and rom. etc.). Computer Organization and Architecture (Design of Computer architecture will help you understand computer peripherals and its storages, accessing them in operating system.

Course Objectives:

This course will enable students to:

- Learn the basic concepts of operating system, services and Process Handling.
- Impart adequate knowledge on the need of parallel programming using multi-threadingconcepts.
- Identify and handling deadlocks.
- Enable effective usage of the memory management techniques.
- Know about various file systems and understand the working of Linux Platform.

Module – I

Introduction to Operating Systems, System Structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special- purpose systems; Computing environments.

Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

08 Hours

Module – II

Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication.

Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; threading issues. **Process Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple- processor scheduling; thread scheduling.

08 Hours

Module – III

Deadlocks: Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

08 Hours

Module – IV

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing**.**

08 Hours

Module – V

File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.

08 Hours

Course Outcomes:

On completion of this course, the students will be able to:

CO1: Demonstrate functional architecture of an operating system.

CO2: Describe process scheduling and Multithreading Concepts.

CO3: Use suitable techniques for handling the deadlocks.

CO4: Apply various memory management techniques.

CO5: Realize the different concepts of OS in platform of usage through case studies.

Textbooks:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Concepts” 9th edition, Wiley-India, 2016**.** ISBN-13: 978-8126554270.

Reference Books:

1. Andrew S. Tanenbaum, Herbert Bos, "Modern Operating Systems " , 4th edition, Pearson, India, 2014. ISBN-13: 978-0133591620.
2. D.M Dhamdhere, “Operating Systems: A Concept Based Approach “, 3rd Ed, McGraw-Hill, 2013.ISBN: 9781259005589.

E-Resources:

1. https://www.tutorialspoint.com/operating_system/index.htm.
2. https://www.studytonight.com/operating-system/.

BIOLOGY FOR ENGINEERS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21BET45	2:0:0:0	02	CIE:50 SEE:50	02 Hours	AEC

Course Objectives:

This course will enable students to

- Understand Why Should Engineers Know Biology
- Analyze the Chemical Composition of Living Forms
- Explain the Human organ systems and bio-designs
- Analyze the nature-bioinspired materials and mechanisms
- Evolution and trends in bioengineering

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Explanation via real life problem, situation modelling, and deliberation of solutions, hands-on sessions, reflective and questioning /inquiry-based teaching.
2. Instructions with interactions in classroom lectures (physical/hybrid).
3. Use of ICT tools, including YouTube videos, related MOOCs, AR/VR/MR tools.
4. Flipped classroom sessions (~10% of the classes).
5. Industrial visits, Guests talks, and competitions for learning beyond the syllabus.
6. Students' participation through audio-video-based content creation for the syllabus (as assignments).
7. Students' seminars (in solo or group) /oral presentations.

Module-I

Science and Engineering Why Should Engineers Know Biology? Introduction Need for Biology

Biomolecules and their applications (Qualitative):

Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents)

05 Hours

Module-II

Human organ systems and bio designs - 1 (Qualitative):

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye).Heart as a pump system (architecture,

electrical signaling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators)

05 Hours

Module-III

Human organ systems and bio-designs - 2 (Qualitative):

Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems). Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis).

05 Hours

Module-IV

Nature-bioinspired materials and mechanisms (Qualitative):

Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swimsuits), Kingfisher beak (Bullet train). Human Blood substitutes -hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs).

05 Hours

Module-V

Trends in bioengineering (Qualitative):

Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Self- healing Bio concrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).

06 Hours

Teaching-Learning Process for all modules

Chalk and Talk, Power point presentation, flip teaching, YouTube videos

Course Outcomes:

At the end of the course the student will be able to:

CO1: Understand Why Should Engineers Know Biology

CO2: Analyze the Chemical Composition of Living Forms

CO3: Explain the Human organ systems and bio designs

CO4: Analyze the Nature-bioinspired materials and mechanisms

CO5: Analyze the evolution and trends in bioengineering

Web links and Video Lectures (e-Resources):

- VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
- https://nptel.ac.in/courses/121106008
- https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
- https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009
- https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
- https://www.coursera.org/courses?query=biology
- https://onlinecourses.nptel.ac.in/noc19_ge31/preview
- https://www.classcentral.com/subject/biology
- https://www.futurelearn.com/courses/biology-basic-concepts

Suggested Learning Resources:

•Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022

•Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.

•Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

•Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.

•Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.

•Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.

•Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.

•Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.

•3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Group Discussion of Case studies
- Model Making and seminar/poster presentations.
- Design of novel device/equipment like Cellulose-based water filters, Filtration system mimicking the kidney, Bioremediation unit for E-waste management, AI and ML based Bioimaging.

PYTHON PROGRAMMING LABORATORY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL46	0:0:2:0	01	CIE:50 SEE:50	03 Hours	PCC

Course Objectives:

- Demonstrate the use of IDLE, Jupiter notebook or PyCharm IDE to create PythonApplications
- Using Python programming language to develop programs for solving real-world problems
- Implement the Object-Oriented Programming concepts in Python.
- Appraise the need for working with various documents like Excel, PDF, Word and Others
- Demonstrate regular expression using python programming

Note: Two hours tutorial is suggested for each laboratory sessions.

Prerequisite

- Students should be familiarized about Python installation and setting Python environment
- Usage of IDLE, Jupiter note book or IDE like PyCharm should be introduced Python
- Installation: https://www.youtube.com/watch?v=Kn1HF3oD19c PyCharm
- Installation: https://www.youtube.com/watch?v=SZUNUB6nz3g

PART- A

List of problems for which student should develop program andexecute in the Laboratory

1. Introduce the Python fundamentals, data types, operators, flow control andexception handling in Python
   a. Students test marks for each course is considered as the best of two test averagemarks out of three test's marks, implement a python program to find the test average marks, take input from the user.
   b. Implement a Python program to check whether a given number is palindrome or not andalso count the number of occurrences of each digit in the input number.

   Data types: https://www.youtube.com/watch?v=gCCVsvgR2KU

   Operators:https://www.youtube.com/watch?v=v5MR5JnKcZI

   Flow Control: https://www.youtube.com/watch?v=PqFKRqpHrjw

   For loop: https://www.youtube.com/watch?v=0ZvaDa8eT5s

   While loop: https://www.youtube.com/watch?v=HZARImviDxg

   Exceptions: https://www.youtube.com/watch?v=6SPDvPK38tw
2. Demonstrating creation of functions, passing parameters and return values
   a. Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for (where N >0) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed.
   b. Demonstrate how to implement a python program to convert binary to decimal, octal to hexadecimal

using functions.

Functions: https://www.youtube.com/watch?v=BVfCWuca9nw

Arguments:https://www.youtube.com/watch?v=ijXMGpoMkhQ

Return value: https://www.youtube.com/watch?v=nuNXiEDnM44

3. Demonstration of manipulation of strings using string methods
   a. When an interpreter reads a line/ sentence from user, find the number of words, digits, uppercase letters and lowercase letters in that sentence; demonstrate with thehelp of python programming.
   b. Let us take two strings compare and find the string similarity between two givenstrings with the help of python programming.

Sample Output:	**Sample Output:**
Original string:	Original string:
Python Exercises	Python Exercises
Python Exercises	Python Exercise
Similarity between two said strings:	Similarity between two said strings:1.0
0.967741935483871	

Strings: https://www.youtube.com/watch?v=lSItwlnF0eU

String functions: https://www.youtube.com/watch?v=9a3CxJyTq00

4. Discuss different collections like list, tuple and dictionary
   a. User enters a list of random numbers, the programmer need to arrange these random numbers in ascending order with sorting techniques such as insertion sort and mergesort using lists in python.
   b. Demonstrate with a python program to convert roman numbers into integer values using dictionaries, by taking inputs from user.

Lists: https://www.youtube.com/watch?v=Eaz5e6M8tL4

List methods: https://www.youtube.com/watch?v=8-RDVWGktuI

Tuples:https://www.youtube.com/watch?v=bdS4dHIJGBc

Tuple operations: https://www.youtube.com/watch?v=TItKabcTTQ4

Dictionary: https://www.youtube.com/watch?v=4Q0pW8XBOkc

Dictionary methods:https://www.youtube.com/watch?v=oLeNHuORpNY

5. Demonstration of pattern recognition with and without using regular expressions
   a. Implement a function called isphonenumber () to recognize a pattern 415-555-4242 without using regular expression and also write the code to recognize the same pattern using regular expression.
   b. Develop a python program that could search the text in a file for phone numbers (+919900889977) and email addresses (sample@gmail.com)

Regular expressions: https://www.youtube.com/watch?v=LnzFnZfHLS4

6. Demonstration of reading, writing and organizing files.
   a. Demonstrate how files are read in python by considering **myfile.txt** as an examplefile name which is entered by the user to perform the following operations.
   I. Display the first N line of the file
   II. Find the frequency of occurrence of the word accepted from the user in the file
   b. Python is termed as secure language; demonstrate a simple method of securing data bycreating a ZIP file of a folder which contains several files inside it.

   Files:https://www.youtube.com/watch?v=vuyb7CxZgbU
   https://www.youtube.com/watch?v=FqcjKewJTQ0

   File organization: https://www.youtube.com/watch?v=MRuq3SRXses
7. Demonstration of the concepts of classes, methods, objects and inheritance
   a. Inheritance is one of the main pillars of OOPs concept. By using inheritance, a child class acquires all properties and behaviors of parent class. Referring the above inheritance concept write a python program to find the area of triangle, circle and rectangle.
   b. Implement a python program by creating a class called Employee to store the details of Name, Employee_ID, Department and Salary, and implement a method to update salary of employees belonging to a given department.

   OOP'sconcepts: https://www.youtube.com/watch?v=qiSCMNBIP2g

   Inheritance: https://www.youtube.com/watch?v=Cn7AkDb4pIU
8. Demonstration of classes and methods with polymorphism and overriding
   a. Inheritance applies to classes, whereas polymorphism applies to methods, using these concepts implement a python program to find whether the given input is palindrome or not (for both string and integer).
   b. Overriding: https://www.youtube.com/watch?v=CcTzTuIsoFk
9. Demonstration of working with excel spreadsheets and web scraping
   a. XKCD is a webcomic website consists of many curious comics and sometimes user wants to save that comic image on their local devices, a user has to visit every page of the comic website. instead implement a python program to download the all XKCD comics.
   b. In python programming how to read the data from the spreadsheet and write the data in to the spread sheet, by using the load workbook() method, demonstrate with code snippet.

   Web scraping: https://www.youtube.com/watch?v=ng2o98k983k

   Excel: https://www.youtube.com/watch?v=nsKNPHJ9iPc

10. Demonstration of working with PDF, word and JSON files
    a. Demonstrate with a python program the possible ways to combine select pages from many PDFs.
    b. Accessing current weather data for any location on Earth, we collect and process weather data from different sources such as global and local weather models, satellites, radars and a vast network of weather stations and in different format. Implement a python program to fetch current weather data from the JSON file format.

PDFs:https://www.youtube.com/watch?v=q70xzDG6nls
https://www.youtube.com/watch?v=JhQVD7Y1bsA
https://www.youtube.com/watch?v=FcrW-ESdY-A
Word files: https://www.youtube.com/watch?v=ZU3cSl51jWE JSON files: https://www.youtube.com/watch?v=9N6a-VLBa2I
Python (Full Course): https://www.youtube.com/watch?v=_uQrJ0TkZlc
Pedagogy: For the above experiments the following pedagogy can be considered. Problem based learning, Active learning, MOOC, Chalk &Talk

PART -B

Practical Based Learning

A problem statement for each batch is to be generated in consultation with the co-examiner andstudent should develop an algorithm, program and execute the program for the given problem with appropriate outputs.

Course Outcomes:

CO1: Demonstrate proficiency in handling of loops and creation of functions.
CO2: Identify the methods to create and manipulate lists, tuples and dictionaries.
CO3: Discover the commonly used operations involving regular expressions and file system.
CO4: Interpret the concepts of Object-Oriented Programming as used in Python.
CO5: Determine the need for scraping websites and working with PDF, JSON and other file formats.

Text Books:

1. Al Sweigart, **"Automate the Boring Stuff with Python",**1stEdition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)
2. Reema Thareja **–Python Programming Using Problem Solving Approach‖** Oxford University Press.
3. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition,Green Tea Press,2015.(Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf)

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type

21CIP47	**1:0:0:0**	**01**	**CIE:50 SEE:50**	**01 Hours**	**HSMC**

Course objectives:

This course will enable the students

- To know the fundamental political structure & codes, procedures, powers, and duties ofIndian government institutions, fundamental rights, directive principles, and the duties of citizens.
- To understand engineering ethics and their responsibilities, identify their individual roles and their responsibilities towards society.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

- Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological toolsand software's to meet the present requirements of the Global employment market.
  i. Direct instructional method (Low /Old Technology),
  ii. Flipped classrooms (High/advanced Technological tools),
  iii. Blended learning (combination of both),
  iv. Enquiry and evaluation-based learning,
  v. Personalized learning,
  vi. Problems based learning through discussion,
  vii. Following the method of expeditionary learning Tools and techniques
- Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can enhance thestudents in theoretical applied and practical skills in teaching of 21CIP39/49 in general.

Module - I

Introduction to Indian Constitution: Definition of Constitution, Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making ofthe Constitution, Role of the Constituent Assembly. Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.

04 Hours

Module – II

Fundamental Rights (FR's), Directive Principles of State Policy (DPSP's) and Fundamental Duties (FD's): Fundamental Rights and its Restriction and limitations in different Complex Situations. DPSP's and its

present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation building.

04 Hours

Module – III

Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

04 Hours

Module – IV

State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (Why and How) and Important Constitutional Amendments till today. Emergency Provisions.

04 Hours

Module – V

Professional Ethics: Definition of Ethics & Values. Professional & Engineering Ethics. Positive and Negative aspects of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Professional Risks, Professional Safety and liability in Engineering. Trust & Reliability in Engineering, Intellectual Property Rights (IPR's).

04 Hours

Teaching Learning Process Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, giving activities and assignments (Connecting Campus & community with administration real time situations).

Course outcome (Course Skill Set)

At the end of the course the student should:

CO 1: Understand the meaning and importance of Constitution.

CO 2: State executives, Electoral process, Amendments.

CO 3: Analyse Panchayat Raj institutions as a medium of decentralization

CO 4: Realize special provisions given for women, children and weaker section of the society.

CO 5: Exhibit engineering ethics and responsibilities of engineers.

Textbook:

1. **"Constitution of India & Professional Ethics"** Published by Prasaranga or published on VTUwebsite with the consent of the university authorities VTU Belagavi.

WEB PROGRAMMING LABORATORY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL481	0:0:2:0	01	CIE:50 SEE:50	02 Hours	AEC

Course Objectives:

- Recollect the evolution of World Wide Web and its relevance to today's technological Revolution and also, to comprehend HTML, CSS scripts to design web layouts.
- Acquire Java Script skills for developing client-side web applications.
- Interpret the use of j Query libraries to simplify complicated JavaScript applications and, to Perform DOM manipulation using j Query constructs.
- Cognize Bootstrap framework with a focus on creating interactive and responsive web pages Faster and easier.
- Assimilate XML fundamentals for developing applications over web.

Note: Two hours tutorial is suggested for each laboratory sessions.

Prerequisite: Students Should have good knowledge in Java Programming.

Students Should have knowledge on Database and SQL queries, connectivity of front end and back end

PART -A

List of problems for which student should develop program and execute in the Laboratory

1. Introduction to the use of HTML tags

   Write a HTML script to display employee details like name, address, mobile number, email id etc similar to a telephone directory
2. To develop web layouts with lists Program:

   Write a HTML program to display a nested list to list down all the elements serviced by an event management company. The list should be a nested list with main events and sub events
3. To develop web layouts with style sheets and web screens in a presentable form Program:

   Write a HTML and CSS script to create a webpage with table structure containing alternative backgrounds using class selector functionalities
4. Develop web layouts with style sheets and web screens in a presentable form

   Write a HTML and CSS program to design the cover page which displays the events taking place in and around the state.
5. Use of jQuery libraries to simplify complicated JavaScript applications Program:

   Write a HTML and javascript program to implement a simple banking application using SQL database. The application should provide features like withdraw, deposit, balance enquiry etc.
6. Use of jQuery libraries to simplify complicated JavaScript applications Program:

   Write a HTML and JavaScript program to create a registration page having fields name, username, email Id, password & re-enter password and apply validation using match & equal functions
7. Use of jQuery libraries to simplify complicated JavaScript applications

Write a HTML and jQuery program to create a webpage to fetch the details of the event and display the invitation

8. Use of jQuery libraries to simplify complicated JavaScript applications Program:
   Write a HTML and jQuery program to design a webpage to accept event organizer name from the user and display it on the webpage.
9. Use of jQuery libraries to simplify complicated JavaScript applications Program:
   Write a HTML and jQuery program to design a webpage to accept event organizer name from the user and display it on the webpage.
10. Use Bootstrap framework to create interactive and responsive web pages Program:
    Write a HTML and bootstrap program to display glyphicons like envelop, print, search etc..Also create buttons having glyphicons as links to carry out specific tasks.
11. Introduction to XML Program:
    Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
12. Mini project Develop a web application project using the languages and concepts learnt. You can use any web technologies and frameworks and databases.

Course Outcomes:

CO1: Adapt HTML and CSS syntax and semantics to build web pages and construct and visuall format tables and forms using HTML and CSS.

CO2: Develop Client side web applications using java scripts

CO3: Use jQuery constructs for DOM manipulation

CO4: Create interactive and responsive web pages faster using Bootstrap framework

CO5: Develop applications over the web using XML fundamentals

UNIX AND SHELL PROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL482	0:0:2:0	01	CIE:50 SEE:50	02 Hours	AEC

Course Objectives:

This course will enable students to**,**

- Understand effective use of Unix concepts, commands and terminology.
- Identify, access, and evaluate UNIX file system.
- Understand UNIX command syntax and semantics.
- Read and understand specifications, scripts and programs.
- Analyze Facility with UNIX Process.

Introduction to Shell scripting:

- Use of Basic UNIX Shell Commands and options related to them:vi, ls, mkdir, rmdir, cd, cat, touch, file, wc, sort, cut, who, man etc.
- Commands related to inode, I/O redirection and piping.
- Shell Programming: Shell script exercises based on following:

  (i) Interactive shell scripts

  (ii) Positional parameters

  (iii) Arithmetic

  (iv) if-then-fi, if-then- else-fi, nested if-else

  (v) Logical operators

  (vi) else + if equals elif, case structure

  (vii) while, until, for loops, use of break

Laboratory Programs:

1. Write a shell script to check whether the entered username and password is valid or not.
2. Write a shell script to add, subtract, multiply, divide two numbers and add two strings.
3. Write a shell script that accepts two file names as arguments and checks the permissions of these files are similar or different.
4. Write a shell program to perform convert lowercase to uppercase using tr statement.
5. Write a non-recursive shell script that accepts any number of arguments and prints them in a reverse order.
6. Write a shell script to check the given file is a directory or not.
7. Write a shell script to compute GCD & LCM of two numbers.
8. Write a shell script to find whether a given number is prime.
9. Write a shell script to check whether the given year is Leap year or not.
10. Write a shell script to check whether the given string is Palindrome or not.

Course Outcomes:

At the end of course students will be able to:

CO1: Know the basics of Unix concepts and commands.

CO2: Evaluate the UNIX file system.

CO3: Apply Changes in file system.

CO4: Write scripts and programs.

CO5: Analyze Facility with UNIX system process.

Text Book:

1. Sumitabha Das: "UNIX – Concepts and Applications", Tata McGraw Hill, Noida, 4th Edition, 15th Reprint, 2011, ISBN-13: 978-0-07-063546-3.

Reference Books:

1. Behrouz A. Forouzan and Richard F. Gilberg: "UNIX and Shell programming", Cengage Learning, India, 1st Edition, 2005, ISBN: 81-35-0325-9.
2. M G Venkatesh Murthy: "UNIX and Shell programming", Pearson Education, Delhi, 1st Edition, 2005, ISBN: 81-7758-745-5.

E-Resources:

1. http://www.mhhe.com/das/uca
2. http://www.tutorialspoint.com/unix/unix_tutorials.pdf.
3. http://www.perldoc.perl.org/

R PROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS483	1:0:0:0	01	CIE:50 SEE:50	01 Hours	AEC

Course Objectives:

- Understanding and being able to use basic programming concepts
- Automate data analysis
- Working collaboratively and openly on code
- Knowing how to generate dynamic documents
- To use continuous approach.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic 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.

Module I

Introduction: Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators,Integers, Factors, Logical operations.

03 Hours

Module II

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the

Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

03 Hours

Module III

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, DATA FRAMES, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations.

03 Hours

Module IV

FACTORS AND TABLES, Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables, Extracting a Subtable, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

03 Hours

Module V

Data Visualization using R: Scatter Plots - Box Plots - Scatter Plots and Box-and-Whisker Plots Together - Customize plot axes, labels, add legends, and add colours

03 Hours

Lab Program:

1. Download and install R-Programming environment and install basic packages using install.Packages () command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.).
3. Write a program to find list of even numbers from 1 to n using R-Loops.
4. Create a function to print squares of numbers in sequence.
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Create a data set and do statistical analysis on the data using R.
11. Construct a 3D scatter plot for the data to include two additional columns: names and gender and a function to load the data in the active session and save it as a data frame.
12. Implement the fan plot for the dataset data = c (179718,41370,41914,44280) and assign a set of colors

to a variable and call it colors.

13. Project the 3D histogram with the z variable as well by generating the data for the x and y values using the seq() function: x = y = seq(-4,4,by =0.5)

Course Outcomes:

At the end of the course the student will be able to:

CO1: Understand basics and different data sets using R programming

CO2: Construct or plot graphs and charts

CO3: Analyse the data and know descriptive statistics by using R Programming

CO4: Develop programming logic using R – Packages.

CO5: Predict the data and take decisions through R programming.

Text Books:

1. Crawley, M. J. (2006), ‐Statistics - An introduction using R‖, John Wiley, London 32.
2. Purohit, S.G.; Gore, S.D. and Deshmukh, S.R. (2015), ‐Statistics using R‖, second edition. Narosa Publishing House, New Delhi.
3. Shahababa B. (2011) , ‐Biostatistics with R‖, Springer, New York.
4. Braun & Murdoch (2007), ‐A first course in statistical programming with R‖, Cambridge University Press, New Delhi.

E- Resources:

1. https://cran.r-project.org/doc/contrib/Owen-TheRGuide.pdf
2. https://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/R/R-Manual/R-Manual2.html
3. https://smac-group.github.io/ds/ 4.
4. https://www.geeksforgeeks.org/predictive-analysis-in r programming

UNIVERSAL HUMAN VALUES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21UHV49	1:0:0:0	01	CIE:50 SEE:50	01 Hours	UHV

Course objectives:

This introductory course input is intended:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
- This course is intended to provide a `much-needed orientational input in value education to the young enquiring minds.

Teaching-Learning Process (General Instructions)

The methodology of this course is exploration and thus universally adaptable. It involves asystematic and rational study of the human being vis-à-vis the rest of existence.

1. The course is in the form of 20 lectures (discussions)
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify
4. It is their own right, based on their Natural Acceptance and subsequent Experiential Validation the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self- evolution.
6. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

Module-I

Introduction to Value Education:

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations **04 Hours**

Module-II

Harmony in the Human Being

Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health

04 Hours

Module-III

Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order

04 Hours

Module-IV

Harmony in the Nature/Existence

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

04 Hours

Module-V

Implications of the Holistic Understanding – a Look at Professional Ethics

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

04 Hours

Teaching- Learning Process: Introduction to the concepts- Chalk and talk method, Discussion, Sharing of experiences, Live Examples and videos

Course Outcome:

At the end of the course the student should:

CO1: By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling

problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO2: They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO3: It is hoped that they would be able to apply what they have learnt to their own self in different day-to-daysettings in real life, at least a beginning would be made in this direction.

Therefore, the course and further follow up is expected to positively impact common graduate attributes like:

a) Holistic vision of life
b) Socially responsible behaviour
c) Environmentally responsible work
d) Ethical human conduct
e) Having Competence and Capabilities for Maintaining Health and Hygiene
f) Appreciation and aspiration for excellence (merit) and gratitude for all

ADDITIONAL MATHEMATICS-II

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21MATDIP41	2:2:0:0	01	CIE:50 SEE:50	01 Hours	NCMC

(Common to all lateral entry students of all branches)

Course Objectives

The purpose of the course is to facilitate the students with concentrate foundation of ordinary, partial differential equations and numerical methods enabling them to acquire the knowledge ofthese mathematical tools.

Module – I

Differential equations-I

Solutions of ordinary differential equations of first order and first degree:-Bernoulli's equations, Exact differential equations. Introduction to general and singular solutions; Solvable for p only;Clairaut's and reducible to Clairaut's equation only**.**

04 Hours

Module – II

Differential equations-II

Linear differential equations with constant coefficients:- Solution of second and third order differential equations –By inverse differential operator method.

04 Hours

Module – III

Differential equations-III

Solution of second order linear differential equation with constant coefficients by using method of variation of parameter. Linear differential equation with variable coefficients: - Solution of Cauchy's and Legendre's Linear equations.

04 Hours

Module – IV

Partial Differential Equationls(PDE's):

Formation of PDE by eliminating the Arbitrary constants and arbitrary functions, solutions of non homogenous PDE by direct integration, and Method of separation of variables.

04 Hours

Module – V

Numerical methods:

Solution of polynomial and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae and Lagrange'sinterpolation formula (All formulae without proof). Problems.

04 Hours.

Course Outcomes:

On completion of this course, students will be able to:

CO1: Solve the ordinary differential equations as applied to various engineering applications.

CO2: Find the solution of the higher order linear differential equations.

CO3: Determine the solution of linear differential equations with variable coefficients.

CO4: Form and solve the partial differential equations with different methods.

V SEMESTER
COURSE SYLLABUS

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST51	3:0:0:0	03	CIE:50 SEE:50	03 Hours	HSMC

Prerequisites: Software Development Life Cycle (SDLC), Scripting Language, Version Control Tool, Database

Course Learning Objectives

- Outline software engineering principles and activities involved in building large softwareprograms. Identify ethical and professional issues and explain why they are of concern to Software Engineers.
- Describe the process of requirement gathering, requirement classification, requirementspecification and requirements validation.
- Infer the fundamentals of object-oriented concepts, differentiate system models, use UMLdiagrams and apply design patterns.
- Explain the role of DevOps in Agile Implementation.
- Discuss various types of software testing practices and software evolution processes.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various courseoutcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternativeeffective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotescritical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students, Analytical skills,develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic andencourage th
8. students to come up with their own creative ways to solve them.
9. 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: The evolving role of software, The changing nature of software, Software engineering, A Process Framework, Process Patterns, Process Assessment, Personal and Team Process Models, Process Technology, Product and Process.

Process Models: Prescriptive models, Waterfall model, Incremental process models, Evolutionary process models, specialized process models.

08 Hours

Module - II

Introduction, Modeling Concepts and Class Modeling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling, abstraction, the three models. Class Modelling: Object and Class Concept, Link and associations concepts, Generalization and Inheritance.

Building the Analysis Models: A sample class model, Navigation of class models, Introduction to RUP and UML diagrams Requirement Analysis, Analysis Model Approaches, Data modeling Concepts,

08 Hours

Module – III

Software Testing: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging.

Agile Methodology & DevOps: Before Agile – Waterfall, Agile Development,

Self-Learning Section: What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOpsLifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools?, Challenges with DevOps Implementation.

08 Hours

Module – IV

Introduction to Project Management: Introduction, Project and Importance of Project Management, Contract Management, Activities Coveredby Software Project Management, Plans, Methods and Methodologies, some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle,

08 Hours

Module – V

Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and SchedulingActivities, Network Planning Models, Forward Pass– Backward Pass

Software Quality: Introduction, The place of software quality in project planning, Importance of software quality, software Quality models, ISO 9126, quality management systems, process capability models, techniques toenhance software quality, quality plans.

08 Hours

Teaching-Learning Process Chalk and board, Active Learning, Demonstration

Course Outcomes

At the end of the course the student will be able to:

CO1: Understand the activities involved in software engineering and analyze the role of variousprocess models

CO2: Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques

CO3: Describe various software testing methods and to understand the importance of agile methodology and DevOps

CO4: Illustrate the role of project planning and quality management in software development.

CO5: Understand the importance of activity planning and different planning models

Text Books:

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, TataMcGraw Hill. Chapter 1: 1.1 to 1.3, Chapter 2: 2.1, 2.2, 2.4 to 2.7, Chapter 8: 8.1 to 8.8, Chapter 13: 13.1 to 13.7
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2ndEdition, Pearson Education, 2005. Chapter 1,2,3,
3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGrawHill Education, 2018.
   Chapter 1: 1.1 to 1.17, Chapter 6: 6.1 to 6.16,Chapter 13: (13.1 to 13.6, 13.9, 13.11, 13.14)
4. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner ‘s Viewpoint, Wiley.
   Chapter 2: 2.1 to 2.
   Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

Reference Books:

1. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nr- ggx7Pt1G4UAHeFlJ
3. http://elearning.vtu.ac.in/econtent/CSE.php
4. http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html
5. https://nptel.ac.in/courses/128/106/128106012/ (DevOps)

DATA BASE MANAGEMENT SYSTEMS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSI52	3:0:2:0	04	CIE:50 SEE:50	03 Hours	IPCC

Course Learning Objectives

- Provide a strong foundation in database concepts, technology, and practice.

- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems.
- Understand the implementation of NoSQL using MongoDB.

Module-I

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications.

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, Examples

08 Hours

Teaching Methods: Blackboard teaching, PowerPoint presentations (if needed), Programming Assignments using SQL

Module-II

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.

Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.

Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.

08 Hours

Module-III

SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL.

Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL.

Database

Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop.

08 Hours

Module-IV

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms

based on Primary Keys, Second and Third Normal Forms, Boyce- Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Examples on normal forms.

Normalization Algorithms: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms **08 Hours**

Module-V

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions.

Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering.

Introduction to MongoDB: Introduction, Getting started; Creating, Updating and Deleting Documents; Querying

08 Hours

Lab Programs:

Aim: Demonstrating creation of tables, applying the view concepts on the tables.

Program 1: Consider the following schema for a Library Database:

BOOK(Book_id,Title,Publisher_Name,Pub_Year)BOOK_AUTHORS(Book_id,Author_Name) PUBLISHER(Name,Address,Phone)BOOK_COPIES(Book_id,Programme_id,No.of_Copies)BOOK_LENDING(Book_id,Programme_id,Card_No,Date_Out,Due_Date)LIBRARY_PROGRAMME(Programme_id,Programme_Name, Address)

Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.
2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. C reate a view of all books and its number of copies that are currently available in the library.

02 Hours

Teaching Methods: Blackboard teaching, PowerPoint presentations (if needed), Programming Assignments using SQL

Aim: Discuss the various concepts on constraints and update operations.

Program 2: Consider the following schema for Order Database:

SALESMAN (Salesman_id, Name, City, Commission) CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)

1. Write SQL queries to
2. Count the customers with grades above Bangalore's average.
3. Find the name and numbers of all salesman who had more than one customer.
4. List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.)
5. Create a view that finds the salesman who has the customer with the highest order of a day.
6. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

02 Hours

Teaching Methods: Blackboard teaching, PowerPoint presentations (if needed), Programming Assignments using SQL

Aim: Demonstrate the concepts of JOIN operations.

Program 3: Consider the schema for Movie Database:

ACTOR(Act_id, Act_Name, Act_Gender) DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(Act_id, Mov_id, Role)

RATING (Mov_id, Rev_Stars)

Write SQL queries to

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after 2015(use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

02 Hours

Teaching Methods : Blackboard teaching, PowerPoint presentations (if needed), Programming Assignments using SQL

Aim: Introduce concepts of PLSQL and usage on the table.

Program 4: Consider the schema for College Database:

STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID)

COURSE(Subcode, Title, Sem, Credits)

IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to

List all the student details studying in fourth semester 'C' section.

1. Compute the total number of male and female students in each semester and in each section.
2. Create a view of Test1 marks of student USN '1NC20IS101' in all Courses.
3. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
4. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding'

If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak'

Give these details only for 5th semester A, B, and C section students. **02 Hours**

Teaching Methods: Blackboard teaching, PowerPoint presentations (if needed), Programming Assignments using SQL.

Aim: Demonstrate the core concepts on table like nested and correlated nesting queries and also EXISTS and NOT EXISTS keywords.

Program 5: Consider the schema for Company Database:

EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)

DEPARTMENT(DNo, DName,MgrSSN, MgrStartDate)

DLOCATION(DNo,DLoc)

PROJECT (PNo, PName, PLocation, DNo) WORKS_ON(SSN, PNo,Hours)

Write SQL queries to

1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs.6,00,000.

02 Hours

Course Outcomes:

At the end of the course students will be able to

CO1: Understand the essentials of DBMS and its architectures, Design and model a real time Scenario using ER-Modeling.

CO2: Formulate and solve SQL queries.

CO3: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database. Using relational algebra

CO4: Familiarize the concept of storage management in DBMS and and indexing structure for files.

CO5: Illustrate the transaction management, concurrency control and database recovery and understand the use of NoSQL using MongoDB

Suggested Learning Resources:

Textbooks

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
   Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.7,Ch 5.1 to 5.3, 8.1 to 8.5, 9.1;Ch 6.1 to 6.5, 7.1 to 7.4; Textbook 2: 6.1 to 6.6;Ch 14.1 to -14.7, 15.1 to 15.6,Ch 20.1 to 20.6, 21.1 to 21.7; Ch1 to Ch4
2. MongoDB: The Definitive Guide, Second Edition, by Kristina Chodorow

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning Demonstration of real time Database projects - E-commerce Platform, Inventory Management ,Railway System, College Data Management, Library Data Management, Solution for Saving Student Records, Hospital Data Management, Blood Donation Management.

AUTOMATA THEORY AND COMPILER DESIGN

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST53	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PCC

Pre-Requisites: Discrete Mathematics, Graph Theory, Data structures, Algorithms.

Course Objectives:

The Student will:

- To Study abstract computing models
- Formalization of the notion of problems via formal languages

- To learn Grammar and Turing Machine
- To learn about the theory of computability and complexity
- Understanding a hierarchy of classes of problems or formal languages

Module I

Formal Language Theory and Finite Automata: Introduction to Formal language, introduction to language translation logic, Essentials of translation, Alphabets and languages, Finite representation of language.

Finite Automata (FA): An Informal Picture of FA, Finite State Machine (FSM), Language accepted by FA, Definition of Regular Language, Deterministic and Nondeterministic FA (DFA and NFA), epsilon- NFA

08 Hours

Module II

Regular Expressions (RE): Operators of RE, Building RE, Precedence of operators, Algebraic laws for RE

Conversions: NFA to DFA, RE to DFA Conversions: RE to DFA, DFA to RE Conversions: State/loop elimination Arden ‘s theorem Properties of Regular Languages: Pumping Lemma for Regular languages, Closure and Decision properties **08 Hours**

Module III

Context Free Grammars (CFG) and Languages: Introduction, Regular Grammar, Context Free Grammar- Definition, Derivation, Language of grammar, sentential form, parse tree, inference, derivation, parse trees, ambiguity in grammar and Language- ambiguous Grammar

Simplification of CFG: Eliminating unit productions, useless production, useless symbols, and Є-productions, Normal Forms- Chomsky normal form, Greibach normal form.

08 Hours

Module IV

Turing Machines: Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers.

08 Hours

Module V

Undecidability: A Language that is not recursively enumerable, An un-decidable problem that is RE, Post Correspondence Problem,

Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church Turing thesis.

08 Hours

Course outcomes:

The Student will be able to:

CO1: Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation.

CO2: Design and develop lexical analyzers, parsers and code generators.

CO3: Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.

CO4: Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers.

CO5: Design computations models for problems in Automata theory and adaptation of such model in the field of compilers.

Text Books

1. John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson Publications.
2. Alfred V.Aho, Monica S.Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers Principles, Techniques and Tools", 2nd Edition, Pearson Publications.

Reference Books:

1. Elain Rich, "Automata, Computability and complexity", 1st Edition, Pearson Education, 2018.
2. Peter Linz, "An introduction to Formal Languages and Automata", 3rd Edition, Narosa Publishers, 1998.
3. K.L.P Mishra, N Chandrashekaran, "Theory of Computer Science", 3rd Edition, PHI, 2012.

E - Resources:

1. https://nptel.ac.in/courses/106/106/106106049/
2. https://nptel.ac.in/courses/106/104/106104123/
3. https://plato.stanford.edu/entries/computational-complexity/#TecDev
4. https://www.cse.iitm.ac.in/~shwetaag/col705.html
5. https://www.cs.ucy.ac.cy/~mavronic/Classes/cs211/index.html
6. https://www.cse.csusb.edu/egomez/cs601.html
7. https://computer.ju.edu.jo/Lists/Courses/Disp_Course.aspx?ID=223&prog=MSc.%20of%20Computer%20Science&dept=Computer%20Science&deptName=Computer%20Science
8. https://www-e.openu.ac.il/courses/20585.html

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST54	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PCC

Pre-Requisites:

1.Mathematics, Probability and statistics.

2.Knowledge in Python or R programming Language.

3. Fundamentals of Data Structures and algorithms

Course Objectives:

The Student will:

- Understand the characteristics of Machine Learning techniques that enable to solve real world problems.
- Learn various supervised learning methods to solve appropriate problems.
- Understand various unsupervised learning algorithms for solving real world problems.
- Understand probabilistic and ensemble learning models for handling unknown pattern.
- Learn the need of rewards and actions to find interesting patterns

Module I

Introduction to Machine Learning: Introduction, Components of Learning, Learning Models , Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.

08 Hours

Module II

Supervised and Unsupervised Learning-I: Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression.

08 Hours

Module III

Supervised and Unsupervised Learning-II: Neural Networks: Introduction, Perception, Multi-layer Perception. Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors.

08 Hours

Module IV

Supervised and Unsupervised Learning-III: Introduction to clustering, K-means clustering, K-Mode Clustering.

Ensemble and Probabilistic Learning: Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, boosting: Ad boost, Stacking.

08 Hours

Module V

Reinforcement Learning and Evaluating Hypotheses Introduction, Learning Task, Q Learning, Nondeterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning,

08 Hours

Course Outcomes:

The student will be able to:

CO1: Recognize the characteristics of Machine Learning techniques that enable to solve real world problems.

CO2: Apply various supervised learning methods to appropriate problems.

CO3: Analyze various unsupervised learning algorithms for solving real world problems.

CO4: Analyze and design probabilistic, ensemble learning models for handling unknown pattern.

CO5: Analyze the need of rewards and actions to find interesting patterns.

Textbooks:

1.Ethem Alpaydin," Introduction to Machine Learning", MIT Press, Prentice Hall of India, 3rd Edition2014.

2.Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar" Foundations of Machine Learning", MIT Press,2012.

3.Tom Mitchell, "Machine Learning", McGraw Hill, 3rdEdition, 1997.

4.MACHINE LEARNING - An Algorithmic Perspective, Second Edition, Stephen Marsland, 2015.

Reference Books:

1. Ian Good fellow, Yoshoua Bengio, and Aaron Courville Deep Learning MIT Press Ltd, Illustrated edition.

2. Christopher M. Bishop Pattern Recognition and Machine Learning - Springer, 2nd edition.

Trevor Hastie, Robert Tibshirani, and Jerome Friedman - The Elements of Statistical Learning: Data Mining, Inference, and Prediction - Springer, 2nd edition.

E - Resources:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_pdf_version.htm
2. https://www.alljntuworld.in/download/artificial-intelligence-ai-materials-notes/
3. https://drive.google.com/file/d/1mPiI4jy6YkJRDiCT21xgzN0VDNkrW23X/view
4. https://towardsdatascience.com/outlier-detection-methods-in-machine-learning-1c8b7cca6cb8
5. http://robots.stanford.edu/papers/thrun.pf-in-robotics-uai02.pdf
6. https://nptel.ac.in/courses/ 106/105/106105077/

ADVANCED JAVA LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL55	0:0:2:0	01	CIE:50 SEE:50	03 Hours	PCC

Pre-Requisites: Data structures, Algorithms, Basic Programming Skills

Course Objectives:

The Student will:

- Understand and manipulate Java strings effectively.
- Master the usage of Array Lists for dynamic data storage.
- Gain proficiency in connecting Java applications to databases.
- Understand and implement the Iterator class for efficient data traversal.
- Learn to handle byte array input efficiently in Java.

1.1.Aim: Create the following program to demonstrate String Handling functions.

2.Program: For sorting applications, you need to know which is less than, equal to, or greater than the next. Write a Java program to sort array of strings using CompareTo() function.

3.2.Aim: Create the following program to demonstrate String Handling functions.

4.Program: Write a Java program to count the occurrence of character in a given string using suitable String handling functions.

5.3.Aim: Introduce java Collections.

6.Program: Write a program to perform string operations using Array List. Write functions for the following a. Append - add at end b. Insert – add at particular index c. Search d. List all string starts with given letter.

7.4.Aim: create the following program to demonstrate working with Array List in Java.

8.Program: Remember the array lists are adding and removing things, and that they are clock-cycle friendlier in this case than resizing arrays as we discussed in lecture. This program allows you to get some hands-on using an array list so you will remember it for those times it would be a good fit for an application.

I. Create an Array List of type String and prompt that user for three names and add these names to your Array List.

II. Print a message with the number of elements in the Array List for the user using the size () method.

III. Prompt the user for two more names and add them to the array List and once again print a message with the number of elements in the array List for the user.

IV. Use a loop to print all of the names in the array List for the user.

v. Ask the user for a name to remove, remove the value the user provides, and then use an enhanced for loop to print all of the names in the array List for the user.

5.Aim: create the following program to illustrates working of LinkedList in Java.

Program: Write a Java program to add elements to the start of a list and to add elements to the end of the list. Obtain the first and last element. Remove first and last element.

6.Aim: create the following program to demonstrate the use of iterator to access each element in the collection.

Program: Write a java program to implement both the Iterator and List Iterator interfaces.

7.Aim: Introduce File operations in java.

Program: Create a program to reads the data from two files and writes in to another file and to display only files in a specified location. Illustrate how to use list() method and also to examine the contents of a directory.

8.Aim: Demonstrate ByteArrayInput Stream and ByteArrayOutput Stream in java.

Program: Write a Java program to read and write string using ByteArrayInput and Output stream.

9Aim: Demonstrate Event Handling using Swing Applet.

Program: Create a Java Program to implement swing-based applets.

10Aim: Create the following program to demonstrate a Swings.

Program: Create a Java Program to handle the event generated by a Swing push button.

11Aim: Implement the concepts of connectivity of Database through JDBC

Program: Create an application to retrieve information (author id, name, address, city, and state) about the authors who are living in the city where the city name begins with letter “B”. You need to write the code to perform the following tasks in the application:

1. Loading a driver.
2. Connect to the Database.
3. Create and execute JDBC statements.
4. Display the result.

12.Aim: Implement the concepts of PreparedStatement Object to accept runtime parameters.

Program: Create an application to retrieve details of all the authors living in a city specified at runtime. In this scenario, the value of city needs to be specified at runtime.

Course outcomes:

The student will be able to:

CO1: Students will master advanced string manipulation techniques in Java, including substring extraction, concatenation, formatting, and regular expressions.

CO2: Students will demonstrate the effective use of Array Lists in Java, understanding dynamic resizing, adding, removing, and iterating through elements.

CO3: Students will be proficient in connecting Java applications to databases using JDBC, performing CRUD operations and handling exceptions related to database connectivity.

CO4: Students will learn to efficiently handle byte array input in Java, including reading and writing data from/to streams, such as File Input Stream and Byte Array Output Stream.

CO5: Students will understand and implement the Iterator class for traversing various data structures, including Array Lists, efficiently and effectively.

Text Books:

1. Herbert Schildt, "Java The Complete Reference", 7th Edition, Tata Mc Graw Hill, 2013, ISBN13:978-0072263855, (Chapters 1-11).

Reference Books:

1. E Balagurusamy, "Programming with Java-A primer", 2nd Edition, Tata McGraw Hillcompanies,2009, ISBN-13:978-9351343202.

RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST56	2:0:0:0	02	CIE:50 SEE:50	02 Hours	AEC

Prerequisites: Literature survey, Requirement analysis

Course objectives:

- To give an overview of the research methodology and explain the technique of defining a research problem
- To explain the functions of the literature review in research.
- To explain carrying out a literature search, its review, developing theoretical and conceptual frame works and writing a review and research reports.
- To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.

To discuss leading International Instruments concerning Intellectual Property Rights.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- Use of Video/Animation to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
- Introduce Topics in manifold representations.
- Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, an Illustration.

08 Hours

Module – II

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed.

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs.

08 Hours

Module – III

Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Ethics in Engineering Research- Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.

08 Hours

Module – IV

Interpretation and Report Writing-Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report writing, Different steps in writing report, Layout of the research report, Types of reports, Oral presentation, Mechanics of writing a research report, Precautions for writing research reports, Conclusion.

Technical Writing and Publishing - Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper-The Choice, Writing Strategies, Journal Paper: Structure and Approach, Language Skills, Writing Style, and Editing, Rules of Mathematical Writing, Publish Articles to Get Cited, or Perish.

Communicating Research Work: Presentation Skills-Oral Presentations Language Choices, Delivery, Poster Presentations, and Presentation Preparation Guidelines.

08 Hours

Module – V

Intellectual property: an introduction - Intellectual property types, more patent basics.

Patents- Detailed overview of patents-What is a patent, what can be the subject of a patent, why are patents important. Legal requirements for patentability - Novelty, Inventive step/non obviousness, Industrial application/utility, Patentable subject matter, Disclosure requirement.

Patent application preparation - Preparing patent applications - Obtaining invention disclosures from Inventors, identifying patentable inventions, Understanding the invention (core inventive concept) Inventor ship. Typical parts of the patent Application - Request, Description, Claims, Drawings, Abstract, and Application format.

08 Hours

Teaching-Learning Process forall modules

Chalk and board, Active Learning, PPT Based presentation, Video

Course Outcomes (Course Skill Set)

At the end of the course the student will be able to:

CO1: Explain the meaning of engineering research.

CO2: Explore the procedure of Literature Review and Technical Reading.

CO3: Explain the various data collection methods, ethics in research.

CO4: Know the techniques involved report writing, technical writing, and presentation skills.

CO5: Explain the fundamentals of patent law & drafting procedure.

Textbooks

1.Research Methodology: Methods and Techniques, C. R. Kothari, Gaurav Garg, New Age Internat ional, 4th Edition, 2019

Chapter 1, 2, Chapter 3, Chapter 6, Chapter 19.

2. Engineering Research Methodology: A Practical Insight for Researchers, Dipankar Deb, Rajeeb Dey, Valentina E.Balas, Intelligent Systems Reference Library, 1st Edition, 2019

Chapter 5, Chapter 6, Chapter 9.

3. WIPO (2022), WIPO Patent Drafting Manual, 2nd edition. Geneva:WIPO., DOI:10.34667/tind.44657 ISBN:978-92-805-3264-7, World Intellectual Property Organization, Second edition

Module 1 - 1, 2, Module 2 - 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, Module 3 - 1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6.

4. RESEARCH METHODOLOGY a step-by-step guide for beginners. Ranjit Kumar, SAGE Publications India Pvt Ltd 3rd Edition, 2011.

Chapter 3.

Reference Books

1. Research Methods for Engineers", David V. Thiel, Cambridge University Press, 2020

Online Resources

1. https://onlinecourses.nptel.ac.in/noc22_ge08/preview
2. https://archive.nptel.ac.in/courses/127/106/127106227/
3. https://onlinecourses.swayam2.ac.in/cec20_hs17/preview

4. https://archive.nptel.ac.in/courses/110/105/110105139/
5. www.indiacode.nic.in

ENVIRONMENTAL STUDIES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21ENV 57	1:0:0:0	01	CIE:50 SEE:50	01 Hours	HSMC

Course Objectives: To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment. The industrial revolution and development have led to the stress on environment in the form of pollution. Checking of the pollution in all fronts at local and global level encompassing the issues of carbon credit, ozone level depletion, global warming, desertification and polar ice cap melting. The main objectives of the course is to expose to students to the problems and mitigation measures concerned to the environmental components like resources, air, water and land.

Module I

Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake.
Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.

03 Hours

Module II

Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind.
Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading.

03 Hours

Module III

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.
Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.

03 Hours

Module IV

Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.

03 Hours

Module V

Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications):
G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001;

Environmental Stewardship- NGOs.

Field work: Visit to an Environmental Engineering Laboratory or Green Building; Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural/Water Treatment Plant/ Waste water treatment Plant. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes; etc (field work equal to 2 lecture works) ought to be Followed by understanding of process and its brief documentation.

03 Hours

Course outcomes:

At the end of the course, students will be able to: ·

CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, ·

CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.

CO3: Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.

CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

Text Books:

1. Benny Joseph: "Environmental Studies". Tata Mc Graw – Hill, 2nd Edition,2012.
2. S M Prakash: "Environmental Studies", Pristine PublishingHouse, Mangalore, 3rd Edition,2018.
3. R Rajagopalan: "Environmental Studies – From Crisis to Cure: Oxford Publisher, 2005.

Reference Books:

1. Raman Sivakumar: "Principals of Environmental Science and Engineering", Cengage learning, Singapur, 2nd Edition, 2005.
2. M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007.
3. Dr. B.S Chauhan, Environmental studies, university of science press 1st edition.

E-Resources

https://youtu.be/tqgo6PYfJLk?si=dd82TkdFKTu8D-zB

ABILITY ENHANCEMENT COURSE

C# & .NET PROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type

21CSL581	**0:0:2:0**	**01**	**CIE:50 SEE:50**	**02 Hours**	**AEC**

OBJECTIVES The main Objective of this course is student know about windows, Web and Console Applications.

EXPERIMENT 1 – BASIC C# PROGRAMS

To understand about basics of C# and execute simple c# programs to perform the following actions:

(a) Calculate Hypotenuse of triangle using dynamic initialization of variables

(b) To get input from the user and perform calculations

(c) Calculate the quadrant for the coordinates using if..else…ladder

(d) Check whether the alphabet is a vowel or not using switch..case…

(e) To understand about for each loop and strings

EXPERIMENT 2 – CLASSES & OBJECTS

To develop a C# application to print the students list using classes and objects

EXPERIMENT 3 – INHERITANCE

To develop a C# application to implement inheritance concepts

(a) Single Inheritance (b) Multilevel Inheritance (c) Multiple Inheritance

EXPERIMENT 4 – OPERATOR OVERLOADING

To develop a console application to implement operator overloading concept in C#

(a) Unary Operator Overloading (b) Binary Operator Overloading

EXPERIMENT 5 – THREADING

AIM To develop a C# console application to implement threading concepts

EXPERIMENT 6 – DELEGATES & EVENTS

AIM To develop a c# console application to implement the following concepts:

(a) Delegates (b) Events

EXPERIMENT 7 – WINDOWS FORM CONTROL

To design a window-based application using C# code in VB.Net

EXPERIMENT 8 – VALIDATING DATA

To implement validating data entered in controls using

(a) Windows based application – Manual coding for validation

(b) Web based application – Validation Controls

EXPERIMENT 9 – CUSTOM DIALOG BOX & MDI APPLICATION

To design a notepad application to implement menus, custom dialog box and MDI concepts

EXPERIMENT 10 – RETRIEVING DATA FROM DATABASE & WORKING WITH DISCONNECTED ENVIRONMENT

To design windows-based application to retrieve data from SQL database and to work with disconnected environment in ADO.Net using C#

COURSE OUTCOMES (COs)

CO1: Display proficiency in C# by building stand-alone applications in the .NET framework using C#.

CO2: Create distributed data-driven applications using the .NET Framework, C#, SQL Server and ADO.NET

CO3: Create web-based distributed applications using C#, ASP.NET, SQL Server and ADO.NET

CO4: Utilize DirectX libraries in the .NET environment to implement 2D and 3D animations and gamerelated graphic displays and audio.

CO5: Utilize XML in the .NET environment to create Web Service-based applications and components.

ANDROID PROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSL582	0:0:2:0	01	CIE:50 SEE:50	02 Hours	AEC

Pre-Requisites:

JAVA Programming Language and XML (Extensible Markup Language)

Programs supplement

the lecture concepts will be based on the latest version of Android SDK.

Course Objectives:

The student will:

- Setting up the Android Application Development Environment, Outline the Android SDK features and the Development Framework.
- Understanding activities, which are the major building blocks of app's user interface.
- Create adaptive, responsive user interfaces that work across a wide range of devices.
- Implementing different navigation paths through your application.

1. Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address are to be displayed.
2. Develop an application using controls like Button and TextView, on click of Button 1 display “Welcome to NCET” and on Click of Button 2 display “Welcome to CSE”. Handle the two buttons in an Activity to demonstrate event handling using both Java and XML.
3. Create an application to demonstrate all Activity life cycle callback methods. Display Toast message When each method invokes.
4. Develop an android application with an Activity and accept data from the user in first Activity. On click of a Next button in first Activity transfer the data from first Activity to second Activity.
5. Create an android application with Activity has three buttons. On click of Buton 1 open the web browser application, on click of Button 2 open the call application and on click of Button 3 open the map application.
6. Develop an android application to Create a login Activity. It asks “username” and “password” from user. If username and password are valid, it displays Welcome message using new activity.
7. Develop an android application to design a Simple Calculator application has two edit texts and four buttons. When you enter two numbers and click a button, the application performs the calculation for that button and displays the result.

8. Develop a simple application with one EditText so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice.

Course Outcomes:

On completion of this course, students will be able to:

CO1: Comprehend the basic features of Android Platform.

CO2: Create Activities and navigate between activities in Android.

CO3: Demonstrate the design concepts of user interface using components and views in Android.

CO4: Understanding different navigation paths through your application.

Text Books

1. Wei – Meng Lee: "Beginning Android Application Development", Wiley publications, ISBN: 978-1-118-01711-1, (Chapters 1-8,10,11).
2. Reto Meier: "Professional Android 4 Application Development", Wiley publications Publisher, 2012, ISBN-10: 812653608X

Reference Books:

1. Mark Murphy: "Beginning Android 3", Apress Springer India Pvt. Ltd., 1st Edition, 2011, ISBN-13: 978-1-4302-3297-1
2. Sayed Hashimi, Satya Komatineni, Dave MacLean; Pro Android 4; Apress Springer India Pvt Ltd; 1st Edition; 2012; ISBN: 978-1-4302-3930-7.
3. Reto Meier: "Professional Android 2 Application Development", Wiley India Pvt. Ltd., 1st Edition, 2012, ISBN: 9788126525898.
4. James Steele: "The Android Developer's Cookbook: Building Applications with the Android SDK", Addison-Wesley Professional, 2010.

E - Resources:

1. https://developers.google.com/training/adf
2. https://goo.gl/ADKvq8
3. https://innovator.samsungmobile.com

SYSTEM PROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS583	0:0:2:0	01	CIE: 50 SEE: 50	02 Hours	AEC

Description of the course: For a program to receive input, either interactively or in a batch environment, you must provide another program or a routine to receive the input. Complicated input requires additional code to break the input into pieces that mean something to the program. LEX and YACC commands are used to develop this type of input program. The LEX command generates a lexical analyzer program that analyzes input and breaks it into tokens, such as numbers, letters, or operators. The tokens are defined by grammar rules set up in the LEX specification file. The YACC command generates a parser program that analyzes input using the tokens identified by the lexical analyzer (generated by the LEX command and stored in the LEX specification file) and performs specified actions, such as flagging improper syntax. Together these commands generate a lexical analyzer and parser program for interpreting input and output handling.

Prerequisite: C language, Discrete Mathematics, Data structures.

Course Objectives:

As a student will be able to:

- Make students familiar with Lexical Analysis and Syntax Analysis phases of Compiler.
- Use Lexical Analyzer using Lex tool & Syntax Analyzer or parser using YACC Tool for solving the problems.
- Understand tokenization and its uses.

Lab Experiments:

PART A:

1. Write a LEX program to count the number of characters, words, spaces and lines in a given input file.
2. Write a LEX program to count the numbers of comment lines in a given C program. Also eliminate them and copy the resulting program into separate file.
3. Write a LEX program to count the number of vowels and consonants in a given string
4. Write a LEX program to recognize a valid arithmetic expression and to recognize the identifiers and operators present. Print them separately.
5. Write a LEX program to copy the content of one file to another file.

PART B:

1. Write YACC program to recognize a valid arithmetic expression that uses operators +, -,* and /.

2. Write YACC program to recognize a valid variable, which starts with a letter, followed by any number of letters or digits.
3. Write the YACC program to recognize valid identifiers, operators, and keywords in the given text (C program) file.
4. Write YACC program to evaluate arithmetic expression involving operators: +, -, *, and /.
5. Write YACC program to recognize the grammar (anb, n>= 10)

Course Outcomes:

After studying this course, the students will be able to:

CO1: Implement the techniques of Lexical Analysis and Syntax Analysis.

CO2: Apply the knowledge of LEX & YACC tools to develop programs.

CO3: Implement formal attributed grammars for specifying the syntax and semantics of programming languages.

CO4: Analyze the system software and compiler design concepts in solving the problems.

CO5: Design LEX and YACC programs for real time problems.

Text Books:

1. John Levine, Doug Brown, Tony Mason, "LEX and YACC", 2nd Edition. O'Reily publications.

Reference Books:

1. Tom Niemann, "LEX & YACC Tutorial", epaper press.

Reference Online Resources:

1. https://www.oreilly.com/library/view/lex-yacc/9781565920002/ch01.html
2. https://www.geeksforgeeks.org/tag/lex-program/
3. https://www.geeksforgeeks.org/introduction-to-yacc/

MICROCONTROLLER PPROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS584	1:0:0:0	01	CIE: 50 SEE: 50	01 Hours	AEC

COURSE OBJECTIVES:

This course will enable students to

- Develop and test assembly language program (alp) using arm7tdmi/lpc2148.
- Conduct the experiments on an arm7tdmi/lpc2148 evaluation board using evaluation version of embedded 'c' & keil uvision-4 tool/compiler.

Module – I

Teaching hours

Introduction: Microprocessors versus microcontrollers, arm embedded systems: the risc design philosophy, the arm design philosophy, embedded system hardware, embedded system software.

03 Hours

Module – II

Arm processor fundamentals: registers, current program status register, pipeline, exceptions, interrupts, and the vector table, core extensions.

03 Hours

Module – III

Introduction to the arm instruction set: data processing instructions, programme instructions, software interrupt instructions

03 Hours

Module – IV

Program status register instructions, coprocessor instructions, loading constants, arm programming using assembly language

03 Hours

Module – V

Writing assembly code, profiling and cycle counting, instruction scheduling, register Allocation, conditional execution, looping constructs

03 Hours

Course outcomes:

After studying this course, students will be able to

1. Differentiate between microprocessor and microcontroller.
2. Write and test assembly language program (alp) using arm7tdmi/lpc2148

3. Conduct the experiments on an arm7tdmi/lpc2148 evaluation board using embedded 'c' & keil-u vision-tool/compiler.
4. Design and develop small scale embedded systems.
5. Understand about instruction set and architecture of 8051

Text Books:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Reference Books:

1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

The following Assembly Language Program (ALP) need to be executed using ARM7TDMI/LPC2148 using an evaluation board/simulator and the required software tool.

1. Write an ALP to Multiply two 16-bit binary numbers.
2. Write an ALP to find the sum of even/odd numbers from a given array of N numbers.
3. Write an ALP to check a given number is a prime number.
4. Write an ALP to add an array of 16-bit numbers and store the 32-bit result in internal RAM.
5. Write an ALP to transfer block of N numbers from internal memory to external memory and vice-versa.
6. Write an ALP to find the square of a number (1 to 10) using look-up table.
7. Write an ALP to find the largest/smallest number in an array of 32 numbers.
8. Write an ALP to arrange a series of 32-bit numbers in ascending/descending order.
9. Write an ALP to count the number of ones and zeros in two consecutive memory locations.
10. Write an ALP to search for a given key element using Binary Search algorithm.

VI SEMESTER
COURSE SYLLABUS

CLOUD COMPUTING

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
21CST61	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PCC

Course Objectives:

This course will enable students to:

- Learn the basic concepts of Cloud Computing, AWS and AWS Economics and Billing System.
- Understanding of Global Infrastructure and Cloud Security.
- Understanding of Networking, Content Delivery and Compute Services.
- Understanding of Storage and Databases.
- Acquire knowledge of application services, monitoring and analytics and pricing.

Module – I

Cloud Concepts overview: Introduction to cloud computing, Advantages of cloud computing, Introduction to Amazon Web Services (AWS), AWS Cloud Adoption Framework (AWS CAF).

Cloud Economics and Billing: Fundamentals of Pricing, Total Cost of Ownership, AWS Organizations, AWS Billing and Cost Management, Technical Support

08 Hours

Module – II

AWS Global Infrastructure Overview: AWS Global Infrastructure, AWS service and service category overview.

AWS Cloud Security: AWS shared responsibility model, AWS Identity and Access Management (IAM), Securing a new AWS account, Securing accounts, Securing data on AWS, Working to ensure compliance, Additional security services and resources.

08 Hours

Module – III

Networking and Content Delivery: Networking basics, Amazon Virtual Private Cloud (Amazon VPC), VPC networking, VPC security, Amazon Route 53, Amazon CloudFront.

Compute: Compute services overview, Amazon EC2, Amazon EC2 cost optimization, Container services, Introduction to AWS Lambda, Introduction to AWS Elastic Beanstalk.

08 Hours

Module – IV

Storage: Amazon Elastic Block Store (Amazon EBS), Amazon Simple Storage Service (Amazon S3), Amazon Elastic File System (Amazon EFS), Amazon Simple Storage Service Glacier.

Databases: Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon Redshift, Amazon Aurora. **08 Hours**

Module – V

AWS Application Services: AWS SQS, AWS SWF, AWS SNS, Elastic Transcoder, API Gateway, AWS kinesis.

AWS Monitoring and Analytics: AWS Cloud Watch, Cloud trail, AWS trusted Adviser's pricing and support: AWS pricing models, Billing dashboard, consolidation billing, AWS budgets, AWS cost Explorer, AWS support plans. **08 Hours**

Course Outcomes:

On completion of this course, students should be able to:

CO1: Identify advantages of cloud computing and economic implications of cloud services

CO2: Analyze AWS security measures and understanding the global infrastructure of AWS services.

CO3: Implement networking fundamentals, deploying compute resources, and optimizing costs within AWS infrastructure.

CO4: Adapt AWS storage solutions and database services to optimize data management and storage needs effectively.

CO5: Analyze AWS application services, monitoring tools, and understanding pricing models and support plans for effective AWS resource management.

Text Books:

1. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2011, ISBN: 978-0-470-88799-8.
2. AWS Certified Solutions Architect Official Study Guide: Associate Exam by Joe Baron, Hisham Baz, Tim Bixler, Biff Gaut, Kevin E. Kelly, Sean Senior, John Stamper- ISBN10 - 1119138558
3. Velte T, Velte A, Elsenpeter R. Cloud computing, a practical approach. McGraw-Hill, Inc.; Sep 22. 2009, ISBN: 9780070683518.

Reference Books:

1. Thomas Erl: "Cloud Computing", Pearson Education, 1st Edition, 2014, ISBN-13: 978-9332535923.
2. Judith Hurwitz, Marcia Kaufman, Fern Halper: "Cloud Computing for dummies", Wiley,1st Edition, 2009, ISBN: 9780470484708.
3. Velte, Anthony T., Toby J. Velte, and Robert Elsenpeter. "Cloud Computing: A Practical Approach." (2009), ISBN: 9780071626941

E-Resources:

1. http://www.buyya.com/MasteringClouds/ToC-Preface-TMH.pdf

FULL STACK DEVELOPMENT

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
21CSI62	3:0:2:0	04	CIE:50 SEE:50	03 Hours	IPCC

Course Objectives:

This course will enable students to,

- To understand the fundamentals of web programming and client-side scripting using HTML and Java script in web page design.
- To access the DOM objects, filters, forms in Java scripts query.
- To Write programs using Hooks, components and Events in ReactJS .
- To learn server-side development using Node.js, Express JS.
- To Understand with the database connectivity and reactive forms using Java script.

Module – I

Java script: Basics: Variables, Operator, DOM, Arrays, Functions, Arrow Functions, Classes, Objects, EventHandling, Map, Babbel JS, React Introduction, React Installation. Simple React programs and CSS styling.

08 Hours

Module – II

React JS: Functional Component, Class Component, Event Based Component, Props, States, Set state, Event Handling, Binding Event Handler, Life Cycle Methods, Lists& Keys, Forms and user inputs, Rendering: Conditional Rendering, List Rendering.

08 Hours

Module – III

Hooks: useState, useMenu, useEffect,Axios Package, useRef , useContext, useReducer,useCallback useInput, React Router, APIs, Practical React: icons, video player, credit card, model, chart, count up.

08 Hours

Module – IV

Introduction to Node.js: What is Node.js?, Features of Node.js, Setup Development Environment-Installing,Node.js, Working with REPL, Node.js Console, Node.js Module, Node Package Manager, Node.js Basics, File System, HTTP and HTTPs, Creating Web Server- Handling http request, Node.js Callbacks, Node.js Events.

08 Hours

Module – V

Database Connectivity and Reactive Forms: Promises, Express.js, Database Connectivity – Connecting to RDBMS and NoSQL database, Performing CRUD operations, What is Reactive Forms, Syncing of HTML and Form, Form Control Arrays, Relative Forms, Value changes and Reacting to status, Create Reactive form through code, Adding Validation, Adding Validation, Grouping, Custom Validators.

08 Hours

Course Outcomes:

On completion of this course, the students will be able to,

CO1: Write client side scripting HTML and Javascript.

CO2: Implement programs using ReactJS components.

CO3: Design test and deploy web pages using React Hooks .

CO4: Develop programs in Node JS, Express JS.

CO5: Implement programs using React JS with database connectivity.

Text Book:

1. Brad Dayley, "Node.js, MongoDB, and AngularJS Web Development, 2018, ISBN- 13: 9789352865505.

Reference Book:

1. Adam Freeman, "Pro Angular JS", A press Publications, 2nd Edition, 2017, ISBN-13: 9781484223062.
2. Learning React Functional Web Development with React and Redux By Alex Banks, Eve Porcello 2017

E-Resources:

1. https://reactjs.org/docs/getting-started.html
2. https://www.mongodb.com/resources
3. https://youtube.com/playlist?list=PLC3y8-rFHvwgg3vaYJgHGnModB54rxOk3

Laboratory Component

List of Programs **12 Hours**

1. Write a ReactJS Program using useState hook .
2. Write a ReactJs Program to style a web page using CSS.
3. Write a ReactJS Program to fetch details from spotifyAPI.
4. Write a ReactJs Program to implementing routing using react-router-dom package.
5. Write a ReactJS Program to implement digital clock using hook.
6. Write a ReactJs program create login form.
7. Write a ReactJs program create a simple greeting website.

COMPUTER GRAPHICS AND IMAGE PROCESSING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST63	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PCC

Course Objectives:

- Overview of Computer Graphics along with its applications.
- Exploring 2D and 3D graphics mathematics along with OpenGL API's.
- Use of Computer graphics principles for animation and design of GUI's.
- Introduction to Image processing and Open CV.
- Image segmentation using Open CV.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.
6. Introduce Topics in manifold representations.
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.

Module-I

Overview: Computer Graphics hardware and software and OpenGL: Computer Graphics: Video Display Devices, Raster-Scan Systems Basics of computer graphics, Application of Computer Graphics. OpenGL: Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attribute functions, OpenGL line attribute functions, Line drawing algorithms (DDA, Bresenham's).

Self-study topics : Input devices, hard copy devices, coordinate representation, graphics functions, fill area primitives, polygon fill areas, pixel arrays, Parallel Line algorithms

Teaching-Learning Process **Chalk & board, Active Learning, Virtual Lab**

Module-II

2D and 3D graphics with OpenGL: 2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates, 2D Composite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformation's function,

3D Geometric Transformations: Translation, rotation, scaling, composite 3D transformations, other 3D transformations, OpenGL geometric transformations functions

Self-study topics: Transformation between 2D coordinate system, OpenGL geometric transformation, Transformation between 3D coordinate system.

Teaching-Learning Process **Chalk & board, Active Learning, Problem based learning Virtual Lab:**

Module-III

Interactive Input Methods and Graphical User Interfaces: Graphical Input Data, Logical Classification of Input Devices, Input Functions for Graphical Data, Interactive Picture-Construction Techniques, Virtual-Reality Environments, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface.

Computer Animation: Design of Animation Sequences, Traditional Animation Techniques, General Computer-Animation Functions, Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures.

Self-study topics: Raster methods for computer animation, Key frame systems, Motion specification.

Teaching-Learning Process **Chalk & board, MOOC, Active Learning**

Module-IV

Introduction to Image processing: overview, Nature of IP, IP and its related fields, Digital Image representation, types of images.

Digital Image Processing Operations: Basic relationships and distance metrics, Classification of Image processing Operations.

Computer vision and OpenCV**:** What is computer vision, Evolution of computer vision, Application of Computer vision, Feature of OpenCV, OpenCV library modules, OpenCV environment, Reading, writing and storing images using OpenCV. OpenCV drawing Functions. OpenCV Geometric Transformations.

Teaching-

Learning Process **Chalk & board, Problem based learning**

Lab practice for OpenCV for basic geometric objects and basic image operation

Module-V

Image Segmentation: Introduction, classification, detection of discontinuities, Edge detection (up to canny edge detection(included)).

Image processing with Open CV: Resizing, Rotation/ Flipping, Blending, creating region of Interest (ROI), Image Thresholding, Image Blurring and smoothing, Edge Detection, Image contours and Face Detection on images using OpenCV.

Teaching-Learning Process **Chalk & board, MOOC Lab practice on image processing. Virtual Lab:**

Course Outcomes:

At the end of the course the student will be able to:

CO 1: Construct geometric objects using Computer Graphics principles and OpenGL APIs.

CO 2: Use OpenGL APIs and related mathematics for 2D and 3D geometric Operations on the objects. CO

CO 3: Design GUI with necessary techniques required to animate the created objects

CO 4: Apply OpenCV for developing Image processing applications.

CO 5: Apply Image segmentation techniques along with programming, using OpenCV, for developing simple applications.

Textbooks

1. Donald D Hearn, M Pauline Baker and WarrenCarithers: Computer Graphics with OpenGL 4th Edition, Pearson, 2014 (Chapter -11, 18, Chapter -1,2,3, 5(1 and 2 only) , Chapter -6, 8)
2. S. Sridhar, Digital Image Processing, second edition, Oxford University press 2016. Chapter 9: 9.1 to 9.4.4.4, Chapter 3

Reference Books

1. Edward Angel: Interactive Computer Graphics- A Top-Down approach with OpenGL, 5th edition. Pearson Education, 2008
2. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: Pearson education

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/106/106106090/
2. https://nptel.ac.in/courses/106/102/106102063/
3. https://nptel.ac.in/courses/106/103/106103224/
4. https://nptel.ac.in/courses/106/102/106102065/
5. https://www.tutorialspoint.com/opencv/ (Tutorial, Types of Images, Drawing Functions)

PROFESSIONAL ELECTIVE COURSE -I

PRECISION AGRICULTURE

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS641	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PEC

Prerequisites:

Basic Computer Knowledge Linear Algebra Statistics and Probability Calculus Graph Theory Programming Skills – Language such as Python, R, MATLAB, C + + or Octave Data, Hardware.

Course Objectives:

This course will enable students to:

- Detailed description of latest tools and technologies available for the agriculture 5.0.
- Describe different type of hardware, platforms and techniques for use in smart farming.
- Learn different modeling techniques in precision agriculture.
- Make data driven based decision making & support systems.
- Learn policies and regulations for adopting AI & ML techniques in Agriculture.

Module-I

Introduction to Precision Agriculture: History of Precision Agriculture and its Global, Precision Agriculture – Introduction, Need and Scope of Precision Agriculture, Components of Precision Agriculture, Tools and Techniques, Site-Specific Crop Management (SSCM, Variable Rate Application (VRA) and Variable Rate Technology (VRT, Adoption of Smart Precision Agriculture, Some Misconceptions about Precision Agriculture.

Smart Intelligent Precision Agriculture: Modern Day Agriculture, Digitization of Agriculture-Digital Farming, Transition to Smart Intelligent Precision Agriculture, Benefits of Smart Intelligent Precision Agriculture.

08 Hours

Module II

Adoption of Wireless Sensor Network (WSN) in Smart Precision Agriculture: Sensors and Wireless Sensor Network, Evolution of Wireless Sensor Networks, Introduction of WSN in Agriculture, Features of Agriculturally Based Sensors, Types of Sensors Used for WSN Agricultural System, Intelligent Sensors Versus Smart Sensors, Impact of the Wireless Sensors on Traditional Agriculture, Sensor Based Variable Rate Application, Applications of WSN in Precision Agriculture, Security Issues and Challenges for WSN Implementation.

IoT (Internet of Things) based Agricultural Systems: Introduction, Architecture of IoT, Brief Overview of IoT Network, Characteristics of Internet of Things, Inter-Operability Challenges, Applications of IoT in Smart Agriculture, Challenges for the Implementation of IoT in Smart Farming, Security and Privacy Issues of an IoT, Fusion of Cloud Platform with IoT.

08 Hours

Module III

AI (Artificial Intelligence) Driven Smart Agriculture: Artificial Intelligence (AI) – Introduction, Categories of AI, Subsets of AI,Life Cycle of an Artificial Intelligence-Based, Prerequisites for Building an ML/AI-Based Agricultural Model, Advantages of A.I in Agriculture.

Machine Learning (ML) Driven Agriculture: Cognitive Technologies, Introduction to Machine Learning, Types of ML, Artificial Neural Networks and Deep Learning, General Applications of Machine Learning, Scope of Artificial Intelligence and Machine Learning in Agriculture, Applications of A.I and M.L in Agriculture.

08 Hours

Module IV

Data-Driven Smart Farming: Introduction, Collection and Management of Real-Time Agricultural Big Data, Transforming Field Data into Meaningful Insights, Processing and Predictive Analysis of Agricultural Data, Predictive Modeling.

Decision-Making and Decision-Support Systems: Introduction, Intelligent Agricultural Decision Support Systems (ADSS), Features and Workings of an Intelligent Agricultural Decision Support System (ADSS), Intelligent Decision Making using AI,ML, and IoT for Farmers.

08 Hours

Module V

Agriculture 5.0 – The Future: Introduction to Agriculture 4.0, Nanotechnology and Smart Farming, Blockchain -Securing the Agriculture Value Chain, Edge-Fog Computing for Smart Farming, Role of Big Data in Agriculture, Transition to Agriculture.

Social and Economic Impacts: Societal and Economic Impact of AI, ML, and IoT in Intelligent Precision Farming, Existence of Forums for Innovation and Commercialization of Intelligent Precision Farming Technology (IPFT).

Environmental Impact and Regulations: Potential Impact on the Environment with Different IPFT, Policy Making and Governance.

08 Hours

Course Outcomes:

On completion of the course, students will be able to:

1. Use the concepts of Artificial Intelligence in precision agriculture.
2. Analyze the WSN and IoT based Agricultural systems.
3. Apply AI and ML Driven system for agriculture.
4. Analyze the key aspects of data driven and decision making & support systems.

5. Compare the traditional agriculture with agriculture 5.0 for societal, economical and environmental Impact.

Text books:

1. Latief Ahmad and Firasath Nabi: "Agriculture 5.0, Artificial intelligence, IoT and machine learning", Taylor & Francis, 1st edition, 2021.
2. Rajesh Singh, Anita Gehlot, Mahesh Kumar Prajapat, Bhupendra Singh, "Artificial Intelligence in Agriculture**"**, 2021.

Reference books:

1. K.C. Ting, S. Panigrahi : "Artificial Intelligence for Biology and Agriculture", 1998.
2. GurjitKaur, PradeepTomar : "Artificial Intelligence and IoT-Based Technologies for Sustainable Farming and Smart Agriculture", 2019.

HUMAN COMPUTER INTERACTION

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
21CS642	3 : 0 : 0 : 0	03	CIE:50 SEE:50	03 Hours	PEC

Course Objectives:

- To learn the foundations of Human Computer Interaction.

- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

Module – I

Foundations of HCI:

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. – Case Studies.

08 Hours

Module – II

Design & Software Process:

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

08 Hours

Module – III

Models and Theories

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. – Case Studies.

08 Hours

Module – IV

Mobile HCI

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. – Case Studies. **08 Hours**

Module – V

Web Interface Design

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies.

08 Hours

Course Outcomes:

CO1: Upon completion of the course, the students should be able to:

CO2: Design effective dialog for HCI

CO3: Design effective HCI for individuals and persons with disabilities.

CO3: Assess the importance of user feedback.

CO4: Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.

CO5: Develop meaningful user interface.

Textbooks:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, ―Mobile Design and Development, First Edition, O‘Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, ―Designing Web Interfaces, First Edition, O‘Reilly, 2009. (UNIT-V)

Reference Books:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

AGILE TECHNOLOGIES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS643	3:0:0 :0	03	CIE:50 SEE:50	03 Hours	PEC

Pre-Requisites: Object Oriented Programming with C++, Software Engineering

Course Objectives:

The Student will be able to:

- Acquire the skills for project planning
- Learn how to prioritize user stories while estimation.
- Recognize design principles of agile methodology.
- Understand the concept of different Scrum practices.
- Get Knowledge about how agile can impact testing practices.

Module-I

Introduction: Need of Agile software development, agile context– Manifesto, Principles, Methods, Values, Roles, Artifacts, Stakeholders, and challenges. Business benefits of software agility.

Project Planning: Recognizing the structure of an agile team– Programmers, Managers, Customers.

08 Hours

Module-II

Project planning: User stories– Definition, Characteristics and content.

Estimation– Planning poker, Prioritizing, and selecting user stories with the customer, projecting team velocity for releases and iterations.

08 Hours

Module-III

Project Design: Fundamentals, Design principles–Single responsibility, Open-closed, Liskov substitution, Dependency-inversion, Interface-segregation.

Extreme Programming- Core principles, values and practices. Kanban, Feature-driven development

08 Hours

Module-IV

Design Methodologies: Need of scrum, Scrum practices –Working of scrum, Project velocity, Burn down chart, Sprint backlog, Sprint planning and retrospective, Daily scrum, Scrum roles– Product Owner, Scrum Master, Scrum Team.

08 Hours

Module-V

Testing: The Agile lifecycle and its impact on testing, Test driven development– Acceptance tests and verifying stories, writing a user acceptance test, Developing effective test suites, Continuous integration, Code refactoring. Risk based testing, Regression tests, Test automation.

08 Hours

Course outcomes:

The Student will be able to:

CO1: Analyze the concept of agile software engineering and its advantages in software development.

CO2: Discuss the core practices behind several specific agile methodologies.

CO3: Identify the roles and responsibilities in agile projects and their difference from projects following traditional methodologies.

CO4: Analyze implications of functional testing, unit testing, and continuous integration.

CO5: Determine the role of design principles in agile software design.

Text Books:

1. Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", International Edition, Pearson
2. Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", First International Edition, Prentice Hall.
3. Pedro M. Santos, Marco Consolaro, and Alessandro Di Gioia, "Agile Technical Practices Distilled: A learning journey in technical practices and principles of software design", First edition, Packt Publisher.

Reference Books:

1. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", International edition, Addison Wesley **Alistair Cockburn, "Agile Software Development: The Cooperative Game", 2nd Edition, Addison-Wesley**

E-Resources:

https://www.edx.org/course/agile-software-development

https://www.coursera.org/learn/agile-software-development

DATA VISUALIZATION USING PYTHON PROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS644	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PEC

COURSE DESCRIPTION: In this course, learning basics of Python, plot graphics, a system for describing and building graphs, and how the ggplot2 data visualization package for Python applies this concept to basic bar charts, histograms, pie charts, scatter plots, line plots, and box plots and Interactive plots with Bokeh.

Course Objectives:

This course will enable students to:

- Understand and use various plot types with Python
- Explore and work with different plotting libraries
- Create effective visualizations
- Exhibit the awareness of the importance and limitation of the exploratory data analysis paradigm
- Identify different tools for respective data analysis

Module- I

Data Visualization and Data Exploration

Introduction: Data Visualization, Importance of Data Visualization, Data Wrangling, Tools and Libraries for Visualization

Overview of Statistics: Measures of Central Tendency, Measures of Dispersion, Correlation, Types of Data, Summary Statistics

Numpy: Numpy Operations - Indexing, Slicing, Splitting, Iterating, Filtering, Sorting, Combining, and Reshaping

Pandas: Advantages of pandas over numpy, Disadvantages of pandas, Pandas operation - Indexing, Slicing, Iterating, Filtering, Sorting and Reshaping using Pandas.

08 Hours

Module - II

Plots

Comparison Plots: Line Chart, Bar Chart and Radar Chart; Relation Plots: Scatter Plot, Bubble Plot , Correlogram and Heatmap; **Composition Plots:** Pie Chart, Stacked Bar Chart, Stacked Area Chart, Venn Diagram; **Distribution Plots:** Histogram, Density Plot, Box Plot, Violin Plot; **Geo Plots:** Dot Map, Choropleth Map, Connection Map; What Makes a Good Visualization?

A Deep Dive into Matplotlib: Introduction, Overview of Plots in Matplotlib, Pyplot **Basics:** Creating Figures, Closing Figures, Format Strings, Plotting, Plotting Using pandas DataFrames, Displaying Figures, Saving Figures; Basic Text and Legend

Functions: Labels, Titles, Text, Annotations, Legends; **Basic Plots:** Bar Chart, Pie Chart, Stacked Bar Chart, Stacked Area Chart, Histogram, Box Plot, Scatter Plot, Bubble Plot; **Layouts:** Subplots, Tight Layout, Radar Charts, GridSpec; **Images:** Basic Image Operations, Writing Mathematical Expressions

08 Hours

MODULE- III

Simplifying Visualizations using Seaborn

Introduction, Advantages of Seaborn **Controlling Figure Aesthetics:** Seaborn Figure Styles, Removing Axes Spines, Contexts; **Color Palettes:** Categorical Color Palettes, Sequential Color Palettes, Diverging Color Palettes; **Interesting Plots in Seaborn:** Bar Plots, Kernel Density Estimation, Plotting Bivariate Distributions, Visualizing Pairwise Relationships, Violin Plots.

08 Hours

MODULE- IV

Plotting Geospatial Data

Introduction, Geoplotlib, The Design Principles of Geoplotlib, Geospatial Visualizations, Tile Providers, Custom Layers, Introduction to Folium

Visualizing Data: Building a Google map from geocoded data, Visualizing networks and interconnection and Visualizing mail data

08 Hours

MODULE- V:

Making Things Interactive with Bokeh

Introduction, Bokeh, Concepts of Bokeh, Interfaces in Bokeh, Output, Bokeh Server, Presentation, Integrating, Adding Widgets.

From Data to Visualization: Determine Where the Visualization Will Be Rendered, Connect to and Draw Your Data

Organize the Layout: Preview of Beautiful Data Creation, Drawing Data With Glyphs, Using the Column Data Source Object, Organizing Multiple Visualizations With Layouts

Adding Interaction: Selecting Data Points, Adding Hover Actions, Linking Axes and Selections, Highlighting Data Using the Legend.

08 Hours

Course Outcomes:

After successful completion of this course, the students will be able to:

CO1: Demonstrate the data visualization techniques.

CO2: Analyze data represented in the form of graphs & charts

CO3: Experiment with different visualization tools.

CO4: Identify geospatial data and interconnection of data.

CO5: Analyze the importance and limitations of data

Text Books

1. Data Visualization with Python, Tim Grobmann and Mario Dobler, Packt Publishing.
2. Python for Everybody: Exploring Data Using Python 3, Charles R. Severance, Create Space Independent Publishing Platform, 1st Edition, 2016

Reference:

1. "Data Visualization": A Successful Design Process, Kirk, Andy, Packt Publishing Ltd, 2012
2. Think Python: How to Think Like a Computer Scientist, Allen B. Downey, Green Tea Press, 2nd Edition, 2015
3. Interactive Data visualization for the Web, Murray, Scott, O'Reilly Media, Inc., 2013
4. Visualizing Data: Exploring and Explaining Data with the Processing Environment, Fry, Ben, O'Reilly Media, Inc., 2007

OPEN ELECTIVES – I

OFFERED BY THE DEPARTMENT TO OTHER DEPARTMENT STUDENTS

INTRODUCTION TO JAVA PROGRAMMING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS651	3: 0:0: 0	03	CIE:50 SEE:50	03 Hours	OEC

Course Objectives:

This course will enable students to:

- Learn the basic concepts of object-oriented programming.
- Understand the basics of JAVA Programming using classes and objects.
- Gain the knowledge of Inheritance and packages.
- Expose to the concepts of exceptions that occur while programming in JAVA.
- Acquire the knowledge of multi-threaded programming in JAVA.

Module – I

Introduction to Object Oriented Concepts: Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object-Oriented Language with C.

Introduction to Java: Java‟s magic, The Byte code, Java Development Kit (JDK), Java Buzzwords, Object-oriented programming, IO Streams, Data types, variables and arrays, reference variables, Operators, Control Statements. Simple Java programs.

08 Hours

Module – II

Classes: Classes fundamentals, Declaring objects, this keyword, garbage collection. Methods: Method Prototyping, Member functions and data members, Constructors, Objects and methods, Method Overloading, Objects and arrays, Access modifiers, Setters and getters, Nested classes, Console I/O.

08 Hours

Module – III

Inheritance: Inheritance basics, using super, creating multi-level hierarchy, method overriding, using Abstract classes, using final.

Packages: Packages: Access Protection, Importing Packages. **08 Hours**

Module – IV

Interfaces, **Exceptions, Applets:** Interfaces, Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, using multiple catch clauses, nested try statements, throw, throws, finally, Exception handling in Java, Applets, Types of Applets, Applet basics and class, Applet Architecture.

08 Hours

Module – V

Event Handling and Multi-Threaded Programming: Two event handling mechanisms, The delegation event model, Event classes, Sources of events, Event listener interfaces, Using the delegation event model, Adapter classes, Inner classes. Multi-Threaded Programming: What are threads? How to make the classes threadable, Extending threads, Implementing runnable, Synchronization, Changing state of the thread, Bounded buffer problems, read-write problem.

08 Hours

Course Outcomes

CO1: Acquire knowledge and distinguish between procedural and object-oriented programming concepts.

CO2: Demonstrate proficient usage of classes, methods, object declaration and garbage collection.

CO3: Apply the concepts of inheritance and packages in Java programming.

CO4: Exhibit proficiency in handling exceptions and understanding applets in Java programming.

CO5: Illustrate proficiency in event handling and multi-threaded programming in Java.

CO6: Demonstrate proficient usage of classes, methods, object declaration and garbage collection.

Textbooks:

1. Herbert Schildt, "Java The Complete Reference", 7th Edition, Tata McGraw 2013, ISBN-**13:** 978-0072263855, (Chapters 1-11).

Reference Books:

1. Herbert Schildt, "The Complete Reference C++", 4th Edition, Tata McGraw Hill, 2013,ISBN- 13: 978-0072226805.
2. E Balagurusamy, "Programming with Java-A primer", 2nd Edition, Tata McGraw Hill companies,2009, *ISBN*-13: 978-9351343202.

E-Resources:

1. www.geeksforgeeks.org/java/
2. www.tutorialspoint.com/java/index.htm

INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS652	3:0:0 :0	03	CIE:50 SEE:50	03 Hours	OEC

Course Objectives:

- Understand the basic concepts of database and Database Management System and difference between relational systems and non-relational systems.
- Understand and successfully apply logical database design principles, including E-R diagrams
- Understand basic database concepts, including the structure and operation of the relational data model.
- Design simple and moderately advanced database queries using Structured Query Language (SQL).
- Understand the concept of a database normalization and transaction

Teaching-Learning Process (General Instructions)

1. These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.
2. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
3. Use of Video/Animation to explain functioning of various concepts.
4. Encourage collaborative (Group Learning) Learning in the class.
5. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
7. Introduce Topics in manifold representations.
8. Show the different ways to solve the same problem with different circuits/ logic and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world-and when that's possible, it helps improve the student's understanding.

Module-1

Introduction to DBMS: Introduction, characteristics of database approach, actors on scene, workers behind the scene, advantages of DBMS approach, when not to use a DBMS

Database system concepts and architecture: Data models, schema and instances, three schema architecture and database languages and interfaces, Classification of DBMS

08 Hours

Module-II

Data Modeling using the Entity-Relationship (E-R) Model: Entity types, entity sets, attributes and keys, relationship types, relationship sets ,roles and structural constraints, weak entity types, proper naming of schema constructs and design choices for ER conceptual design redefining the ER design for the company database ,relationship types with degree higher than two

08 Hours

Module -III

Relational Database Concepts: Introduction to relational database, relational database structure, relational model terminology – domains, attributes, tuples, relations & relational database schema, integrity constraints, entity integrity, referential integrity, keys constraints, domain constraints.

08 Hours

Module- IV

Basic SQL: The CREATE TABLE command in SQL, attribute data types and domain in SQL, specifying constraints in SQL, basic retrieval queries in SQL, INSERT, DELETE and UPDATE statements in SQL, joins: inner ,outer join and self joins, aggregate functions in SQL, views (virtual tables) in SQL, The DROP and ALTER command, grouping : group by and having clause.

08 Hours

Module-V

Data Normalization: Anomalies in relational database design. Decomposition. Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.

Transaction Management: Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions.

08 Hours

Course Outcomes

At the end of the course the student will be able to

CO1: Describe the features of a database system and its application and compare various types of data models.

CO2: Identify entities and relationships and draw ER diagram for a given real-world problem.

CO3: Analyze relational database concepts and constraints associated with the relational model.

CO4: Formulate solution to a query problem using SQL Commands

CO5: Explain the need of normalization and normalize a given relation to the desired normal form and different approaches of transaction processing.

Text Books:

1. Fundamentals of Database Systems by Navathe and Elmasri –Pearson Education, Fifth Edition.

Reference books:

1. Database Systems Concepts, 3rd edition by Abraham Silberschatz, Henry Korth and S. Sudarshan McGraw Hill International Editions.
2. Introduction to Database systems by CJ Date, Published by Addison-Wesley.
3. Principles of database systems by Ullman, Computer Science press, 1984.

INTRODUCTION TO CYBER SECRITY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSI653	3:0:0:0	03	CIE:50 SEE:50	03 Hours	OEC

Prerequisite: Introduction to Cyber Security

Course Objectives:

- To familiarize cybercrime terminologies and perspectives
- Understanding cybercrime in mobiles and wireless devices along with the tools for Cybercrime and prevention
- Understand the motive and causes for cybercrime, cybercriminals, and investigators
- Understanding criminal case and evidence, detection standing criminal case and evidence

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic 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.

Module – I

Introduction to Cybercrime:

Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws, Global Perspectives

Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000. **08 Hours**

Module – II

Cyber Offenses:

How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cyber cafe & cybercrimes. | Botnets: The fuel for cybercrime, Attack Vector.

Botnets: The Fuel for Cybercrime, Attack Vector

08 Hours

Module-III

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, Attacks on Wireless Networks.

08 Hours

Module – IV

Understanding the people on the scene: Introduction, understanding cyber criminals, understanding cyber victims, understanding cyber investigators.

The Computer Investigation process: investigating computer crime.

Understanding Cybercrime Prevention: Understanding Network Security Concepts, Understanding Basic Cryptography Concepts, Making the Most of Hardware and Software Security

08 Hours

Module – V

Cybercrime Detection Techniques: Security Auditing and Log Firewall Logs, Reports, Alarms, and Alerts, Commercial Intrusion Detection Systems, Understanding E-Mail Headers Tracing a Domain Name or IP Address.

Collecting and preserving digital Evidence: Introduction, understanding the role of evidence in a criminal case, collecting digital evidence, preserving digital evidence, recovering digital evidence, documenting evidence.

08 Hours

Course Outcomes

At the end of the course the student will be able to:

CO1: Explain the cybercrime terminologies

C02: Describe the Cyber offenses and Botnets

CO3: Illustrate the Tools and Methods used on the Cyber crime

CO4: Explain the Phishing and Identity Theft

CO5: Justify the need of the computer forensics

Textbooks

1. SunitBelapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2013
2. Debra Little John Shinder and Michael Cross, “Scene of the cybercrime”, 2nd edition, Syngress publishing Inc, Elsevier Inc, 2008

Reference Books:

1. Robert M Slade, “Software Forensics”, Tata McGraw Hill, New Delhi, 2005.
   Ch1 (1.1 to 1.8) Chapter 7 (7.1. to 7.5, 7.7 to 7.9) Ch4 (4.1 to 4.9, 4.12)
2. Bernadette H Schell, Clemens Martin, “Cybercrime”, ABC – CLIO Inc, California, 2004.
   Ch3,Ch 4, Ch 7, Ch 9, Ch 10.
3. Nelson Phillips and EnfingerSteuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.
4. Kevin Mandia, Chris Prosise, Matt Pepe, “Incident Response and Computer Forensics”, Tata McGraw -Hill, New Delhi, 2006.

Weblinks and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=czDzUP1HclQ
2. https://www.youtube.com/watch?v=qS4ViqnjkC8
3. https://www.trendmicro.com/en_nz/ciso/21/h/cybercrime-today-and-the-future.html

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Real world problem solving: Demonstration of projects related to Cyber security.

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS654	3:0:0 :0	03	CIE:50 SEE:50	03 Hours	OEC

Pre-Requisites:

1. Mathematics, Probability and statistics.

Course Objectives:

The Student will be able to:

- Understand the modern view of AI as the study of agents that receive percepts from the Environment and perform actions.
- Gain knowledge of reasoning for different adversarial searches.
- Learn AI techniques for uncertain knowledge representation and reasoning.
- Gain knowledge of planning, decision making and learning methods in solving various problems.
- Understand the need of expert systems and their tools.

Module -I

Introduction to AI: Intelligent agents – Perception –Natural language processing – Problem – Solving agents – Searching for solutions: Uniformed search strategies – Informed search strategies.

08 Hours

Module-II

Knowledge and reasoning Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents: Propositional logic – First order logic – Syntax and semantics – Using first order logic – Inference in first order logic.

08 Hours

Module-III

Uncertain knowledge and reasoning-Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.

08 Hours

Module-IV

Planning and learning- Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic domains – Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

08 Hours

Module-V

Expert systems-Definition – Features of an expert system – Organization – Characteristics – Prospector –

Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN.

08 Hours

Course outcomes:

The Student will be able to:

CO1: Apply the modern view of AI as the study of agents that receive percepts from the Environment and perform actions.

CO2: Apply knowledge of reasoning for different adversarial searches.

CO3: Analyze AI techniques for uncertain knowledge representation and reasoning.

CO4: Develop knowledge of planning, decision making and learning methods in solving various problems.

CO5: Analyze the need of expert systems and their tools.

Textbooks:

1. Stuart Russel and Peter Norvig, 'Artificial Intelligence A Modern Approach' Pearson Education, Second Edition, 2019 / PHI
2. Donald A.Waterman 'A Guide to Expert Systems', Pearson Education, 2010.

Reference Books:

1. George F.Luger 'Artificial Intelligence – Structures and Strategies for Complex Problem Solving', Pearson Education, Fourth Edition, 2020.
2. Elain Rich and Kevin Knight,'Artificial Intelligence', Tata McGraw Hill, Second Edition, 2010.

E - Resources:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_pdf_version.htm
2. https://www.alljntuworld.in/download/artificial-intelligence-ai-materials-notes/
3. https://drive.google.com/file/d/1mPiI4jy6YkJRDiCT21xgzN0VDNkrW23X/view
4. https://towardsdatascience.com/outlier-detection-methods-in-machine-learning-1c8b7cca6cb8
5. http://robots.stanford.edu/papers/thrun.pf-in-robotics-uai02.pdf

MINIO PROJECT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type

21CSMP67	**-----**	**02**	**CIE:100**	**-----**	**MP**

***L:T:P:S** **Two contact hours /week for interaction between the faculty and students.**

INNOVATION/ENTERPRENURSHIP/SOCIETAL INTERNSHIP

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21INT68	**-----**	**03**	**CIE:100**	**-----**	**INT**

***L:T:P:S** **Completed during the intervening period of IV and V semesters**.

VII SEMESTER
COURSE SYLLABUS

CRYPTOGRAPHY & NETWORK SECURITY

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
21CST71	3 : 0 : 0 : 0	03	CIE:50 SEE:50	03 Hours	PCC

Course Objectives:

As a student will be able to learn:

- Acquire the knowledge of basic concepts of cryptography and network security and classify attacks on a network.
- Understand and analyze the different processes for hiding the information with conventional cryptographic algorithms.
- Comprehend various block cipher cryptosystems.
- Learn the concepts of public cryptosystems and key management Systems.
- Understand and apply authentication techniques to provide secure communication.

Prerequisites:

Students should have the knowledge of Computer Networks, Mathematics, and Algorithm Concepts.

Module – I

Introduction: Service mechanisms and attacks, The OSI security architecture, A Model for Network Security. **Symmetric Ciphers:** Symmetric cipher model, substitution techniques.

08 Hours

Module – II

Symmetric Ciphers: Transposition techniques, Steganography. **Block Ciphers and DES**: Simplified DES. Block cipher principles, DES, Strength of DES, Block cipher design principles.

08 Hours

Module – III

Advanced Encryption Standard - AES Transformation Function: Cipher-Substitute Bytes Transformation, Shift Row Transformation, Mix Column Transformation, Add Round Key Transformation, AES key expansion. Block cipher modes of operation.

08 Hours

Module – IV

Asymmetric Ciphers - Public key cryptography and RSA: Principles of public key cryptosystems, RSA algorithm. **Other public key cryptosystems and key management:** Key management, Diffie-Hellman key exchange. Elliptic Curve Cryptography.

08 Hours

Module – V

Network Security Applications - Authentication Applications: X.509 Authentication Service, Kerberos. **Electronic Mail Security:** PGP.

08 Hours

Course Outcomes

At the end of this course, students will be able to

CO1: Describe the basic concepts of cryptography and network security and classify attacks on a network, symmetric ciphers and substitution techniques.

CO2: Apply and integrate the different process for hiding the information with conventional cryptographic algorithms, transposition techniques and block ciphers.

CO3: Illustrate the various block cipher cryptosystems like DES and AES.

CO4: Analyse public cryptosystems and key management systems

CO5: Analyse and demonstrate authentication techniques to provide secure communication.

Textbooks:

1) Cryptography and Network Security: William Stallings, Pearson Education, 2003

2) Behrouz A Forouzan, Debdeep Mukhopadhyay: Cryptography and Network Security, 2nd Edition, Special Indian edition, Tata McGraw-Hill, 2011.

Reference Books:

1) Cryptography and Network Security, Atul Kahate, TMH, 2003

Reference Online Resources:

1) https://nptel.ac.in/course.php

ADVANCED COMPUTER ARCHITECTURE

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST72	2:0:0:0	02	100	03 Hours	PCC

Course Description: An Advanced Computer Architecture course typically covers advanced topics related to the design and organization of computer systems. This course is usually taken at the graduate level or in upper-level undergraduate programs in computer science or electrical engineering. The specific content may vary depending on the institution and the instructor, but here is a general overview of what might be covered in an Advanced Computer Architecture course:

Prerequisite: An Advanced Computer Architecture course often include a solid foundation in computer science and computer architecture at the undergraduate level. While specific prerequisites can vary between institutions and instructors,

Course Objectives:

- To learn the importance Understanding Fundamental and Input/Output Systems.
- To Develop a comprehensive understanding of memory hierarchy, encompassing the roles of cache, RAM, and secondary storage in computing systems to know the design patterns.
- To Provide an overview of parallel computing, including its significance, challenges, and advantages over sequential computing.
- Explore sequential and procedural programming, emphasizing structured and modular code design principles.
- Examine Amdahl's Law, assessing its impact on parallel program speedup and exploring constraints when a portion of the program remains serial.

Module – I

Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes.

08 Hours

Module – II

Memory System:

Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Virtual memories **Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors . **08 Hours**

Module-III

Parallel Computer Models: The state of computing, Classification of parallel computers, Multiprocessors and multicomputer, Multi vectors and SIMD computers. **Program and Network Properties:** Conditions of

parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency.

08 Hours

Module – IV

Program flow mechanisms: Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms. **Principles of Scalable Performance:** Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches.

08 Hours

Module – V

Speedup Performance Laws: Amdahl's law, Gustafson's law, Memory bounded speed up model, Scalability Analysis and Approaches .**Advanced Processors:** Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures.

08 Hours

Course Outcomes:

At the end of this course, the students will learn:

CO1: Understand the importance of Understanding Fundamental and Input/Output Systems Analyze to apply the UML notation and symbols.

CO2: Understanding of memory hierarchy, encompassing the roles of cache.

CO3: To overview of Master Sequential and Procedural Programming.

CO4: To understanding the sequential execution flow and logical structures within a program.

CO5: Apply Gustafson's Law to analyze and understand the scalability of parallel systems with larger problem sizes, emphasizing the importance of scaling with increased computational resources.

Text Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill.
2. Kai Hwang, ―Advanced computer architecture‖; TMH.

Reference Books:

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson
2. Kai Hwang and Zu, ―Scalable Parallel Computers Architecture‖; MGH.3. M.J Flynn, ―Computer Architecture, Pipelined and Parallel Processor Design‖; Narosa Publishing.

PROFESSIONAL ELECTIVE-II

OBJECT ORIENTED MODELLING AND DESIGN

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
21CST731	3:0:0:0	03	100	03 Hours	PEC

Course Description: A course on Object-Oriented Design and Modeling typically covers fundamental principles and techniques related to designing software systems using object-oriented methodologies. The course aims to equip students with the skills and knowledge necessary for creating modular, maintainable, and scalable software solutions. Below is a general course description that outlines the key topics often covered in such a course:

Prerequisite: Object-Oriented Design and Modeling course may vary depending on the institution and the specific curriculum. However, here are common prerequisites that students are expected to have before enrolling in such a course:

Course Objectives:

- To learn the importance of modeling in the software development life cycle.
- To apply the UML notation and symbols.
- To know the design patterns.
- To learn the object-oriented approach systems design and software solutions.
- To know the object-oriented software testing.

Module – I

Basic concepts: Basic concepts: objects, classes, abstract classes, data types, ADT, encapsulation and information hiding, inheritance, association, aggregation, composition, polymorphism, dynamic binding, object-oriented principles.

08 Hours

Module – II

Modelling Using UML: UML Diagrams: Use case diagrams, class diagrams, various relationships among classes: generalization, association, aggregation, composition, inheritance, dependency etc., object diagram, UML packages, activity diagram, state machine diagram, sequence diagram, communication diagram, interaction overview diagram, component diagram, deployment diagram, UML 2 diagrams.

08 Hours

Module – III

Design Patterns: Basic pattern concepts, Types of patterns, some common design patterns such as Expert, Creator, Façade, MVS, MVC, Publish-Subscribe, Observer, Proxy etc.

08 Hours

Module –IV

Designing using UML: Overview of OOAD methodology, Use case model development, Domain modelling, Identification of entity objects, Brooch's object identification method, Interaction modelling, CRC cards,

Applications of the analysis and design process, object-oriented design principles. OOD goodness criteria, CK Metrics, LK Metrics, MOOD Metrics, Code Refactoring

08 Hours

Module –V

Testing Object Oriented Software: Challenges in testing object-oriented software, Implications of object-oriented Features in testing object-oriented software, Importance of grey-box testing of object-oriented software, Coverage analysis, State-based testing, Class testing, Fault-Based Testing, Scenario-Based Test Design, Integration Testing: Thread-based integration Strategies, Use-based integration Strategies, Cluster Testing, Validation Testing, System Testing, Testing tools.

08 Hours

Course Outcomes:

At the end of this course, the students will learn:

CO1: Understand the importance of modeling in the software development life cycle.

CO2: Analyze to apply the UML notation and symbols.

CO3: Understand the design patterns.

CO4: Design and develop the object-oriented approach systems Design and software solutions.

CO5: Explore object-oriented software testing.

Text Book:

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018

Reference Books:

1. Rumbaugh and Blaha, Object-oriented Modeling and design with UML, Pearson, 2007
2. Bernd Bruegge and, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java, Pearson, 2009

BLOCK CHAIN TECHNOLOGY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS732	3 : 0 : 0 : 0	03	100	03 Hours	PEC

Course Objectives:

- Be Able to explain what is block chain and why we need block chain? What are the real-world problems that block chain is trying to solve?
- Understand and describe how block chain works and explain the underlying technology of transactions, blocks, proof-of-work, and consensus building.
- Understand and describe how blockchain works
- Explain the underlying technology of transactions, blocks, proof-of-work, and consensus building
- How bit coin crypto currency work.

Module– I

Introduction to Block chain: Back story of Block chain, what is Block chain? Centralized vs. Decentralized Systems, Layers of Block chain, why is Block chain Important? Limitations of Centralized Systems, Block chain Adoption So Far, Block chain Uses and Use Cases How Block chain Works-1: Laying the Block chain Foundation, Cryptography, Symmetric Key Cryptography.

08 Hours

Module– II

How Block chain Works-2: Asymmetric Key Cryptography, Diffie-Hellman Key Exchange, Symmetric vs. Asymmetric Key Cryptography, Nash Equilibrium, Prisoner's Dilemma, Byzantine Generals' Problem, Zero-Sum Games, Why to Study Game Theory, Computer Science Engineering, The Block chain, Merkle Trees, Putting It All Together, Properties of Block chain Solutions, Block chain Transactions, Distributed Consensus Mechanisms, Block chain Applications, Scaling Block chain, Off-Chain Computation, Sharding Block chain State

08 Hours

Module– III

How Bit coin Works: The History of Money, Dawn of Bit coin, What Is Bit coin? Working with Bit coins, The Bit coin Block chain, Block Structure, The Genesis Block, The Bit coin Network, Network Discovery for a New Node, Bit coin Transactions, Consensus and Block Mining, Block Propagation, Bit coin Scripts, Bitcoin Transactions Revisited, Scripts, Full Nodes vs. SPVs, Full Nodes, SPVs, Bit coin Wallets. **08 Hours**

Module– IV

Introduction to Cryptography & Crypto currencies: Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Crypto currency

08 Hours

Module– V

How to Store and Use Bit coins: Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

08 Hours

Course Outcomes:

After the completion of this course, student will be able to

CO1: Understand and explore the working of Block chain technology

CO2: Understand and analyze the working of game theory.

CO3: Analyze the working of bit coin scripts and transactions

CO4: Analyze the Impact of Block chain Technology on Crypto-currency.

CO5: Understand and explore online wallets, exchanges and payment services.

Text Books:

1. Beginning Block chain: A Beginner's Guide to Building Block chain Solutions by Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bit coin and Crypto-currency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

References Books:

1. Mastering Bit coin by Andreas M. Antonopoulos
2. Block chain Technology: Crypto-currency and Applications by S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Oxford University Press 2019.

E-Resources:

1. NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/#
2. Udemy: https://www.udemy.com/course/build-your-blockchain-az/
3. EDUXLABS Online training :https://eduxlabs.com/courses/blockchain technology-training/?tab=tab-curriculum

BIG DATA ANALYTICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS733	3:0:0:0	03	CIE: 50 SEE: 50	03 Hours	PEC

Description of the course:

Big Data has been described by some Data Management pundits (with a bit of a snicker) as "huge, overwhelming, and uncontrollable amounts of information." In 1663, John Graunt dealt with "overwhelming amounts of information". The Big Data course provides a unique approach to help students act on data for real business gain. The focus is not what a tool can do, but what you can do with the output from the tool. Gain the skills you need to store, manage, process, and analyze massive amounts of unstructured data to create an appropriate data lake. As big data analytics is gaining popularity with every passing day, it is essential for businesses to be aware of the big data analytics predictions and stay abreast with all the latest trends. The companies will require big data analytics to work on these data to provide insight for the companies so student able to get a better job in companies.

Prerequisite:

Good knowledge skill on database and data structures

Course Objectives:

This course will enable students to

- Understand Big – Data, Hadoop Distributed File system and Map Reduce.
- Explore Hadoop tools and manage Hadoop Administration.
- Appraise the role of Business intelligence and its applications across industries.
- Assess core data mining techniques for data analytics.
- Learn various Text Mining techniques.

Module - I

Introduction To Big Data: Big Data and its importance, Four Vs, Big data applications. Introduction To Hadoop: Hadoop Distributed File System Basics, Hadoop components, Hadoop Eco System, Hadoop Map Reduce Framework.

08 Hours

Module - II

Essential Hadoop Tools: Yarn, Hive, Oozie, Pig, Flume, Hadoop YARN Applications, Managing Hadoop with Apache Ambari, Basic Hadoop Administration Procedures.

08 Hours

Module-III

Business Intelligence Concepts and Application: BI – Tools, Skills, Applications, Data Warehousing – Approaches and Architecture, Data Mining – CRISP – DM, Techniques, Tools, Myths, Mistakes, Data Visualization – Types of charts.

08 Hours

Module – IV

Decision Trees: Pseudo code, Regression – Logistic, Advantages and Disadvantages, Artificial Neural Networks – Design principles, Steps in developing ANN, Advantages and Disadvantages, Cluster Analysis - K-means algorithm, Association Rule Mining - Apriori algorithm.

08 Hours

Module – V

Text Mining: Architecture , TDM, Applications, Naïve-Bayes Analysis - Model, Advantages and Disadvantages, Support Vector Machines - Model, Advantages and Disadvantages , Web Mining – Content, Structure, Usage, Social Network Analysis - Techniques and Algorithm, Page Rank, Practical Considerations.

08 Hours

Course Outcomes:

On completion of this course, the students are able to:

CO1: Master the concepts of Big Data, HDFS and Map Reduce framework
CO2: Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration
CO3: Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making
CO4: Demonstrate the importance of core data mining techniques for data analytics
CO5: Illustrate and analyze Text Mining Techniques

Text Books:

1) Douglas Eadline,"Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1stEdition, Pearson Education, 2016. ISBN-13: 978-9332570351
2) Anil Maheshwari, “Data Analytics”, 1st Edition, McGraw Hill Education, 2017. ISBN-13: 978-9352604180

Reference Books:

1) Tom White, ―Hadoop: The Definitive Guide‖,4 Edition, O'Reilly Media,
2) Boris Lublin sky, Kevin T. Smith, Alexey Yakubovich, ―Professional Hadoop Solutions",1st Edition, Wrox Press, 2014ISBN-13: 978-8126551071
3) Eric Sammer, ―Hadoop Operations: A Guide for Developers and Administrators",1st Edition, O'Reilly Media, 2012.ISBN-13: 978-9350239261

E-Resources:

1) https://www.tutorialspoint.com/big_data_tutorials.htm
2) https://nptel.ac.in/courses/106/104/106104189/

INTERNET OF THINGS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS734	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PEC

Course Objectives:

This course is designed to:

- Introduce the fundamental concepts of IoT and physical computing
- Expose the student to a variety of embedded boards and IoT Platforms
- Create a basic understanding of the communication protocols in IoT communications.
- Familiarize the student with application program interfaces for IoT.
- Enable students to create simple IoT applications.

Module-I

Overview of IoT: The Internet of Things: An Overview, The Flavour of the Internet of Things, the "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances. Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open-source Vs Close source, Tapping into the community.

08 Hours

Module-II

Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Other Notable Platforms, Mobile phones and tablets, Plug Computing: Always-on Internet of Things.

08 Hours

Module-III

Communication in the IoT: Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols.

Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol.

08 Hours

Module-IV

Business Models: A short history of business models, the business model canvas, who is the business model for, Models?, Funding an Internet of Things startup, Lean Startups.

Manufacturing: What are you producing, designing kits, Designing printed circuit boards.

08 Hours

Module-V

Moving to Manufacture: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software. **Ethics:** Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.

08 Hours

Course outcomes:

Upon completion of the course, the students should be able to:

CO1: Choose the sensors and actuators for an IoT application.

CO2: Select protocols for a specific IoT application.

CO3: Utilize the internet to establish the connections for IoT applications.

CO4: Experiment with embedded boards for creating IoT prototypes.

CO5: Design a solution for a given IoT application.

Text Book:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things,WileyPublications,2012

Reference Books:

1. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press,2014.
2. The Internet of Things, Enabling technologies and use cases – PethuruRaj, Anupama C. Raman, CRCPress.

Reference sites:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/

PROFESSIONAL ELECTIVE-III

INTRODUCTION TO DEEP LEARNING (IC)

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS741	3:0:0:0	03	100	03 Hours	PEC-III

Prerequisites: Data Mining, Data warehouse, Database, Big data, Cloud computing, Testing.

Course Objectives:

- Introduce the major applications and types of machine learning algorithms.
- Know the fundamentals of Neural Networks.
- Understand the basics of deep learning and its strategies.
- Illustrate the convolutional neural networks and Recurrent neural networks.
- Learn the use of deep learning tools, programming interface and various case studies.

Module -I

Machine Learning: Machine Learning - Examples of machine learning applications - Types of machine learning Supervised Learning: Classification - Decision Trees, Neural Networks – Unsupervised Learning: Clustering-Clustering Methods-Graph Clustering.

08 Hours

Module-II

Fundamentals Of Neural Networks: Basics of Neural Networks- Neural network representation-History andcognitive basis of neural computation- Perceptrons- Perceptron Learning Algorithm- Multilayer Perceptrons (MLPs)- Representation Power of MLPs- Back Propagation.

08 Hours

Module-III

Deep Learning Fundamentals And Strategies: Introduction to deep learning-History of Deep Learning-Perspectives andissues in deep learning – Deep Neural Networks - Unsupervised deep learning - Deep reinforcement learning - Deep learning strategies.

08 Hours

Module-IV

CNN and RNN: Foundations on CNN, Convolutional Neural Networks (CNNs): LeNet, AlexNet, ZF- Net, VGGNet, GoogLeNet, ResNet—Recurrent Neural Networks- Optimization in deep learning:Gradient Descent(GD)-Momentum Based GD.

08 Hours

1. Module-V

Deep Learning Tools: CUDA ToolKit: Introduction, Programming Model, Programming interface, Performance Guidelines- NVIDIA- NVIDIA Architecture- Case Study: Tensor Flow, Caffe, Theano, Torch.

08 Hours

Course Outcomes:

Students undergoing this course are able to:

CO1: Understand the concepts of machine learning algorithms.

CO2: Describe the fundamentals of neural networks.

CO3: Explain the different Strategies and Perspectives of Deep learning fundamentals.

CO4: Illustrate CNN and RNN model for real time application

CO5: Apply the knowledge in deep learning tools.

Text Books:

1. Goodfellow, I., Bengio,Y., and Courville, A., ‚Deep Learning', MIT Press,2016..
2. Ethem Alpaydin, ‚Introduction to Machine Learning', MIT Press,2014.
3. Li Deng and Ding Yu, ‚Deep Learning Methods and Applications',Now Publishers,2014.

Reference Books:

1. Tom M Mitchell, ‚Machine Learning' , First Edition, McGraw Hill Education, 2013
2. Yegnanarayana, B , ‚Artificial Neural Networks', PHI Learning Pvt. Ltd,2009.
3. Satish Kumar, ‚Neural Networks: A Classroom Approach', Tata McGraw-Hill Education,2004.
4. Christopher Bishop, ‚Pattern Recognition and Machine Learning' 2e,Springer, 2006.

List of Exercises / Experiments

1. Basic image processing operations: Histogram equalization, thresholding, edge detection,
2. data augmentation, morphological operations
3. Implement SVM/Softmax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network
4. Study the effect of batch normalization and dropout in neural network classifier
5. Familiarization of image labelling tools for object detection, segmentation
6. Image segmentation using Mask RCNN, UNet, SegNet
7. Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)
8. Image Captioning with Vanilla RNNs
9. Image Captioning with LSTMs

10. Network Visualization: Saliency maps, Class Visualization
11. Generative Adversarial Networks
12. Chatbot using bi-directional LSTMs
13. Familiarization of cloud based computing like Google colab

References:

1.Francois Chollet, “Deep learning with Python” – Manning Publications.

ADVANCED COMPUTER NETWORKS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS742	3-0-0-0	03	CIE:50 SEE:50	03 Hours	PEC

Prerequisite: This course assumes a basic knowledge of computer networks and working proficiency with Unix/Linux operating systems, computer networks and computer architecture courses.

Course Objectives:

The Course will enable Students to :

- Understand the fundamentals of network building and protocol layering.
- Explain datagram Communication and different service models with source routing techniques.
- Learn the concept of fundamental link state routing protocols.
- Understand the principles of simple Demultiplexer and mastering reliable byte stream.
- Gain knowledge on congestion control, early detection and configure troubleshoot communication.

Module-I

Foundation: Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window, Concurrent Logical Channels.

08 Hours

Module-II

Internetworking I: Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork? Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless addressing, Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Virtual Networks and Tunnels.

08 Hours

Module-III

Internetworking- II: Network as a Graph, Distance Vector (RIP), Link State (OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems (BGP), IP Version 6 (IPv6), Mobility and Mobile IP.

08 Hours

Module-IV

End-to-End Protocols: Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO,

Fair Queuing, TCP Congestion Control, Additive Increase/Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery.

08 Hours

Module-V

Congestion Control and Resource Allocation Congestion: Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System (DNS), Electronic Mail (SMTP, POP, IMAP, MIME), World Wide Web (HTTP), Network Management (SNMP).

08 Hours

Course outcomes:

After studying this course, the students will be able to:

CO1: Analyze the fundamental requirements of a network, connectivity and resource sharing.

CO2: Design scalable networking architectures to manage common network services.

CO3: Use the protocols involved in the establishment and termination of connections.

CO4: Develop proficiency in designing, managing scalable and efficient routing solutions.

CO5: Analyze skills in network management using SMTP including monitoring, configuring etc.

Text Books:

1. Larry Peterson and Bruce S Davi, "Computer Networks: A System Approach", 5thEdition, Elsevier Publications, 2014.
2. Douglas E Come, "Internetworking with TCP/IP, Principles, Protocols and Architecture", 6thEdition, PHI Publications, 2014.

Reference Books:

1. Uyless Black, "Computer Networks, Protocols, Standards and Interfaces", 2ndEdition, PHI.
2. Behrouz A Forouzan, "TCP /IP Protocol Suite", 4thEdition, Tata McGraw-Hill Publications.

E-Resources:

1. https://mu.ac.in/wp-content/uploads/2022/11/MSC-Computer-Science-Advance-Networking-Concepts.pdf
2. web.eecs.umich.edu/~zmao/eecs589/notes/lec1.pdf

ROBOTIC PROCESS AUTOMATION

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS743	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PEC

Prerequisites:

Basic understanding of software coding and programming logic.

Descriptions:

This is a complete Blue Prism Developer Course. It covers all the concepts related to RAP bot development using Blue Prism. After completing this course you should be able to develop your own BOT at your workplace. This course covers everything right from the basics, so anyone who is interested to become a Blue Prism developer can master the concepts.

Course Objectives:

This course will enable students to:

- Gain foundational knowledge of RPA and Blue Prism platform.
- Understanding of process studio.
- Understanding of object studio.
- Understanding of Exception Handling & Exception Management.
- Understanding of Release management.

Module – I

RPA: Benefits, Tools, Uses, Lifecycle, Types**. Automation:** Introduction to Blue Prism: Accessing the Blue Prism Training Environment and Learning Edition, Set-up, Quick Start, Glossary & Expression Writing guides.

08 Hours

Module – II

Process Studio: An introduction to Process Studio, Running a Process, Basic Skills, Process Validation, Decision Stage, Calculation Stage, Data Items.

Process Flow: Decisions, Circular Paths, Controlling Play, Set Next Stage, Breakpoints, Collections and Loops, Layers of Logic, Creating Input & Output Parameters, Stepping, Pages.

08 Hours

Module – III

Business Objects: An introduction to Business Objects & Object Studio, What are Business Objects? Using Action Stages, Using Object Studio, Using Navigation Stages, Using Wait Stages, Using Throttles, Unconditional Waits, Creating Unique Attributes, Using Write Stages, Using Read Stages, Creating Actions, Action Inputs & Outputs **08 Hours**

Module – IV

Exception Handling & Exception Management: An introduction to Exception Handling, Recovery Mode, Throwing an Exception, Exception Bubbling, Preserving the current Exception, Using Blocks.

08 Hours

Module – V

Work Queues: Introduction to Work Queues, Working Items, Queue Items, Work Queue Configuration, Deferring Items, and Exception Items retries. Additional Features: Release Manager.

08 Hours

Course Outcomes:

On completion of the course, students will be able to:

CO1: Understand Robotic Process Automation technology with blue prism.

CO2: Apply through blue prism tool to process input/output configurations.

CO3: Explore the business objects studio to interact with external applications.

CO4: Design a programmed robot that includes exception management.

CO5: Explore Release Management and Deploy bots with Control room.

Text Books:

1. Blue prism Software Robots- The Virtual Workforce Foundation Course Training Guide Version: 5.0.2
2. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: OReilly Publishing, 2018, ISBN: 9781788470940 2.

Reference Books:

1. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018
2. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation, 1st Edition, Consulting Opportunity Holdings LLC, 2018

E-Resources:

1. https://www.tutorialspoint.com/blue_prism/blue_prism_introduction_to_rpa.htm
2. https://www.guru99.com/blue-prism-tutorial.html

OPEN-SOURCE TECHNOLOGIES

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
21CS744	3:0:0:0	03	CIE:50 SEE:50	03 Hours	PEC

Prerequisites:

Basic knowledge of computers, operating systems and commercial soft wares

Descriptions:

This course builds on design and programming courses for the students to learn the technologies, social, and pragmatic aspects of developing opensource software through direct involvement in an open source project. Students will learn to use the tools, techniques, and strategies of open source developers.

Course Objectives:

This course will enable students to:

- Understand the difference between open source software and commercial software.
- Learn about system Administrator task.
- Learn about Network and Security Administration.
- Learn about Shell Programming.
- Learn about Open source Tools.

Module – I

Over View of Open Source Software : Need of Open Sources –Advantages of Open sources – Applications-FOSS – FOSS usage –Free Software Movement – Commercial Aspect of Open SourceMovement – Licensing – Certification – Open Source Software Development Model – comparison with close source / Proprietary software – Free Software – Open source vs source –available –Widely used open source software license :Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public Licenseand Mozilla Public License.

Open Source Operating System:Installation of Linux (Redhat-CentOS): Theory about MultibootEnvironment, Hardisk Partitioning, Swap space, LVM, and Boot loader.

Command Line: Basic File System Management Task, working with files, Piping and Redirection, Working with VI editor, use of sed and understanding FHS of Linux.

08 Hours

Module – II

Open Source Operating System: System Administrator task: Job management, Process Management, Mounting Devices and file system working with Linux, Backup, working with user, group and permission, Managing Software. Understanding Boot process and related files, Common kernel Management Task.

08 Hours

Module – II

Open source Operating System: Network and Security Administration: Basic networking commands, Configuration of Apache Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers. Securing servers with IP tables. Setting up cryptographic services, SSL, Managing Certificate with OpenSSL, working with the GNU Privacy guard.

08Hours

Module – IV

Open Source Operating System: Shell Programming: Bash Shell Scripting, Executing Script, Working with Variables and Input, Using Control Structures, Script control, handling with signals, Creating functions, working sed and gawk.

Working with web using shell script: Downloading web page as formatted text file and parsing for data, working URL etc.

08 Hours

Module – V

Open source Tools:Version Control using RCS and CVS (hands on RCS in single Machine) Content management: Understanding working of Drupal (Basic Drupal components) Security assessment: OpenVAS IDE: Working of Eclipse.08 Hours

Course Outcomes :

On completion of the course, students will be able to:

CO1: Differentiate and elaborate the open source technology.

CO2: Perform System Administrator Task.

CO3: Configure the Network Securities for open source.

CO4: Design commands using Shell Programming

CO5: Create Open Source projects – Linux, Eclipse.

Text books:

1. Redhat Linux 6.0 Administration Wiley
2. Linux Shell scripting Cookbook: SarathLakshman PACKT
3. Linux Lab - Open source Technology : Ambavade -Dreamtech
4. Beginning Android Development Wrox Press

Reference books:

1. Drupal guide to Planning and Building Web Site: Wrox Pres

OPEN ELECTIVE COURSE -II

R PROGRAMMING

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS751	3:0:0:0	03	CIE:50 SEE:50	03 Hours	OEC

Prerequisite: Programming Knowledge, Statistics.

Course Objectives:

- Explore and understand how R and R Studio interactive environment.
- To learn and practice programming techniques using R programming.
- Read Structured Data into R from various sources.
- Understand the different data Structures, data types in R.
- To develop small applications using R Programming

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic 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
9. helps improve the students' understanding.

Module - I

Numeric, Arithmetic, Assignment, and Vectors: R for Basic Math, Arithmetic, Variables, Functions, Vectors, Expressions and assignments Logical expressions.

08 Hours

Module - II

Matrices and Arrays: Defining a Matrix, Sub-setting, Matrix Operations,

Conditions and Looping: if statements, looping with for, looping with while, vector-based programming.

08 Hours

Module - III

Lists and Data Frames: Data Frames, **Lists,** Special values, the apply family.

08 Hours

Module - IV

Functions: Calling functions, scoping, Arguments matching, writing functions: The function command, Arguments, specialized function.

08 Hours

Module - V

Pointers: packages, frames, de bugging, manipulation of code, compilation of the code.

08 Hours

Teaching-Learning Process for all modules

Chalk and board, Active Learning, Demonstration, presentation, problem solving, MOOC

Course Outcomes (Course Skill Set):

At the end of the course the student will be able to:

CO1: To understand the fundamental syntax of R through readings, practice exercises,

CO2: To demonstrations and writing R code.

CO3: To apply critical programming language concepts such as data types, iteration,

CO 4: To understand control structures, functions, and Boolean operators by writing R programs and through examples

CO 5: To import a variety of data formats into R using R-Studio

Textbooks

1. Jones, O., Maillardet. R. and Robinson, A. (2014). Introduction to Scientific Programming and Simulation Using R. Chapman & Hall/CRC, The R Series.
   Chapter 2(2.1 to 2.7), Chapter 2- 2.8, chapter 3- 3.2 to 3.5., Chapter 6- 6.2 to 6.4, Chapter 5- 5.1 to 5.6, Chapter 8- 8.1 to 8.8

References:

1. Michael J. Crawley, “Statistics: An Introduction using R”, Second edition, Wiley,2015

Weblinks and Video Lectures (e-Resources):

1. Wickham, H. & Grolemund, G. (2018). for Data Science. O’Reilly: New York. Available for free at http://r4ds.had.co.nz

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Demonstration of simple projects

INTRODUCTION TO MACHINE LEARNING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS752	3-0-0-0	03	CIE:50 SEE:50	03 Hours	OEC

Description of the course:

Machine learning (ML) is a form of Artificial intelligence that makes predictions from data. It is a new technological aspect which is used to automate processes like image classification, speech recognition, and market forecasting. A machine learning (ML) developer is an expert on using data to training models.

Prerequisite:

Basic Probability concepts

Course Learning Objectives:

This course will enable students to:

- Understand the basic concepts of various types of machine learning algorithms
- Understand the well posed learning techniques.
- Design decision tree models to solve the problem
- Apply Artificial Neural Networks with multilayer perceptron.
- Solve problems by applying simple Reinforcement based learning methods.

Module– I

Introduction: Introduction to machine learning, Types of Machine learning, supervised learning, unsupervised learning, semi supervised learning, reinforcement learning, Batch learning, Online Learning, Instance based learning, Model based learning, Bad and insufficient quality of data, poor quality data, Irrelevant features, Testing, Over fitting and Under fitting the data

Teaching Learning Methodology: Chalk & Talk**,** Python IDE **08 Hours**

Module–II

Introduction to Well-Posed Learning problems, designing a learning system, Perspectives and issues in machine learning, Find-S Algorithm, Candidate elimination Algorithm.

08 Hours

Teaching Learning Methodology: Chalk & Talk, Python IDE

Module– III

Decision Tree Learning: Introduction, Decision Tree representation, Appropriate problems for decision tree learning, The basic decision tree algorithm, C4.5 algorithm, Hypothesis space search in decision tree algorithms, Issues in decision tree learning.

08 Hours

Teaching Learning Methodology: Chalk & Talk, Python IDE

Module– IV

Artificial Neural Networks: Introduction, Neural network representation, Problems for neural network learning, Perceptrons, Multiple layer networks and back propagation algorithm, Remarks on the Back-propagation Algorithm

08 Hours

Teaching Learning Methodology: Chalk & Talk, Python IDE

Module– V

Reinforcement Learning: Introduction, Reinforcement learning problem, Reinforcement learning problem characteristics, The Learning task, Q Learning, An Algorithm for Q learning.

08 Hours

Teaching Learning Methodology: Chalk & Talk, Python IDE

Course Outcomes:

On completion of this course, the students will be able to:

CO1: Discuss the concepts of machine learning algorithm and its types.

CO2: Design Different machine learning algorithms.

CO3: Use decision tree models to solve the problem

CO4: Apply neural networks for appropriate applications.

CO5: Analyze Reinforcement learning problem and its characteristics.

Text Books:

1. Tom M Mitchell, “Machine Learning”, McGraw-Hill, 1997
2. Rudolph Russell, Machine Learning Step by step guide to implement machine learning algorithms with python

Reference Books:

1. Aaron Courville, Ian Goodfellow, and Yoshua Bengio, Deep Learning, MIT Press,2015, ISBN:9780262035613
2. Christopher Bishop, Pattern recognition and machine learning. Himalaya Publishing House. ISBN: 98345789
3. Course material available on Swayam platform and NPTEL, for the course on Introduction to Machine Learning, conducted by Prof. Sudeshna Sarkar, IIT Kharagpur
4. Ethem Alpaydın, Introduction to Machine Learning, MIT press 4th edition ISBN: 9780262043793.
5. C Agarwal, Machine Learning for Text, Pearson Education - 2006 (2 & 4). ISBN – 15:34519801.

E-RESOURCES:

- http://www.infocobuild.com/education/audio-video-

courses/electronics/PatternRecognitionApplication-IIT-Kharagpur/lecture-27.html

- https://cs.stanford.edu/people/eroberts/courses/soco/projects/neural-networks/Sources/index.html
- https://onlinecourses.nptel.ac.in/noc19_ee53/preview
- https://onlinecourses.nptel.ac.in/noc22_ge04/preview
- http://www.digimat.in/nptel/courses/video/117105084/L35.

DIGITAL MARKETING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CS753	3:0:0:0	03	CIE:50 SEE:50	03 Hours	OEC

Course Objectives:

This course will enable students to:

- Comprehend business advantages of digital marketing and its importance for marketing success and to develop a digital marketing plan.
- Learn Website and SEO optimization techniques and also, to outline Google Ad Words campaigns.
- Acquire knowledge of Google Analytics for measuring effects of digital marketing and to get insights of future trends that will affect the development of digital marketing.
- Learn to use various social media platforms in order to create, manage and evaluate digital marketing efficiently.
- Cognize strategies used for email marketing, resource planning and budgeting.

Module - I

Introduction to digital marketing, Digital vs. Real Marketing, Digital Marketing Channels, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis, Web design, Optimization of Web sites.

08 Hours

Module - II

SEO Optimization, Writing the SEO content, Web design, Optimization of Web sites, Google AdWords- creating accounts, Google AdWords- types, Introduction to CRM, CRM platform, CRM models, Introduction to Web analytics, Web analytics - levels.

08 Hours

Module - III

Introduction of Social Media Marketing, creating a Facebook page, Visual identity of a Facebook page Types of publications, Business opportunities and Instagram options, Optimization of Instagram profiles, Integrating Instagram with a Web Site and other social networks, Keeping up with posts.

08 Hours

Module - IV

Business tools on LinkedIn, creating campaigns on LinkedIn, Analyzing visitation on LinkedIn, Creating business accounts on YouTube, YouTube Advertising, YouTube Analytics, Facebook Ads,
Creating Facebook Ads, Ads Visibility.

08 Hours

Module - V

E-mail marketing, E-mail marketing plan, E-mail marketing campaign analysis, Keeping up with conversions, Digital Marketing Budgeting- resource planning - cost estimating - cost budgeting – cost control.

08 Hours

Course Outcomes:

On completion of this course, the students are able to:

CO1: Discuss the importance of digital marketing and create suitable plans for marketing success.

CO2: Analyse customer relationships across all digital channels and build better customer relationships.

CO3: Design social media pages for marketing purpose.

CO4: Develop social media channels to achieve maximum benefit for the business.

CO5: Analyze the email marketing strategies to minimize the digital marketing budget.

Text Book:

1. Damian Ryan & Calvin Jones, "Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation", Kogan Page Limited, 1st Edition, 2009, ISBN-978- 0749453893.

Reference Books:

1. Joe Pulizzi, "Epic Content Marketing", McGraw-Hill Education, 1stEdition 2013, ISBN-978-0071819893.
2. The Beginner's Guide to Digital Marketing (2015), Digital Marketer. (PDF)

E-Resources:

1. https://www.digitalmarketer.com/digital-marketing/
2. https://www.tutorialspoint.com/digital_marketing/index.htm
3. https://www.javatpoint.com/digital-marketing

DATA SCIENCE & VISUALIZATION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type

21CS754	**3 : 0 : 0 : 0**	**03**	**100**	**03 Hours**	**PEC**

COURSE OBJECTIVES:

- To introduce data collection and pre-processing techniques for data science
- Explore analytical methods for solving real life problems through data exploration techniques
- Illustrate different types of data and its visualization
- Find different data visualization techniques and tools
- Design and map element of visualization well to perceive information

Module– I

Introduction to Data Science

Introduction: What is Data Science? Big Data and Data Science hype – and getting past the hype, Why now? Datafication, Current landscape of perspectives, Skill sets. Needed Statistical Inference: Populations and samples, Statistical modelling, probability distributions, fitting a model

08 Hours

Module– II

Exploratory Data Analysis and the Data Science Process

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The DataScience Process, Case Study: Real Direct (online real estate firm). Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbours (k- NN), k-means.

08 Hours

Module– III

Feature Generation and Feature Selection

Extracting Meaning from Data: Motivating application: user (customer) retention. Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms. Filters; Wrappers; Decision Trees; Random Forests. Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.

08 Hours

Module– IV

Data Visualization and Data Exploration

Introduction: Data Visualization, Importance of Data Visualization, Data Wrangling, Tools and Libraries for Visualization Comparison Plots: Line Chart, Bar Chart and Radar Chart; Relation Plots: Scatter Plot, Bubble

Plot , Correlogram and Heatmap; Composition Plots: Pie Chart, Stacked Bar Chart, Stacked Area Chart, Venn Diagram; Distribution Plots: Histogram, Density Plot, Box Plot, Violin Plot; Geo Plots: Dot Map, Choropleth Map, Connection Map; What Makes a Good Visualization?

08 Hours

Module– V

Deep Dive into Matplotlib

Introduction, Overview of Plots in Matplotlib, Pyplot Basics: Creating Figures, Closing Figures, Format Strings, Plotting, Plotting Using pandas DataFrames, Displaying Figures, Saving Figures; Basic Text and Legend Functions: Labels, Titles, Text, Annotations, Legends; Basic Plots:Bar Chart, Pie Chart, Stacked Bar Chart, Stacked Area Chart, Histogram, Box Plot, Scatter Plot, Bubble Plot; Layouts: Subplots, Tight Layout, Radar Charts, GridSpec; Images: Basic Image Operations, Writing Mathematical Expressions

08 Hours

Course Outcomes:

At the end of the course the student will be able to:

CO 1: Understand the data in different forms

CO 2: Apply different techniques to Explore Data Analysis and the Data Science Process

CO 3: Analyze feature selection algorithms & design a recommender system.

CO 4: Evaluate data visualization tools and libraries and plot graphs.

CO 5: Develop different charts and include mathematical expressions.

Suggested Learning Resources:

Textbooks

1. Doing Data Science, Cathy O'Neil and Rachel Schutt, O'Reilly Media, Inc O'Reilly Media, Inc, 2013
2. Data Visualization workshop, Tim Grobmann and Mario Dobler, Packt Publishing, ISBN 9781800568112

Reference:

1. Mining of Massive Datasets, Anand Rajaraman and Jeffrey D. Ullman, Cambridge University Press, 2010
2. Data Science from Scratch, Joel Grus, Shroff Publisher /O'Reilly Publisher Media
3. A handbook for data driven design by Andy krik

Weblinks and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/105/106105077/
2. https://www.oreilly.com/library/view/doing-data-science/9781449363871/toc01.html
3. http://book.visualisingdata.com/
4. https://matplotlib.org/
5. https://docs.python.org/3/tutorial/

PROJECT WORK

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSP76	-------	10	CIE:100 SEE:100	03 Hours	Project

- Two contact hours /week for interaction between the faculty and students.

Activity of Phase – I

Batch formation, project identification, literature survey, Guide allocation, finalization of problem statement with objectives and outcomes, Synopsis submission, Preliminary seminar for the approval of the selected topic and objectives.

Course Outcomes:

CO1: Review the current state of Art and trends in their area of interest in current technologies and identify a suitable problem in their chosen subject domain with justification.

CO2: Survey the available research literature/documents for the tools and techniques to be used.

CO3: Examine the functional, non-functional, and performance requirements of their chosen problem definition.

CO4: Design system architecture for different components and develop all the system components using appropriate tools and techniques.

CO5: Work effectively in a team and use good project management practices and defend the project work as a team.

VIII SEMESTER
COURSE SYLLABUS

TECHNICAL SEMINAR

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21CSM81	----	01	CIE:100	03 Hours	Seminar

- One contact hours /week for interaction between the faculty and students.

RESEARCH INTERNSHIP/INDUSTRY INTERNSHIP

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
21INT82	**----**	**15**	**CIE:100 SEE:100**	**----**	**INT**

- Two contact hours /week for interaction between the faculty and students.

Activity of Internship

Students need to complete Internship at Industry and should submit the certificate along with the report.