M.Sc. Software System

Syllabus

AFFILIATED COLLEGES

Program Code: 32J

2023 – 2024 onwards

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A++" Grade by NAAC,
Ranked 21st among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)	
The **M.Sc. SS** programdescribe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Gradates would be software professionals deploying technical skills to solve industry related problems.
PEO2	Graduates will contribute towards the society with responsibility
PEO3	Graduates will work towards enhancing research, academics, industry and government.

Program Specific Outcomes (PSOs)	
After the successful completion of **M.Sc. SS** program, the students are expected to	
PSO1	To apply knowledge gained to solve computational tasks related to various disciplines.
PSO2	To design software solutions for developing complex software and hardware problems using advanced techniques.
PSO3	To work as a effective leader and with team spirit with professional ethics and managerial skills to manage diverse projects.

Program Outcomes (POs)	
On successful completion of the **M.Sc. SS**program	
PO1	Develop creativity and Problem Solving skills with the knowledge of Computing and Mathematics.
PO2	Ability to develop and carry out experiments, interpret and infer data
PO3	Design algorithms and develop software to aid solutions to industry and governments.
PO4	Review the latest technology and tool handling mechanism.
PO5	Analyses the outcome to solve global environment related issues.
PO6	Apply the knowledge in lifelong learning journey to equip themselves.
PO7	Identify the perspective of business practices, risks and limitations.
PO8	Work with professional and ethical values.
PO9	Formulate the responsibilities of human rights and entrepreneurial spirit.
PO10	Understand the methods to communicate effectively and work collectively.

BHARATHIAR UNIVERSITY:: COIMBATORE.
M.Sc. SOFTWARE SYSTEM
(*Affiliated Colleges - *Effective For the candidates admitted during the academic year 2023 – 2024 & onwards)
REVISED SCHEME OF EXAMINATIONS – CBCS PATTERN

Course Code	Title of the Course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total Marks
FIRST SEMESTER							
	Paper I English	4	4		25	75	100
	Paper II Algebra and Calculus	4	4		25	75	100
	Paper III Introduction to Information Technology	4	4		25	75	100
	Paper IV Digital Fundamentals and Computer Architecture	4	5		25	75	100
	Paper V Programming in C	4	5		25	75	100
	Practical I C Programming Lab	3		4	40	60	100
	Practical II Office Automation Lab	3		4	40	60	100
	Total	26	22	8			
SECOND SEMESTER							
	Paper I Numerical Methods	4	4		25	75	100
	Paper II Microprocessors and Assembly Language	4	4		25	75	100
	Paper III Accounting and Financial Management	4	5		25	75	100
	Paper IV Data Structures	4	5		25	75	100
	Paper V System Software	4	4		25	75	100
	Practical I Assembly Language Programming Lab	3		4	40	60	100
	Practical II Data Structures Lab	3		4	40	60	100
	Total	26	22	8			
THIRD SEMESTER							
	Paper I Discrete Structures	4	4		25	75	100
	Paper II Operating Systems	4	4		25	75	100
	Paper III Multimedia	4	4		25	75	100
	Paper IV Object Oriented	4	5		25	75	100
	Paper V COBOL and Business Data Processing	4	5		25	75	100
	Practical I Object Oriented Programming Lab	3		4	40	60	100
	Practical II COBOL Programming Lab	3		4	40	60	100
	Total	26	22	8			

FOURTH SEMESTER							
	Paper I Operations Research	4	4		25	75	100
	Paper II Computer Graphics	4	4		25	75	100
	Paper III Relational Data Base Management System	4	4		25	75	100
	Paper IV Computer Networks	4	5		25	75	100
	Paper V Structured System Analysis and Design	4	5		25	75	100
	Practical I Graphics and Multimedia Lab	3		4	40	60	100
	Practical II RDBMS Lab	3		4	40	60	100
	Total	26	22	8			
FIFTH SEMESTER							
	Paper I Web Designing	4	4		25	75	100
	Paper II Client Server Computing	4	4		25	75	100
	Paper III Software Engineering	4	4		25	75	100
	Paper IV Visual Programming	4	5		25	75	100
	Paper V Principles of Compiler Design	4	5		25	75	100
	Practical I Web Designing Lab	3		4	40	60	100
	Practical II Visual Programming Lab	3		4	40	60	100
	Total	26	22	8			
SIXTH SEMESTER							
	Paper I Java Programming	4	4		25	75	100
	Paper II Python Programming	4	4		25	75	100
	Paper III Elective-I	4	4		25	75	100
	Paper IV Mobile Computing	4	5		25	75	100
	Paper V Object Oriented Analysis and Design	4	5		25	75	100
	Practical I Java Programming Lab	3		4	40	60	100
	Practical II Python Programming Lab	3		4	40	60	100
	Total	26	22	8			
SEVENTH SEMESTER							
	Project Work and Viva Voce – I	13			50	150*	200
	Total	13					

EIGHTH SEMESTER							
	Paper I Data Mining and Warehousing	4	4		25	75	100
	Paper II Advanced Java Programming	4	4		25	75	100
	Paper III Elective – II	4	4		25	75	100
	Paper IV Artificial Intelligence and Expert Systems	4	5		25	75	100
	Paper V Information Security	4	5		25	75	100
	Practical I Data Mining using R	3		4	40	60	100
	Practical II Advanced Java Programming Lab	3		4	40	60	100
	Total	26	22	8			
	NINETH SEMESTER						
	Paper I Principles of Management and Marketing	4	4		25	75	100
	Paper II PHP Programming	4	4		25	75	100
	Paper III Software Testing	4	4		25	75	100
	Paper IV Elective – III	4	5		25	75	100
	Paper V Elective – IV	4	5		25	75	100
	Practical I PHP Programming Lab	3		4	40	60	100
	Practical II Software Testing Lab	3		4	40	60	100
	Total	26	22	8			
TENTH SEMESTER							
	Project Work and Viva Voce - II	13			50	150*	200
	Total	13					
	Grand Total	234					6000

ONLINE COURSES							
1.	**#SWAYAM / MOOC**	2					
2.	**#Job oriented Certificate course**	2					

* Project Evaluation – 100 marks, Viva-voce – 50 marks in ESE

During II / III /IV/V/VI/VII/VIII / IX Semester (Optional).

First
Semester

Course code		ENGLISH	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the students are familiar with fundamentals of English Grammar and its Mechanism	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:
1. Acquire greater skills in speech mechanism
2. Eradicate grammatical errors in writing.
3. Carry out casual conversation in everyday situation.
4. Equip with language skills

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Develop the ability of critical reading and thinking	K4,K5
2	Heighten awareness of correct usage of English grammar in writing and speaking & enlarge their vocabulary	K1,K3
3	Improve reading fluency skills, comprehension & Increase self-awareness about the English language	K2,K4
4	Enhance professionalism & competence in the four modes of literacy	K3,K6
5	Strengthen the ability to write academic papers, essays, reports and summaries using the process approach	K4,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	READING PRACTICE	12-- hours

Reading practice and exposure to samples of good Written English. The motherlands to youth (Oratorical style used in a speech) - Kid charlie Chaplin (first person in big-graphy) - Mr. Know all (short story) - Futurology aldoushuxley (essay on a serious topic) – The Lessons are to be used for reading practice and discussion - The Exercise at the end of each lesson on ―pairs of words‖ and idioms are to be carefully studied to strengthen vocabulary and pronunciation - The lessons arc to be used as a base for practicing essay writing.

Unit:2	STRUCTURES AND VOCABULARY	12-- hours

Structures and vocabulary used in technical writing in English - The comparative structure - Impersonal passive - In structures - Purpose - Time statement and contracted statementPreposition which - Because of pattern - Noun and phrases.

Unit:3	READING COMPREHENSION	12-- hours

The lessons that are prescribed for detailed study in the textbook may be used to teach reading comprehension.

Unit:4	LETTER WRITING	12-- hours

The following types of letter writing are to be taught: Inviting a dignitary for a function - Accepting the invitation - Declining the invitation - Calling for quotations - Placing orders - Letter of complaints regarding goods, conserving water, electricity etc. and being punctual - Letter for clarification - riting Application for the post.

Unit:5	WRITING A REPORT	12-- hours

Writing a laboratory report on a simple experiment in Physics Transcending: Tabular columns - The tree diagrams - Pie diagrams - View diagrams Block diagrams and flowcharts into continuous writing

and vice versa.		
Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
	Expert Lectures – Online Seminars - Webinars	
	Total Lecture hours	**60 -- hours**

Text Books	
1	KeshavaKurap and B.Ardhanareeswaran ―New patterns of contemporary prose‖ edited Macmillan,Madras.
2	Humanities and Social Sciences Division‖, Anna University, Madras. ―English for Engineers and Technologies - Skill approach‖, Madras, Orient Longman Ltd, 1990.
3	Freeman saran, ―Written Communication in English ―, Calcutta Orient Longman Ltd, 1989.
Reference Books	
1	Pillai G. Radakrishnan, K. Razeevan and P. Baskaran Nair, ―written English for you ―, Madras, Emerald Publishers
2	Herbert A.J. "The Structure of Technical English", Singapore, Longmans, 1987.
Related Online Contents [TUTORIAL POINT, SWAYAM, W3 computing, Websites etc.]	
1	https://www.britishcouncil.in/english/courses-adults/spoken-english
2	NPTEL Course: Technical English for Engineers
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	M	S	M	S
CO2	L	L	L	L	L	L	L	S	L	S
CO3	L	L	L	M	L	S	L	M	L	S
CO4	M	L	L	M	L	S	L	S	S	S
CO5	M	L	L	M	L	L	L	S	L	S

*S-Strong; M-Medium; L-Low

Course code		ALGEBRA AND CALCULUS	L	T	P	C
Core/Elective/Supportive		Supportive	4			4
Pre-requisite		This course requires that the students are familiar with the basic formulae in trigonometry and they are well known with the integration.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Learn the basics of Classical algebra and Trigonometry
2. Know the applications of Differential and Integral Calculus
3. Apply the Trigonometric and Hyperbolic functions for solving problems
4. Develop the applications of Horner's method
5. Create the knowledge on recognizing the appropriate tools of calculus to solve applied problems.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of all trigonometric functions	K2
2	Evaluate Maxima and Minima for given equations	K5
3	Solve algebraic equations and inequalities.	K5
4	Know basic ideas of vector algebra	K1
5	Analyze the topic like Line integral, Surface Integral with generalize integration to functions defined on curves and surfaces.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	ALGEBRA	12-- hours

Algebra: Binomial, Exponential, Logarithmic series- Summation of series using Binomial, Exponential, Logarithmic series-Finding coefficients of x in power series expansion-Approximation using Binomial, Exponential, Logarithmic series. Theory of equations; relations between roots and coefficients of polynomial-formation of equations- Decreasing and increasing of roots- Reciprocal equations. Horner's method of finding the roots of polynomial equations.

Unit:2	TRIGONOMETRY	12-- hours

Trigonometry: Expansion of sin nx,cosnx in terms of sin x, cosx,expansion of tanx. Expansion of

sin x, cos x, tan x- hyperbolic and inverse hyperbolic functions- Logarithms of complex numbers.

Unit:3	APPLICATIONS OF DIFFERENTIAL CALCULUS	12-- hours

Applications of differential calculus : Curvature in Cartesian and polar coordinates –circle of curvature. Envelopes and evolutes –statement of Taylor's series for a function of two variables – Maxima and Minima of two variables(proof not required). Constrained maxima and minima – Lagrange's multiplier method.

Unit:4	MULTIPLE INTEGRALS	11-- hours

Multiple integrals: Evaluation of multiple integrals – Change of order of integration-application of multiple integral to find area and volume of solid . Beta and Gamma integrals : Definition – Relation connecting beta and gamma integral – Properties –Evaluation of definite integration in terms of Beta and Gamma functions .

Unit:5	VECTOR CALCULUS	11-- hours

Vector calculus: Differentiation of vectors – Gradient , divergence of curl – Directional Derivative- Line, Surface and volume integral – Statement of greens theorem – Gauss divergence theorem and Stoke's theorem – Applications.

Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**60-- hours**

Text Book(s)

1. Venkata Subramanian N. K, Lakshmi Narayanan K. A, Sundram V and Balasubramanian R "Engineering mathematics ", JJ publishing company , Madurai, 1996.
2. VenkataramanN.K , "Engineering mathematics vol 1,ii" , The National publishing Co , 1981.

Reference Books

1. Narayanan S, Manickavachagampillai T.K and RamanaianG,"Advanced Mathematics For Engineering students vol-I " S.Vishwanathan (Printers and Publishers pvt ltd) 1986.
2. Kandasamy P , Thilagavathy K , and Gunavathy K , "Engineering Mathematics Vol ,2" , S.Chand and co,New Delhi Vol-1989, Vol2-1990.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

- SWAYAM Course: Differential calculus.
- NPTEL Course: Algebra-I

Course Designed By:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
S	M	M	M	S	L	L	L	L	S
S	M	S	S	L	L	L	L	M	M
S	S	S	L	S	L	M	M	L	S
S	M	M	S	L	L	L	M	L	M
S	M	M	M	M	L	M	L	L	S

*S-Strong; M-Medium; L-Low

Course code		Introduction to Information Technology	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Should have knowledge on electronics technology	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Learn basics of Data and its types, Input Units
2. Acquire the knowledge on processing Multimedia Data
3. Understand the information stores in Memory and Output Devices.
4. Know the basic concepts of Computer Networks
5. Able to Communicate through Internet

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts on data and Information	K2
2	Apply techniques for processing textual data, pictures and Images.	K1,K3
3	Identify various memory units and remember the input and output devices	K1,K4
4	Know about software, hardware and networks	K2
5	Handle internet applications comfortably	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Data and Information	12-- hours

Data and Information: Types of data, simple model of a computer – Desktop computer. Acquisition of numbers and textual data: Introduction – Input units – Internal representation of numeric data, representation of characters in computers – Error detecting codes.

Unit:2	Fundamentals of Data Acquisition	12-- hours

Acquiring graphical data: Introduction – Acquisition of textual data, pictures – Storage format for pictures – Image compression fundamentals – Image acquisition with digital camera. Acquiring audio data – Acquisition of video – Processing multimedia data – Processing and displaying textual data.

Unit:3	Data Storage	12-- hours

Data Storage: Introduction – Memory cell – RAM, ROM, Floppy Disk Drive, CD ROM, Archival Memory – Central Processing Unit - Output Devices.

Unit:4	Basics of Computer	11-- hours

Computer software – Computer networks – Data organization.

Unit:5	Web Services	11-- hours

Some Internet Applications – Email – WWW – Information Browsing Service – Information Retrieved from World Wide Web – Audio on Internet – Business Information System : Introduction – Types of information needed by organization – Why should we use computer in business – Design of operational information system – System life cycle – Computer systems for transaction processing.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	60 -- hours

Text Books

1. V.Rajaraman–Introduction toInformation Technology‖, Prentice Hall ofIndia, 2003.
2. AjoyKumarRay&TinkuAcharya, –InformationTechnology– PrinciplesandApplications –, PrenticeHallofIndia, 2004.

Reference Books	
1	ResearchandDevelopment Wing,ITLEducation,–IT Tools and Applications‖, Macmillan India Ltd.,2004.
2	S.K. Sarkar&A.K. Gupta, –Elements of Computer Science‖, S. Chand & Co., 2002.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/fundamentals_of_science_and_technology/information_technology.htm
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	L	S	S	M	S	M	L
CO2	S	S	M	M	S	M	M	M	M	M
CO3	L	S	M	M	S	M	M	M	M	M
CO4	M	S	S	S	S	M	M	M	M	M
CO5	M	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		Digital Fundamentals and Computer Architecture	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Needs knowledge on electronics components	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Helps to understand the Number System and Digital Circuits.
2. Handle Input Output and Memory Management Process
3. Know the concepts of Data processed in CPU

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Evaluate the number system using binary values	K5
2	Apply logics to create Digital Circuits	K3,K2
3	Remember to handle Input and Output Units	K1,K2
4	Know how to handle Memory Mapping	K1,K4
5	Understand the various of types of Memory Organization	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Number System	15-- hours

Number System and Binary Codes: Decimal, Binary, Octal, Hexadecimal – Binary addition, Multiplication, Division – Floating point representation, Complements, BCD, Excess3, Gray Code. Arithmetic Circuits: Half adder, Full adder, Parallel binary adder, BCD adder, Half subtractor, Full subtractor, Parallel binary subtractor - Digital Logic: the Basic Gates – NOR, NAND, XORGates.

Unit:2	Combinational and Sequential Circuits	15-- hours

Combinational Logic Circuits: Boolean algebra – Karnaugh map – Canonical form 1 – Construction and properties – Implicants – Don_t care combinations - Product of sum, Sum of products, simplifications. Sequential circuits: Flip-Flops: RS, D, JK, and T - Multiplexers – Demultiplexers – Decoder-Encoder – shift registers-Counters.

Unit:3	Input Output Management	15-- hours

Input – Output Organization: Input – output interface – I/O Bus and Interface – I/O Bus Versus Memory Bus – Isolated Versus Memory – Mapped I/O – Example of I/O Interface. Asynchronous data transfer: Strobe Control and Handshaking

Unit:4	Interrupt, DMA and Output Processor	14-- hours

Priority Interrupt: Daisy- Chaining Priority, Parallel Priority Interrupt. Direct Memory Access: DMA Controller, DMA Transfer. Input – Output Processor: CPU-IOP Communication.

Unit:5	Memory Management	14-- hours

Memory Organization: Memory Hierarchy – Main Memory- Associative memory: Hardware Organization, Match Logic, Read Operation, Write Operation. Cache Memory: Associative, Direct, Set-associative Mapping – Writing into CacheInitialization.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	75 -- hours

Text Books

1. V.K. Puri, Digital Electronics Circuits and Systems, TMH.
2. Albert Paul Malvino, Donald P Leach ,Digital principles and Applications, TMH, 1996.

Reference Books	
1	M. Morris Mano ,Computer System Architecture , PHI
2	M. Carter, Computer Architecture , Schaum‘s outline series, TMH
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	NPTEL course on Computer Architecture and Organization
2	https://www.javatpoint.com/digital-computers
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	L	M	L	M	S
CO3	M	S	S	M	S	M	M	M	M	S
CO3	L	M	S	M	M	S	M	M	M	M
CO4	S	S	M	M	S	S	M	M	M	M
CO5	S	S	M	M	S	S	M	M	M	M

*S-Strong; M-Medium; L-Low

Course code		PROGRAMMING IN C	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the students are familiar with programming language such as C	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the C programming basics concepts
2. Ability to solve problems by applying OOPs concepts in C Programming Language
3. Creates logical thinking on pointers and structures
4. Develop large and complex software
5. Apply Sequential Files and Random Access Files concepts

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Create coding to solve problems using C Programming Language.	K6
2	Understand the concepts and create Arrays and functions.	K2
3	Remember the difference between other programming languages with C.	K1
4	Apply pointers and arrays in C programming.	K3
5	Evaluate BIOS and DOS Interrupts.	K5

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Programming Languages	15-- hours

Planning the Computer Program – Flow Chart – Types of Logic used in Flowchart – Computer Languages – Hierarchy of Programming Languages – Classifications of Programming Languages – Popular Programming Languages – Program development process – Characteristics of a Good Program – Program Development Process – Error in Programming.

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Unit:2	Overview of C	15-- hours

An overview of C – Data types and sizes – Declarations – Variables – Constants – Operators – Expressions – Formatted and Unformatted Input / Output statements - Program Control Structures – Loop Control Structures – Arrays – Strings

Unit:3	Functions	15-- hours

Function – Function Arguments – Function Prototype – Recursion – Storage Classes – Structures – Unions – Bit Manipulations and Enumerations – Self-Referential Structures – Dynamic Memory Allocation.

Unit:4	Pointers	15-- hours

Pointers – Introduction – Pointers and Arrays – Pointers and Strings – Pointers and Functions - Pointers and Structures

Unit:5	File processing	15-- hours

File processing – Basic methods for FILE - Sequential Files – Random Access Files - C Preprocessors – Command Line Arguments Low Level Programming in C – Calling BIOS and DOS Interrupts – Port I/O Functions to Access CMOS – Keyboard and Speaker – Writing into Video Buffer.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	75 -- hours

Text Books

1	YeswanthKanetkar, —Let us C‖, BPB
2	YeswanthKanetkar, —TSR through C‖ , BPB
Reference Books	
1	Ashok N.Kamthane. —Programming with ANSI and Turbo C‖, Pearson Education Asia
2	E.Balagurusamy, —Programming in ANSI C‖, Tata McGraw Hill
3	Deitel&Deitel, —C How to Program‖, Third Edition, PHI/Pearson Education Asia.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/105/106105171/
2	https://nptel.ac.in/courses/106/104/106104128/
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	S	M	M	M	M
CO3	S	S	S	M	S	M	M	S	S	M
CO3	S	S	S	M	S	S	S	M	S	S
CO4	S	S	S	L	S	M	M	M	S	M
CO5	S	S	S	L	S	S	M	M	M	M

*S-Strong; M-Medium; L-Low

Course code		'C' PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		This course presents the Programming techniques in C, explains data types, arrays, pointers, files.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Introduce students to the field of programming using C language.
2. Evaluate real time applications using the power of C language features.
3. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.
4. Provide exposure to problem-solving through programming
5. Train the student to the basic concepts of the C-Programming language
6. Involves a Lab component which is designed to give the student hands-on experience with the concepts

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Create C concepts in problem solving and do programming in C language	K6
2	Apply the right data representation formats based on the requirements of the problem.	K3
3	Apply the specification of syntax rules for numerical constants and variables, data types	K3
4	Remember the capability for self-learning.	K1
5	Understand the concept of File operations	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

	Programs	**45 hours**

1. Write a C program to find the sum, average, standard deviation for a given set of numbers.
2. Write a C program to generate n prime numbers.
3. Write a C program to generate Fibonacci series.
4. Write a C program to print magic square of order n where n > 3 and n is odd.
5. Write a C program to sort the given set of numbers in ascending order.
6. Write a C program to check whether the given string is a palindrome or not using pointers.
7. Write a C program to count the number of Vowels in the given sentence.
8. Write a C program to find the factorial of a given number using recursive function.
9. Write aC program to print the students Mark sheet assuming roll no, name, and marks in 5 subjects in a structure. Create an array of structures and print the mark sheet in the university pattern.
10. Write a function using pointers to add two matrices and to return the resultant matrix to the calling function.
11. Write a C program which receives two filenames as arguments and check whether the file contents are same or not. If same delete the second file.
12. Write a program which takes a file as command line argument and copy it to another file. At the end of the second file write the totali)no of chars ii) no. of words and iii) no. of lines

	Total Practical hours	**45 hours**

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	L	S	M	S	S	M	M
CO2	S	S	S	M	S	M	S	S	M	M
CO3	S	S	M	M	S	M	S	S	M	M
CO4	M	M	L	M	S	M	S	S	M	M
CO5	S	S	S	L	S	M	S	S	M	M

*S-Strong; M-Medium; L-Low

Course code		Office Automation Lab	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Basic operations on Computer	Syllabus		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Text Editing and Formatting in MS Word
2. Prepare bills and charts in MS Excel
3. Design interactive Slides in MS PowerPoint

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Prepare Bio-data and Letter Writing and Formatting text **(Excercises-1,2)**	**K1, K6**
2	Apply the concepts of Tables and Manipulations (**Exercises -3)**	**K2, K3**
3	Understand and Remember the Picture insertion and Mail Merge concepts **(Excercis-4,5)**	**K1,K2**
4	Prepare Mark List, Bills and draw Charts Using MS Excel **(Excercises-1-6)**	**K1,K3**
5	Design Presentation Slides in MS Power point (**Excercises-1-3)**	**K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs

I. WORDPROCESSING

1. Textmanipulation
   Change the font size and type Aligning and justification of text Underlining the Text Indenting the Text
   i. Prepare a Bio-Data ii. Prepare aletter

2. Usage of Numbering, Bullets, Footers and Headers Usage of Spell checks and Find andReplace
   i) Prepare a document in newspaperformat
   ii. Prepare a document with bullets and footers and headers.

3. Tables andManipulations
   Creations, Insertion, Deletion (Columns & Rows) and usage of Auto Format
   i. Create a mark sheet using table and find out the totalmarks.

4. Picture Insertion and alignment i. prepare a greeting card ii. Prepare ahandout

5. Mail Merge concepts i. Prepare a business letter for more than one company usingmail

II. MS-EXCEL

1. Prepare a Mark List for students (use Conditional Formatting).
2. Arrange data in Ascending and Descendingorder.
3. Pay billPreparation.
4. Prepare a Calendar – Autoformatting
5. EB billPreparation.
6. Draw the different type of charts (Line, Pie, Bar) to illustrate year-wise performance of sales,purchase, profit of a company by using chartwizard

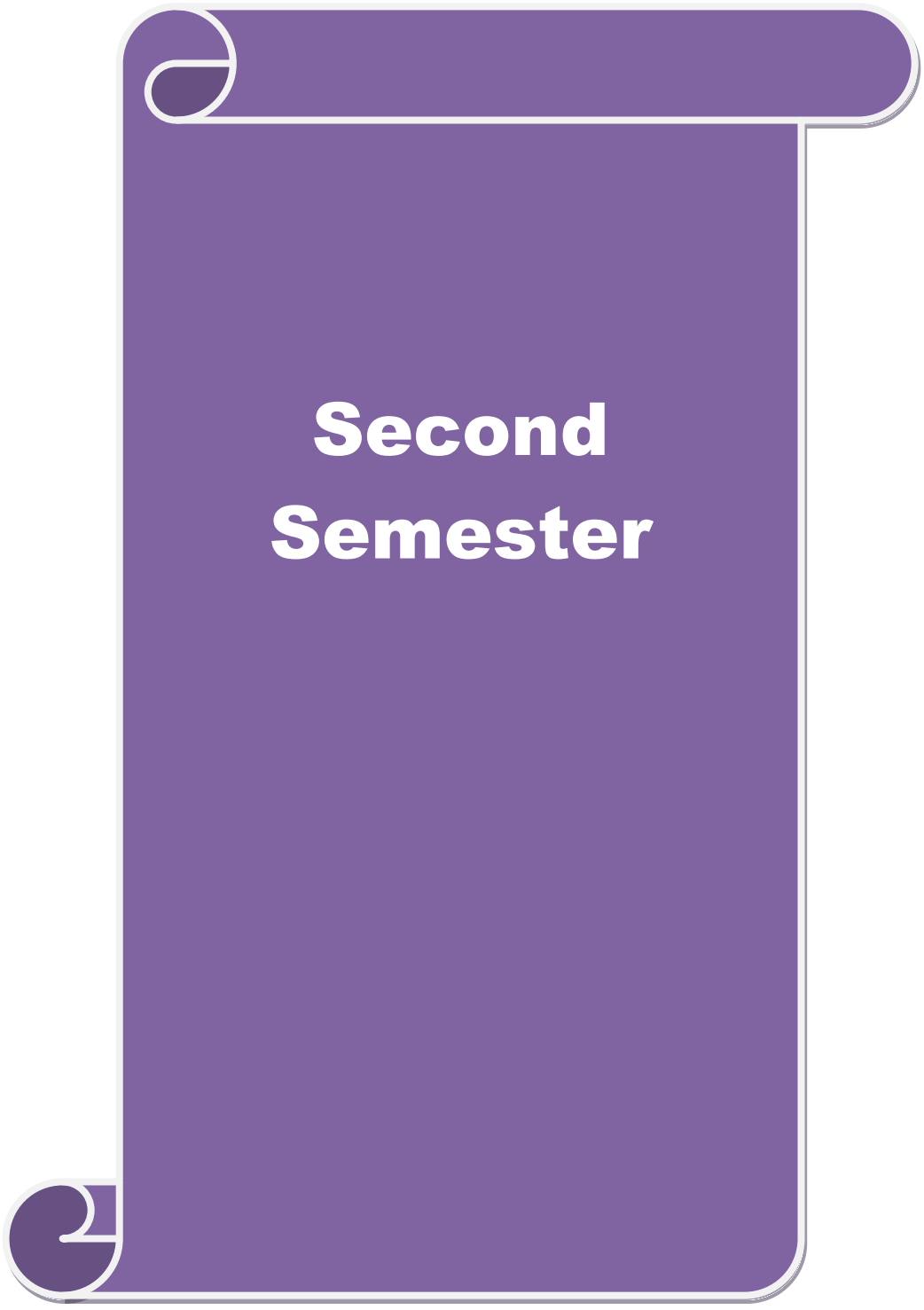
III. MS POWERPOINT

1.Design presentation slides for a product of your choice. The slides must include name, brand name, type of product, characteristics, special features, price, special offer etc.Add voice if possible to explain the features of the product. The presentation should work in manual mode. (Apply Animation schemes and SlideTransition)

	2. Design slides for the headlines News of a popular TV Channel. The Presentation Shouldcontain the following transactions: Top down, Bottom up, Zoom in andZoom out.Thepresentation should work in custommode. 3. Design presentation slides for the Seminar/Lecture Presentation using animationeffects.	
	Total Lecture hours	**45 hours**

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	S	S	M	S	S	M	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S
CO3	L	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low


Second
Semester

Course code		NUMERICAL METHODS	L	T	P	C
Core/Elective/Supportive		Supportive	4			4
Pre-requisite		This course requires that the students are familiar with the differential calculus and integral calculus	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:
1.Understand the consistent & inconsistent systems
2. Learn the method of curve fitting, methods of numerical differentiation and integration
3.Develop the knowledge on several numerical methods to solve polynomial & transcendental equations and ordinary differential equations.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Solve algebraic equations and transcendental equations using appropriate numerical methods and approximate a function using appropriate numerical methods	K5,K4
2	Derive numerical methods for various mathematical operations and tasks such as interpolation, differentiation, integration and the solution of linear and non-linear equations	K5
3.	Apply numerical methods to obtain approximate solutions to mathematical problems	K3, K2
4	Analyze and evaluate the accuracy of common numerical methods	K4
5	Implement numerical methods in Matlab	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	MATRIX	12 - hours

Definition and elementary properties of determinants - Cramer‘s rule. Matrices - Properties - Rank - Inverse - Consistency and inconsistencies of systems of linear algebraic equations - Eigen values and Eigen vectors - Diagonalisation.

Unit:2	FINITE DIFFERENCES	12 - hours

Curve fitting by methods of least squares - Only curves of the form or Reducible to the form y=ax+b, y=ax**2+bx+c. Finite difference operators - Difference table. Solution of first and second order linear finite difference equation with constant coefficients.

Unit:3	NUMERICAL DIFFERENTIATION AND INTEGRATION	11 - hours

Newton‘s forward and backward formulae - Lagrange‘s interpolation Formula. Numerical differentiation - Numerical integration using trapezoidal Rule and Simpson‘s 1/3 rule.

Unit:4	SOLUTION OF NUMERICAL ALGEBRAIC AND TRANSCENDENTAL EQUATIONS	12 - hours

Methods of false position, iterative method and Newton rapson method for finding real roots for transcendental and polynomial equations - Graffe‘s roots squaring method and bairstow‘s method for solving polynomial equations. Power method of Mises and Jacobbi method for finding Eigen values and Eigen vector of matrices. Methods for solving simultaneous linear algebraic equations - gauss elimination method - Gauss Jordan elimination method - Gauss Jacobi and gauss seidel iterative methods.

Unit:5	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	11 - hours

Numerical methods for solving ordinary differential equations. Taylor‘s series method, Euler‘s and modified Euler‘s (Heun‘s) method - Rungekutta methods of second and

fourth order - Mime‘s predictor and corrector - Adam‘s predictor and corrector methods.		
Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**60-- hours**
Text Book(s)		
1	P. Kandasarny and others, —”Engineering mathematics vol. 2”, S.Chund and Co., New Delhi, 1987.	
2	N.K. Venkataraman, —”Numerical methods in science and engineering”, The national publishing co, Chennai, 1986.	
Reference Books		
1	C.F Gerald, —”Applied numerical analysis”, Addison Wesley .	
2	S.S Sastry, —”Introductory methods of numerical analysis”, Prentice - Hall of India	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	NPTEL Course: NUMERICAL METHODS	
2	NPTEL Course : NUMERICAL ANALYSIS	
www.nptel.ac.in		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	M	L	L	M	M	L	L	L
CO2	S	M	M	M	M	S	M	M	M	M
CO3	M	M	M	L	L	M	M	L	L	M
CO4	M	M	M	L	M	M	L	L	L	M
CO5	L	M	M	M	M	L	M	M	M	L

*S-Strong; M-Medium; L-Low

Course code		MICROPROCESSORS ANDASSEMBLYLANGUAGE PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Needs knowledge basic hardware and programming language skill.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Learnt thelow level programming.
2. Understood the functions of microprocessor and interfacingdevices.
3. Gaining knowledge on Assembly level language programming with various microprocessor

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Interpreting the various types microprocessor and its architecture	K1, K2
2	Understands the ALP with various practical concepts	K2, K3
3	Evaluate the ability of 386 and 486 microprocessor performance	K2, K4
4	Analyze the various devices, ports and brands of Microprocessor	K3, K4
5	Remember the basic model microprocessor and its architecture	K4, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION TO MICROPROCESSORS	12 hours

Introduction to microprocessors: Evolution of microprocessors – Single-chip Microcomputer–EmbeddedMicroprocessors–Bit-Sliceprocessors–Microprogramming– RISCandCISCProcessors–Scalar and Superscalar Processors–VectorProcessors–Array Processors–Symbolic Processors–Digital Signal ProcessorsIntel8086– PinDescriptionofIntel8086–Operatingmodes of 8086–Register organizationof 8086–BIU andEU– Interrupts– 8086 based computer system– AddressingModes of 8086

Unit:2	ASSEMBLY LEVEL LANGUAGE PROGRAMMING	12 hours

8086InstructionSet–InstructionGroups–AddressingModeByte–Segment Register Selection–SegmentOverride–8086InstructionsAssembly Language Programsfor 8086:LargestNumber,SmallestNumberinaDataArray–NumbersinAscendingand Descendingorder–BlockMoveorRelocation–BlockMoveusingREPinstruction–Sum ofaseries – MultibyteAddition

Unit:3	BASIC MODELS OF MICROPROCESSOR	12 hours

Intel 386 and486 Microprocessors:Intel386 and 486 Microprocessor–486DX Architecture–RegisterOrganizationof 486Microprocessor–Memory Organization– OperatingModesofIntel486–VirtualMemory–MemoryManagementUnit–Gates– Interrupts and Exceptions– AddressingModes of80486– Pin Configuration

Unit:4	DEVICES, PORTS AND VARIOUS BRANDS OF MICROPROCESSOR	10 hours

Inputdevices–Outputdevices–Memory andI/Oaddressing–8086Addressing and Address Decoding– ProgrammableI/OPorts– DMADataTransfer.Other Microprocessors– PowerPCMicroprocessors–PentiumMicroprocessors–Pentium Pro microprocessor – AlphaMicroprocessor– CyrixMicroprocessor– MIPSMicroprocessor– AMDMicroprocessor

Unit:5	MOTOROLA AND ITS COMPONENTS	12 hours

MOTOROLA68000,MOTOROLA68020,MOTOROLA68030,MOTOROLA

68040InterfacingofA/DConverterandApplications:Introduction–InterfacingofADC 0808orADC0809toIntel8086–BipolartoUnipolarConverter–SampleandHoldCircuit, LF398 – Microprocessor-based Measurement andControl of Physical Quantities		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures - online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1.	BadriRam, Advanced Microprocessors andInterfacing, Tata McGraw-HillPublishing Company Limited, Fourteenth reprint, 2007
2.	A.K. Ray, K.M. Bhurchandi, Advanced Microprocessors and Peripherals,Tata McGraw-HillPublishingCompanyLimited, Second Edition, 2007

Reference Books

1.	Ramesh. S. Goankar,Microprocessorarchitecture, Programming and applications. WileyEaster (India)
2.	DouglasV. Hall, Microprocessorsand digital systems,McGrawHill.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106/106/106106210/
2	https://www.mooc-list.com/course/introductory-intel-x86-architecture-assembly-applications-alliteration-ost

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	L	S	S	M	S	S
CO2	S	M	S	S	S	S	S	M	S	S
CO3	S	S	S	S	M	S	S	S	M	S
CO4	M	S	M	M	S	S	S	S	S	S
CO5	S	S	S	M	M	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		ACCOUNTING AND FINANCIAL MANAGEMENT	L	T	P	C
Core/Elective/Supportive		Supportive	4			4
Pre-requisite		This course requires that the students are familiar with the basic accounting terms.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To know the basic concept of accounting.
2. To apply the Technique of recording business transaction.
3. To learn the scope of Cost Accounting in business.
4. Enable the learners to understand, and apply the techniques of management accounting in the financial decision making.
5. Recognize the different types of budget.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remember the basic accounting concepts and book keeping.	K1, K3
2	Understand recording business transaction and prepare annual financial statement.	K2, K6
3	Evaluate alternative accounting cost methods to optimize business solutions.	K3, K5
4	Analyze the Financial Statement associate with Financial Data in the organization.	K4, K5
5	Apply knowledge of budgeting in budget preparation using accounting system.	K3, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Introduction To Accounting	15-- hours

Accounting Principles And Concepts- Double Entry Book Keeping- Income And Expenditure- Accounting Record And System - Assets And Liabilities- Depreciation, Depletion And Amortization - Accounting For Depreciation..

Unit:2	Basics Of accounting And Preparing Financial Statements	15-- hours

Journal - Ledger - Trial Balance - Trading, Manufacturing And Profit And Loss Account - Balance Sheet - Analysis And Interpretation Of Financial Statements With Ratios.

Unit:3	Basics Of Costing And Marginal Costing	15-- hours

Cost Accounting - Methods And Techniques Of Cost Accounting - Classification Of Cost - Material Cost - Labour Cost - Overhead- Fixed And Variable Cost - Cost - Volume - Profit Analysis - Marginal Costing And Decision Making.

Unit:4	Analyzing Financial Statements	14-- hours

Ratio Analysis - Introduction - Classification Of Ratios - Current Ratio Liquidity Ratio – Debt Equity Ratio - Gross Profit Ratio- Net Profit Ratio- Return On Investment (ROI) Ratio - EPS - Assets Utilization Ratios - Advantages & Limitations Of Ratio Analysis.

Unit:5	Budgeting And Budgetary Control	14-- hours

Budgeting And Budgetary Control - Types Of Budgets - Preparation Of Various Functional Budgets- Preparations Of Cash Budgets - Flexible Budgets - Advantages Of Budgeting And Budgetary Control.

Unit:6	CONTEMPORARY ISSUES	2 Hours
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	75-- hours

Text Books	
1	T.S.Grewal,,DoubleEntryBookkeeping‘,AllIndia;SultanChand1991.
2	S.N.Maheswari , _Princp1es of Management Accounting‖, Sultan Chand, New Delhi,1994.

Reference Books	
1	S.K.Gupta&R.K.Sharma, –Practical problems in management accounting‖.
2	KhanandJain,—FinancialManagement‖,TataMcGrawHill,1993.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	SWAYAM Course:Financial Accounting and Analysis.
2	NPTEL Course:Management Accounting

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	M	L	L	M	M	L	L	S
CO2	S	M	S	M	M	M	M	S	M	S
CO3	S	S	M	H	M	S	S	S	S	M
CO4	M	S	S	M	M	M	S	M	S	M
CO5	S	M	M	M	M	M	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code		DATASTRUCTURES	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Requires basic programming skill to practice the various data structure concepts	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Understood the various Data Structures and Algorithms.
2. Learning about the Data Representation techniques such as Stack, Queue, List and etc.,
3. Gives ability to understand the working of sorting and searching methods

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Makes to understand the fundamentals of algorithm and data structures such stack and queue	K1, K2
2	Evaluate the working of various types of List and storage management	K2, K5
3	Apply the representation of data in tree structure and analyze various operations of tree	K3, K5
4	Understanding the various sorting mechanism of data	K4, K6
5	Apply and Analyze the symbol tables and File handing methods	K2, K3

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

Unit:1	BASIC OF ALGORITHM AND DATA STRUCTURE CONCEPTS	15 hours

Introduction:Introduction of Algorithms, AnalysingAlgorithms. Arrays: Spare Matrices – Representation of Arrays. Stacks andQueues.Fundamentals– Evaluation of Expression InfixtoPostfix Conversion– Multiple Stacks andQueues – Perform Analysethe Algorithms.

Unit:2	LINKED LIST AND STORAGE MANAGEMENT	15 hours

LinkedList:SinglyLinkedList–LinkedStacksandQueues–PolynomialAddition – MoreonLinkedLists–SparseMatrices–DoublyLinkedListandDynamic–Storage Management – GarbageCollection and Compaction.

Unit:3	TREES	15 hours

Trees:Basic Terminology–BinaryTrees–BinaryTreeRepresentations–Binary Trees – Traversal–MoreonBinaryTrees–ThreadedBinary Trees–Binary TreeRepresentation ofTrees–CouncilBinary Trees.Graphs:Terminology andRepresentations–Traversals, Connected Components and SpanningTrees

Unit:4	SORTING TECHNIQUES	15 hours

InternalSorting:InsertionSort–QuickSort–2WayMergeSort–HeapSort– ShellSort– Sorting on SeveralKeys.ExternalSorting:StorageDevices–Sorting with Disks:K-WayMerging –Sortingwith Tapes– Perform Analyzethe Algorithms.

Unit:5	SYMBOL TABLES AND FILES	13 hours

SymbolTables: Static Tree Tables –Dynamic Tree Tables – HashTables:HashingFunctions – Overflow Handling. Files: Files, Queries and Sequential organizations– Index Techniques –FileOrganizations. CaseStudy: Recursion– Towers ofHanoi– Pattern MatchinginStrings.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars		
	Total Lecture hours	75 hours

Text Books

1.	Ellis Horowitz, SartajShani, DataandFileStructures,GalgotiaPublication.
2.	Ellis Horowitz, SartajShani, SanguthevarRajasekaran,ComputerAlgorithms, GalgotiaPublication.

Reference Books

1.	Mark Allen Weiss, DataStructuresandAlgorithmAnalysisinC,,Pearson Education Asia,Second Edition.
2.	Robert Kruse, C.L.Jondo, Bruce Leung, Data Structures andProgram Design in C, PHI/Pearson Education Asia, Second Edition.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://onlinecourses.swayam2.ac.in/cec19_cs04/preview
2	https://nptel.ac.in/courses/106/102/106102064/

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	S	S	S	S	M	S	S
CO2	S	S	S	M	M	S	S	M	M	S
CO3	S	M	M	M	M	S	S	M	M	S
CO4	M	M	M	S	M	S	S	M	M	S
CO5	S	S	M	S	M	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		SYSTEMSOFTWARE	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Basic knowledge on Computer Hardware and Software and ALP.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Students should have learnt thefunctions of assemblers
2. Gained knowledge on loaders&editors concepts
3. Makes them to excel in Text editors concepts and working

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Analyze the basic of System Software	K1, L2
2	Understand the working of Assembler and Compiler	K3, K4
3	Evaluate the various activities of Loader and Linker	K3, K6
4	Analyze the concept of Macroprocessor and working	K4, K5
5	Understand the performance of Text Editors	K2, K5

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

Unit:1	INTRODUCTION TO SYSTEM SOFTWARE	10 hours

What is system software-Components of system-Software and their functions : assemblers, Loaders and linkers. Macroprocessors, Compilers, operatingsystem, text editors, debuggers, briefdiscussion ofstructureof somecomputers

Unit:2	ASSEMBLER AND COMPILER	12 hours

Assemblers, machine- Dependent features: program relocation; machine–independent features: literals. symbol-Definingstatements expressions, program blocks, control sectors, program linking; assembler design options ; two-pass assembler with overlaystructure, one- pass assembler-multipass assembler-introductionto compilers-Phases ofcompilers.

Unit:3	LOADERS AND LINKERS	12 hours

Loaders and linkers: Machine-dependent loader features; Relocation,Linking, Tablesand logic for a linking loader: Machine-independent features:Librarysearch,Loader options, and Overlay programs,Loader designoptions:Linkage editor, dynamiclinking andBoot strap loaders.

Unit:4	MICROPROCESSOR	12 hours

Macroprocessors: Machine-independent macroprocessorfeatures: Concatenation ofmacro parameters, Generation ofunitlevels, Conditional macro expansion, Keyword macro parameters, Macro processor design options,Macro processingwithin languages translators.

Unit:5	TEXT EDITORS	12 hours

Text editors: Overview of editingprocess, User interface, EditorStructure.Interactive debuggers: Debugging and capabilities, Relationship with other parts ofthesystem, User interface criteria.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	60 hours

Text Books	
1.	LelandL. Beck,–SystemSoftware:An introduction to System Programming‘‘, Addison Wesleypublishingcompany.
2.	D.M.Dhamdhere, –System Software‖, TMH. 1991.
Reference Books	
1.	JohnJ.Donovan. –System Programming‖.McGrawHill .

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_software_concepts.htm
2	https://nptel.ac.in/courses/106/105/106105087/

Course Designed By:

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	L	S	S	M	S	S	M	M	M
CO2	S	S	S	M	L	S	M	L	L	L
CO3	S	S	M	S	M	S	M	M	M	M
CO4	S	M	M	S	S	S	M	M	M	M
CO5	M	S	S	M	L	S	M	L	L	L

*S-Strong; M-Medium; L-Low

Course code		ASSEMBLYLANGUAGE PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Learner should have fundamental knowledge on Computer Hardware such as Registers, Memory, Binary Number system and etc.,	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Provides knowledge on understating of Internal operations of Computer Hardware
2. Creates capability to work with middle programming level language with mnemonics
3. Designing of Assembly Language programming with ease.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the Assembler and assembler directives **(Program 1,2)**	K2
2	Able to Apply the working concept of BCD **(Program 3,4)**	K3
3	Analyze the way of sorting values and checking strings with loop and macros **(Program 5, 6, 7, 8)**	K4
4	Evaluate the BCD conversion, sub string checking **(Program 9, 10)**	K5
5	Able to Create method for finding values and message conversion process **(Program 11, 12)**	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs

1. Studyof assembler (turbo) and assembler directives.
2. Studyof INT21Hfunctions forinputand output.
3. Packing and unpackingofBCD digits.
4. Conversion ofBCD into ASCIIcharacterand viceversa.
5. Delayloop implementation.
6. Arrangement ofnumbers in ascending and descendingorder.
7. Checking whetheragivenstringis a palindromeor not.
8. Usageof macros.
9. BCD to binaryconversion and viceversa.
10. To checkwhetheragiven stringis sub string of another.
11. To find the minimum and maximum number of*a* givenarray.
12. Encryption and decryptionofamessage.

	Total Lecture hours	**45 hours**

Text Books

1.	BadriRam, Advanced Microprocessors andInterfacing, Tata McGraw-HillPublishing Company Limited, Fourteenth reprint, 2007

Reference Books

1.	A.K. Ray, K.M. Bhurchandi, Advanced Microprocessors and Peripherals,Tata McGraw- Hill PublishingCompany Limited, Second Edition, 2007

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs44/
2	https://freevideolectures.com/course/3018/microprocessors-and-microcontrollers/8

Course Designed By:

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	L	S	M	M	S	M	S
CO2	S	S	M	L	M	M	M	S	M	S
CO3	S	M	S	S	M	M	M	S	M	S
CO4	S	S	S	S	M	M	M	M	M	S
CO5	S	M	M	M	M	M	M	M	M	S

*S-Strong; M-Medium; L-Low

Course code		DATA STRUCTURES LAB (Using C)	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Students should possess knowledge in C Programming and Data Structures concepts such as Stack, Queue, Sorting, Searching and etc.,	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Ability to do programming in C language with various applications.
2. Understand the Working Concepts of Data Structures.
3. Gaining the Practical experience of sorting, searching, tree, list and etc.,

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the working of matrix operations and sparse matric **(Program 1,4)**	K2
2	Apply the concept of Linked list for data processing **(Program 2, 3)**	K3
3	Analyze the implementation of Stack and Queue and its operations **(Program 5, 6)**	K4
4	Create the concepts of tree operations **(Program 7, 8)**	K6
5	Evaluate the searching and sorting techniques **(Program 9, 10)**	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs

1. Implementation ofmatrixoperations usingarrays.
2. Linked list:implementation of aSingle,Double, Circularlinkedlist.
3. Stringapplications using arraysand linked list.
4. Implementation ofsparsematrix.
5. Implementation ofstacksusingarrays andlinked list.
6. Implementation ofqueue, circularqueue, priority queueusingarrayand linked lists.
7. Implementationof binarytrees.
8. Implementation ofAVLtrees.
9. Searchingtechniques: linear search, binarysearchusingarrays, linkedList
10. Sortingtechniques: insertion, selection, bubble, Quick, shell, radix, heap sorts

Total Lecture hours **45 hours**

Text Books

1. Ellis Horowitz, SartajShani, Dataand FileStructures,GalgotiaPublication.

Reference Books

1. Mark Allen Weiss, DataStructures andAlgorithm Analysisin C,,Pearson Education Asia,Second Edition.

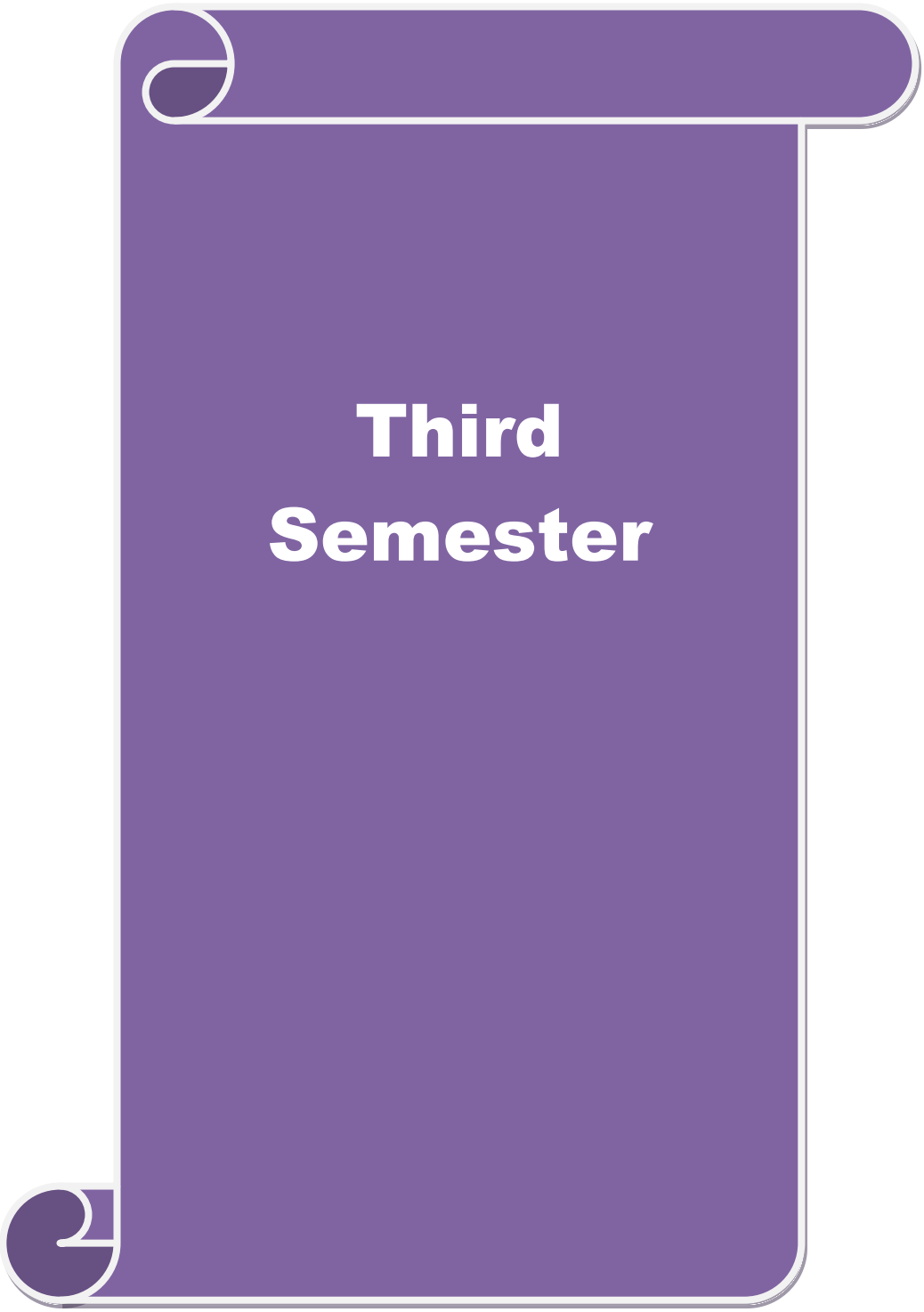
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.coursera.org/specializations/data-structures-algorithms
2. https://nptel.ac.in/courses/106/105/106105085/

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	S	M	S	S
CO2	S	M	L	M	S	M	S	M	S	M
CO3	S	L	S	S	M	S	S	M	S	S
CO4	S	M	M	M	S	M	S	M	S	M
CO5	S	M	S	M	S	S	S	M	S	S


Third
Semester

Course code		DISCRETE STRUCTURES	L	T	P	C
Core/Elective/Supportive		Supportive	4			4
Pre-requisite		Thiscourserequiresthatthestudentsare familiar with the settheoreticalnotions,relations andformallanguages.	Syllabus Version		2021-22	

Course Objectives:

1. Learn the basic set operations, logic and Prepositional Calculus.
2. Familiar with the concepts of Functions and Relations.
3. Knowledge on graphs, digraphs & trees.
4. Ideas on four classes of grammars
5. Ability to understand push down automata.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Formulate thebasic terminology of functions, relationsand sets.	K1
2	Design theoperations withFunctionsand relations.	K2
3	Evaluate thebasicterminology of graph theory	K3
4	Analyze modelingand design of FSA	K4
5	Apply PDAto find solution for computer based system.	K5,, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	**SETTHEORY**	12 hours

Settheory:SetNotations-BasicSetOperations-VennDiagram-LawsofSetTheory-PrinciplesofInclusionandExclusion-Partition-Minsets.Logic:Proposition-LogicalOperators -Truthtables-Normalforms-Lawsoflogic-ProofsinPrepositionalCalculus–Mathematical Induction..

Unit:2	**FUNCTIONSANDRELATIONS**	12 hours

Functions &Relations:Injective, Surjective. BijectiveFunctions - Composition, Identity, Inverse-PropertiesofRelations-Closure Operationson Relations-SolutionofRecurrence Relations-Non-homogeneousFiniteOrderlinearRecurrenceRelations.Grouptheory:Group Axioms-SemiGroups-Monodies-ApplicationofGenerationofCodesusingParitychecks- ErrorRecoveryin-Group codes.

Unit:3	**GRAPHTHEORY**	12 hours

Graphtheory:GraphsandDigraphs-Definitions-RepresentationofGraphsinaDigital Computer-ApplicationofGraphs:ShortestPathProblem.Trees:BasicDefinitions-BinaryTrees - Traversalof Binary Trees- ExpressionTrees- Infix, Postfix, and PrefixExpressions.

Unit:4	**FORMALLANGUAGES**	12 hours

FormalLanguages:FourClassesofGrammars(Phrase Structure,Context Sensitive,Context free, Regular)- ContextFreeLanguages:GenerationTrees-Ambiguity.FiniteAutomata:Finite stateAutomata(FSA)– Non-DeterministicFSA- Conversion of NDFSAto DFSA- Acceptance of aRegular Setby anFSA- Construction of aRightLinearGrammar fromFiniteAutomata.

Unit:5	**PUSHDOWNAUTOMATA**	12-- hours

PushDown Automata(PDA):Definitions-AcceptanceOfAWorkByAFiniteStateAnd EmptyStore ConstructionOfAPDAToAccept LanguagesByEmptyStore GivenAPDATo Accept TheLanguage ByFinite State-DefinitionOfADeterministicPDA.TuringMachines: Definitions–ConstructionOfASimpleTuringMachinesUniversal TuringMachine-Halting Problem.

Unit:6	CONTEMPORARY ISSUES	2 Hours
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**60 hours**

Text Books

1	DeorrAlan and LevasseurKenneth, ―Applied DiscreteStructuresfor computer science‖, Galgotiapublications, New Delhi,

Reference Books

1	John E. Hopcroftand Jeffrey D.UIlman, ―Formal languages and their relations to Automata‖, AdditionWesleypublishing company.

Related Online Contents [MOOC, SWAYAM, W3 computing, Websites etc.]

1	https://www.tutorilspoint.com/discrete_mathematics/index.htm
2	NPTELCourse:DiscreteMathematics

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	L	M	S	M	L	M	L
CO2	M	L	L	S	L	S	M	L	L	M
CO3	S	L	S	M	S	M	M	S	M	L
CO4	S	M	S	L	L	L	M	L	L	M
CO5	M	S	M	L	M	M	L	L	L	M

Course code		OPERATING SYSTEMS	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Basic knowledge on Computer operations and programming skill.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. This course presents the Introduction about operating systems, process management, CPU scheduling, memory management, secondary storage management.
2. To enable the students to learn the basic functions, principles and concepts of operating system.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the design issues associated with operating systems	K1, K2
2	Master various process management concepts like scheduling, deadlock management	K2, K3
3	Analyze on memory management	K3, K5
4	Analyze about the disk performance optimization and file systems	K4, K5
5	Analyze on Linux operating system	K4, K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	**INTRODUCTION**	13-- hours

INTRODUCTION: Definition of OS-Mainframe System-Desktop Systems-Multi processor System-Distributed-Clustered-Real time Systems-Handheld Systems-Operating System Structure-System Components-Services-System Calls-System Programs-System Design and Implementation.

Unit:2	**PROCESS MANAGEMENT**	11-- hours

PROCESS MANAGEMENT: Concepts-Process Scheduling-Operations on Processes-Cooperating Processes-Inter Process Communication-CPU Scheduling-Scheduling Concepts-Criteria-Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling.

Unit:3	**PROCESS SYNCHRONIZATION**	12-- hours

PROCESS SYNCHRONIZATION: Critical Section-Synchronization Hardware-Semaphores-Problems of Synchronization-Critical Regions-Monitors-Deadlocks-Characterization-Handling Deadlocks-Deadlock Prevention – Avoidance-Detection-Deadlock Recovery.

Unit:4	**MEMORY MANAGEMENT**	11-- hours

MEMORY MANAGEMENT: Storage Hierarchy-Storage Management Strategies-Contiguous-Non Contiguous Storage Allocation-Single User-Fixed Partition-Variable Partition-Swapping-Virtual Memory-Basic Concepts-Multilevel Organization-Block Mapping-Paging-Segmentation-Page Replacement Methods-Locality-Working Sets.

Unit:5	**I/O AND FILE SYSTEMS**	11-- hours

I/O AND FILE SYSTEMS: Disk Scheduling-File Concepts-File System Structure-Access Methods-Directory Structure-Protection-Directory Implementation-Allocation Methods-Free Space Management **Case Study:** Linux Operating System – Commands, Shell Programming, Report writing

Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	**60 hours**
Text Books		
1	Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, Inc., 2004	
2	Milankovic M., Operating System Concepts and Design, 2nd Edition, McGraw Hill, 1992	
Reference Books		
1	P.C.Bhatt, An Introduction to Operating Systems-Concepts and Practice, Prentice Hall Of India, 2004	
2	H.M.Deitel, An Introduction to Operating Systems, 2nd Edition, Pearson Education, 2002	
Related Online Contents [MOOC, SWAYAM, W3 computing, Websites etc.]		
1	https://www.mooc-list.com/course/using-python-interact-operating-system-coursera	
2	https://onlinecourses.swayam2.ac.in/cec20_cs06/preview	
Course Designed By:		

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	L	S	S	M	S	M	L	M
CO2	S	M	M	M	M	S	M	S	S	M
CO3	S	M	L	M	M	S	M	M	L	L
CO4	M	M	S	L	S	M	S	S	M	S
CO5	S	M	S	M	L	S	M	M	S	S

*S-Strong; M-Medium; L-Low

Course code		MULTIMEDIA	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Basis to know the different multimedia concepts including text, image, graphics, audio, and video.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

3. To understand the concepts, Techniques, tools for a multimedia applications.
4. Students should make a mass roll on Multimedia Technologies.
5. To identify the general skill set of Text, Image Audio/Video
6. Analyze and produce a creativity of Animation and their tools

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand and Remember the basics of Multimedia	K2
2	Understand the basics of image and the evaluate the color models	K5
3	Analyze the Audio Signals and Evaluate the techniques and tools of audio	K4
4	To Understands the video signals and evaluate the video formats	K5
5	Analyze and remember the animation techniques	K1

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	**INTRODUCTION TO MULTIMEDIA**	13-- hours

Introduction: Multimedia Presentation and Production – Characteristics of Multimedia Presentation – Multiple Media- Utilities of Multi-sensory Perception – Hardware and Software Requirements. Digital Representation: Analog Representation – Waves – Digital Representation – Need for Digital Representation – Analog to Digital Conversion – Digital to Analog Conversion. Text: Types of Text – Unicode Standard – Font – Insertion of Text – Text compression – File formats.

Unit:2	**IMAGE**	12-- hours

Image: Image Types – Seeing Color – Color Models – Basic Steps for Image Processing – Scanner – Digital Camera – Interface Standards – Specification of Digital Images – CMS – Device Independent Color Models – Image Processing software – File Formats – Image Output on Monitor and Printer.

Unit:3	**AUDIO**	11-- hours

Audio: Introduction – Acoustics – Nature of Sound Waves – Fundamental Characteristics of Sound – Microphone – Amplifier – Loudspeaker – Audio Mixer – Digital Audio – Synthesizers – MIDI – Basics of Staff Notation – Sound Card – Audio Transmission – Audio File formats and CODECs – Audio Recording Systems – Audio and Multimedia – Voice Recognition and Response - Audio Processing Software.

Unit:4	**VIDEO**	11-- hours

Video: Analog Video Camera – Transmission of Video Signals – Video Signal Formats – Television Broadcasting Standards – Digital Video – Digital Video Standards - PC Video – Video Recording Formats and Systems - Video File Formats and CODECs – Video Editing – Video Editing Software.

Unit:5	**ANIMATION**	11-- hours

Animation: Types of Animation – Computer Assisted Animation – Creating Movement – Principles of Animation – Some Techniques of Animation – Animation on the Web – Special

Effects – Rendering Algorithms. Compression: MPEG-1 Audio – MPEG-1 Video - MPEG-2Audio – MPEG-2 Video.		
Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**60-- hours**

Text Books	
1	Ranjan Parekh, Principles Of Multimedia, TMH.
2	TayVaughan , Multimedia: Making it Work –, 7 th edition, TMH.
Reference Books	
1	VikasGupta , Multimedia And Web Design, DreamTech press,2007.

Related Online Contents [MOOC, SWAYAM, W3 computing, Websites etc.]

1	https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_multimedia.htm
2	https://www.wisdomjobs.com/e-university/multimedia-tutorial-270.html

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	L	S	S	M	S	M	L	M
CO2	S	M	M	M	M	S	M	S	S	M
CO3	S	M	L	M	M	S	M	M	L	L
CO4	M	M	S	L	S	M	S	S	M	S
CO5	S	M	S	M	L	S	M	M	S	S

*S-Strong; M-Medium; L-Low

Course code		OBJECT ORIENTED PROGRAMMING AND C++	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Students should know the basics of C Languages and need to be familiar with a few software like text editor, compiler linker and libraries	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To understand C++ concepts from the basis of C Language
2. To learn the OOP Concepts
3. To code, document, compile, run and implement the object oriented programming
4. Analyze design/implementation issues allocated for variable and binding, control flow, types, subroutines, parameter passing.
5. Apply and reuse the objects, class and methods

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concept of OOP	K2
2	Create a functions and evaluate the methods of functions	K6
3	Apply constructors and analyze the constructor overloading	K3
4	Understand the concept of Inheritance and evaluate the types	K5
5	Remember the basics of IO Streams and create Pointers	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	BASICS – APPLICATIONS OF OOPS	15-- hours

. Principles of object oriented programming - Software crisis - Software Evolution - Procedure oriented programming -Object oriented programming paradigm - Basic concepts and benefits of OOP - Object oriented language - Application of OOP - structure of C++ - Applications of C++ - Tokens, Expressions and control structures - Operators in C++ - Manipulators.

Unit:2	FUNCTIONS	15-- hours

Functions in C++ - Function prototyping - Call by reference - Return by reference - Inline functions - Default, Const arguments - Functions overloading - Friend and virtual functions - Classes and Objects - Member functions - Nesting of member functions - Private member functions - Memory allocations for objects - Static data numbers - Static member functions - Arrays of objects - Objects as function arguments - Friendly functions - Returning objects - Const member functions - Pointers to members.

Unit:3	CONSTRUCTOR	15-- hours

Constructors - Parameterized constructor - Multiple constructors in a class - Constructor with default arguments - Dynamic initialization of objects - Copy and dynamic constructors - Destructors - Operator overloading -Overloading unary and binary operators - Overloading operators using friend functions

Unit:4	INHERITANCE	14-- hours

Inheritance - Defining derived clauses - Single inheritance - Making a private member inheritable - Multiple inheritance - Hierarchy inheritance - Hybrid inheritance - Virtual base classes - Abstract classes - Constructed and derived classes - Member classes - Nesting of classes.

Unit:5	I/O STREAMS - POINTERS	14-- hours

Streams - String I/O - Character I/O - object I/O - I/O with multiple objects - File pointers - Disk

I/O with member functions - Error handling - Redirection - Command line arguments - Overloading extraction and insertion operators.		
Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**75-- hours**

Text Books

1	E. Balagurusamy, ―Object Oriented Programming in C++‖, Tata McGraw Hill publishing company limited, 1995.
2	Robert Lafore, ―Object oriented Programming in turbo C++‘‘, Galgotia publications pvt. Limited, 1993.

Reference Books

1	BjarneStroustrup, ―The C++ Programming‖, Addition Wesley, 1991.

Related Online Contents [W3SCHOOLS, SWAYAM, MOOC, Websites etc.]

1	http://www.cplusplus.com/doc/tutorial/
2	https://www.w3schools.com/cpp/

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	M	M	M	L	M	S	M
CO2	S	S	M	S	L	M	M	S	M	S
CO3	S	S	M	S	L	M	M	S	M	S
CO4	M	S	M	S	M	M	L	M	S	M
CO5	S	M	L	M	M	S	M	M	L	L

*S-Strong; M-Medium; L-Low

Course code		COBOL AND BUSINESS DATA PROCESSING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		A basic understanding of any Programming language with Job Control Language (JCL)	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To implement and create COBOL programming in business, finance, and administrative systems.
2. To evaluate the various concept of Verbs using certain procedure division
3. To understand the concept of Tables
4. To understand file handling in COBOL
5. To Understand variety of Business applications using COBOL

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand and creating application programs and we cannot use it to write system software and business Applications.	K2
2	Remember and understand I/O verbs to data from the user and display the output of COBOL program	K1
3	Evaluate the array of a data structure and is a collection data is stored in table	K5
4	Evaluate Field, Record and File with analyze the verbs of File	K5
5	Create and Apply various Business Applications of COBOL	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	COBOL BASICS	15-- hours

Format of COBOL. programs - Structure - Character set - Cobol words - Data names and identifiers, Literals, Figurative constants - Identification division - Level structures - Data entries - File section - Working storage section - Editing.

Unit:2	PROCEDURE DIVISION	15-- hours

Structure of procedure division - Arithmetic verbs - add, subtract, multiply, Divide - Data movement verbs - Move, Move corresponding - Gob, Goto..Depending on, Accept, Display - Conditional verbs - if, if then else, Types of conditions - Redefines clause - Renames clause - perform statement-table handling - occurs clause - Multidimensional tables.

Unit:3	TABLE HANDLING	15-- hours

Perform verb and table handling - Indexed tables and indexed names - Set verb - Search verb - Sorting a table - Sequential files - File characteristics - File control entries for sequential files - File description - Fixed length, Variable length records - Statement for sequential files - Examples of sequential fie processing - Sort verb - Merge verb.

Unit:4	FILE HANDLING	14-- hours

Direct access files - Relative files - Indexed sequential files - Programs - COBOL subroutine - Structure of a subroutine - Calling of a subroutine - examples illustrating a subroutine

Unit:5	BUSINESS APPPLICATIONS	14-- hours

Programs for financial accounting - Payslip - inventory management - Invoice-. Order processing - Banking - Mark list processing - College admission processing on merit basis.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**75-- hours**
Text Books		
1	M K Roy, D. GhosDastidhar, ―COBOL Programming‖, Tata McGraw Hill, 1989.	
2	Philipakkis ―Structured COBOL programming‖.	
Reference Books		
1	Stern & Siren, ―COBOL Programming‖	
2	V. Rajaraman, COBOL programming –PHI Publications.	
Related Online Contents [TUTORIAL POINT, SWAYAM,Javatpoint, Websites etc.]		
1	https://www.tutorialspoint.com/cobol/cobol_overview.htm	
2	https://www.javatpoint.com/cobol	
Course Designed By:		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	M	S	S	S	M	L	S
CO2	S	M	L	M	L	M	S	M	L	L
CO3	S	M	M	S	M	M	M	S	M	M
CO4	S	S	M	S	L	S	L	M	S	M
CO5	S	S	L	M	S	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code		OBJECT ORIENTED PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Students should know the basic concept of C Languages	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand how C++ differs from C
2. Evaluate errors in C++ and how to solve the errors
3. To develop the logical handling among different problems
4. Analyze a Problem and know how to build a applications

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Able to understand Object Oriented Programming and Procedure Oriented Programming	K2
2	Create and evaluate various applications	K5
3	Understand and apply objects, class, Streams, inheritance, polymorphism etc.	K3
4	Create the use of various OOPs concepts with the help of programs	K6
5	Understand advanced features of C++ specifically stream I/O, templates and operator overloading	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

	Programs	**45 Hours**
1.	Write a C++ Program to create a class to implement the data structure STACK. Write a constructor to initialize the TOP of the STACK. Write a member function PUSH() to insert an element and member function POP() to delete an element check for overflow and underflow conditions..	
2.	Write a C++ Program to create a class ARITHMETIC which consists of a FLOAT and an INTEGER variable. Write member functions ADD (),SUB(), MUL(), DIV() to perform addition, subtraction, multiplication, division respectively. Write a member function to get and display values	
3.	Write a C++ Program to read an integer number and find the sum of all the digits until it reduces to a single digit using constructors, destructors and inline member functions	
4.	Write a C++ Program to create a class FLOAT that contains one float data member. Overload all the four Arithmetic operators so that they operate on the object FLOAT.	
5.	Write a C++ Program to create a class STRING. Write a Member Function to initialize, get and display stings. Overload the operators ++ and == to concatenate two Strings and to compare two strings respectively.	
6.	Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_Number, E_Name, Department, Basic, Salary, Grade. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA and PF depending on the grade.	
7.	Write a C++ Program to create a class SHAPE which consists of two VIRTUAL FUNCTIONS Calculate_Area() and Calculate_Perimeter() to calculate area and perimeter of various figures. Derive three classes SQUARE, RECTANGLE, TRIANGE from class Shape and Calculate Area and Perimeter of each class separately and display the result.	
8.	Write a C++ Program to create two classes each class consists of two private variables, a integer and a float variable. Write member functions to get and display them. Write a FRIEND Function common to both classes, which takes the object of above two classes as	

	arguments and the integer and float values of both objects separately and display the result.
9.	Write a C++ Program using Function Overloading to read two Matrices of different Data Types such as integers and floating point numbers. Find out the sum of the above two matrices separately and display the sum of these arrays individually.
10.	Write a C++ Program to check whether the given string is a palindrome or not using Pointers
11.	Write a C++ Program to create a File and to display the contents of that file with line numbers.
12.	Write a C++ Program to merge two files into a single file.
	Total Lecture hours **45-- hours**

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	L	M	S	S	M	L	M	L
CO2	S	S	M	S	L	M	-	M	S	M
CO3	S	M	S	M	S	M	L	S	M	L
CO4	S	S	S	M	S	L	L	M	M	M
CO5	S	M	M	S	M	L	S	S	S	M

*S-Strong; M-Medium; L-Low

Course code		COBOL PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Programmers should have a basic knowledge of programming, databases, files and business application systems	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To identify the COBOL development and maintenance tasks
2. To understand the basic structure of a COBOL program
3. To construct basic COBOL and continues strategic modular programming
4. To Implement various Business applications and programs

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Create and understand various applications of business needs	K2
2	Able to analyze various types of COBOL divisions	K4
3	Create conditions to evaluate procedures.	K6
4	Create and apply file concepts with various applications	K6

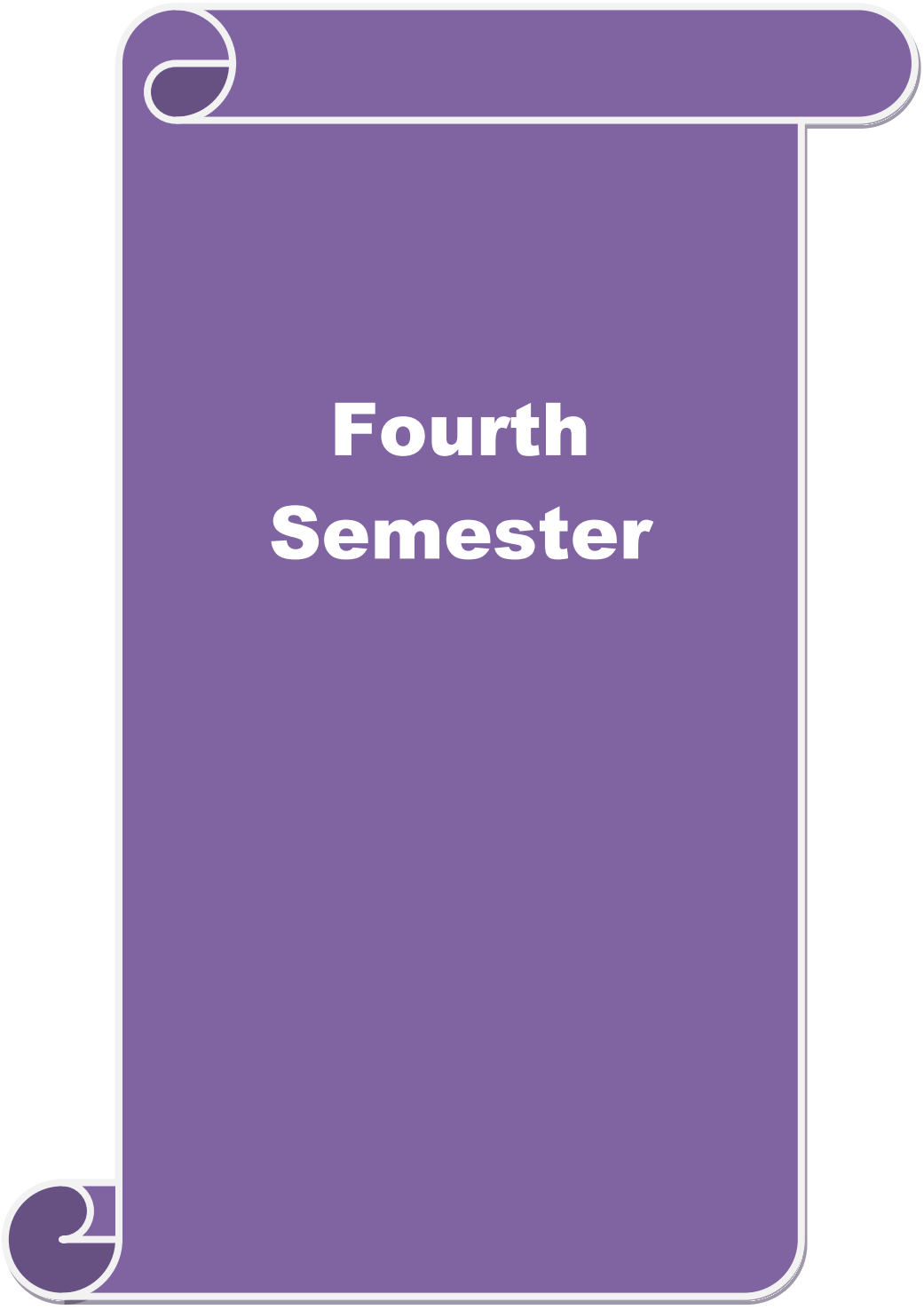
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

	Programs	45 Hours
1.	Write a COBOL program to find the sum of individual digits of a 10-digit number until a single digit is produced.	
2.	Write a COBOL program to accept the inputs student Name, Marks for five subjects and declare the result as PASS, if the student gets minimum 40 in each subject otherwise declare the result as FAIL.	
3.	Write a COBOL program to accept a date (DDMMYY) and display the result in the following specified format: For eg : 030498 as 3rd APR 1998 [Use REDEFINES Clause].	
4.	Write a COBOL program to display the given three digit number into words using OCCURS clause For eg : 342 THREE HUNDRED AND FORTY TWO	
5.	Write a COBOL program to create a student data file using the following fields: ROLL-NO, NAME, AGE, SEX, YEAR-IN-COLLEGE, MARKS for five subjects.	
6.	Write a COBOL program to create the following two files using the student data file (Created by pro gram 5) . FILE 1: List of male student who are studying third year of the College. FILE 2: List of female students who are studying first year of the College. [Use MOVE…….CORRESPONDING Option]	
7.	Write a COBOL program to sort the student data file (created by program-5) in the ascending order of the fields SEX, Year-in-college and ROLL-NO. [Use SORT Verb].	
8.	Write a COBOL program to create an Employee file for the employees of an organization using the following fields : EMP-NO , NAME , DOB, SEX, BASIC-PAY, DESIGNATION.	
9.	Write a COBOL program to update the new BASIC-PAY of each employee in the Employee data file (created in program 8) by incrementing 25% of BASIC -PAY.	
10.	Write a COBOL program to find the number of male employees whose BASIC-PAY > 4000 and the number of female employees whose BASIC-PAY < 3000 using the employee data file (created by program 8)	
11.	Write a COBOL program to create an inventory data file by using the following fields : ITEM-CODE, DESCRIPTION, OPEN-STOCK, PURCHASES, SALES, SAFETYLEVEL, CLOSE-STOCK‘	
12.	Write a COBOL program to prepare RE- ORDER LEVEL STATEMENT by using the	

	inventory data file (crated by program 11) if the CLOSE-STOCK is less than SAFETY LEVEL : A.B.C.& COMPANY, CHENNAI-600006 RE-ORDER LEVEL STATEMENT ---------- - ITEM-CODE DESCRIPTION SAFETY-LEVEL CLOSE-STOCK ----------
	Total Lecture hours **45-- hours**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	L	S	S	S	M
CO2	S	M	S	S	M	M	S	S	L	L
CO3	S	S	L	S	M	L	M	L	S	M
CO4	S	M	M	S	L	L	S	M	M	S

*S-Strong; M-Medium; L-Low


Fourth
Semester

Course code		OPERATIONS RESEARCH	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the students are familiar to solve the linear equations and to plot the points in graph.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Determine the solution to a linear problem.
2. Provide a scientific basis for planning of inventory needs.
3. Evaluate the problems dealing with the waiting line, the arrival of units or persons requiring service.
4. Know the applications of Mathematics in industry, decision making and real life.
5. Plan, schedule and control of projects.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Identify and develop operational research models from the verbal description of the real system.	K4,K6
2	Understand the mathematical tools that are needed to solve optimization problems.	K2,K5
3	Plan, forecast and make rational decision.	K3,K6
4	Know basic ideas of project management techniques.	K1,K3
5	Analyze the problem, and establish the maximization of profits.	K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	LINEAR PROGRAMMING PROBLEM	12-- hours

Linear programming - Graphical method for Two Dimensional problems - Central problem of LP - Various definitions - Statements of basic theorems and properties - Phase I and phase II of the Simplex method.

Simplex Multp1iers - Dual and Primal - Dual Simplex Method - Sensitivity Analysis - Transportation problem and its Solution - Assignment problem and its solution.

Unit:2	QUEUING AND REPLACEMENT THEORY	12-- hours

Queuing theory: Characteristics of Queuing systems - Steady state M/M/l, *MIMJI 1K*, and M/M/(Queuing models.

Replacement theory: Replacement of items that deteriorate - Replacement of items that fail - Group Replacement.

Unit:3	INVENTORY THEORY	12-- hours

Inventory Theory: Costs involved in Inventory Problems - Single item deterministic Model – Economic lot size models Without Shortages and With Shortages having production rate Infinite and Finite.

Unit:4	DECISION MAKING PROBLEM	11-- hours

Decision-making: Decision under uncertainty, under certainty and under risk - Decision trees- Expected value of Perfect Information and Imperfect Information.

Unit:5	PERT AND CPM	11-- hours

PERT and CPM : Arrow Networks - Time Estimates - Earliest Expected Time, Latest allowable occurrence time and slack - Critical Path - Probability of meeting Scheduled date of completion of Projects - Calculations on CPM Networks - Various Floats for Activities - Critical path - Updating Project - Operation Time cost trace off curve - Project Time Cost trade off curve - Selection of Scheduled based on Cost Analysis.

Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**60-- hours**

Text Book(s)

1	KantiSwarup, **P.K.**GuptaandManmohan, Operations Research, Sultan Chand &Sons, 1991.
2	F.Hillerand, G.J.Lieberman, –Introduction to operations research, Holden DayInc, 1980.

Reference Books

1	HamdyA.Taha, –Operations research-Anintroduction‖, McMillan publishingco., 1982.
2	L.R.Shaffer, J.B.FilterandW.LMeyer, –TheCritical path method‖, McGraw Hill.
3	M.K.Venkatararnan, Linear programming, The National publishing Co.,1989.
4	N.S.Kamho,—Mathematical-programmingtechniques‖,affiliatedeast-westpresspvtltd., 1991.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	CEC Course: Operations Research
2	NPTEL Course: Operations Research
3	NPTEL Course: Constrained and unconstrained Optimization

www.swayam.gov.in, www.nptel.ac.in

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	M	M	L	L	L
CO2	S	S	S	M	M	S	M	M	M	M
CO3	M	M	M	L	L	M	M	L	M	M
CO4	M	M	M	L	M	M	L	L	L	L
CO5	S	S	S	M	M	S	M	M	M	S

*S-Strong; M-Medium; L-Low

Course code		COMPUTER GRAPHICS	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the science visualization and to familiar with images and colors with the creation of manipulating objects.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

4. Understand the Graphics concept and IO Devices
5. Ability to solve the 2D Transformation and Algorithms
6. Develop the creation of curves and surfaces
7. Ability to solve the 3D Transformation and Algorithms
8. Review varieties of realism in computer graphics

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Able to understand the basis of Input and output devices	K2
2	Interpret the 2D Transformation Algorithms	K3
3	Understand the fundamentals of animation, parametric curves and surfaces.	K2
4	Identify 3D transformation algorithms and analyze the animation graphics.	K4
5	Understand the basic concept of realism.	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	IO DEVICES	12-- hours

Graphics input - output devices Direct input devices - Cursor devices - Direct screen interaction logical input function. Cathode Ray tubes – Line drawing displays - Raster scan displays- Hard copy devices.

Unit:2	2D TRANSFORMATIONS	12-- hours

Two Dimensional graphics - 2D-Transformations - 2D-Algorithms - Line drawing algorithms - Line covering - Line clipping and polygon clipping. Raster graphics - Scan conversion of polygons - Region filling - Algorithms.

Unit:3	CURVES AND SURFACES	11-- hours

Curves and surfaces : Parametric representation of curves - Curves - B-Spline curves - Parametric representation of surfaces - Planes - Curved surfaces - Ruled surfaces - Surfaces.

Unit:4	3D TRANSFORMATIONS	12-- hours

Three - dimensional Graphics: 3D - Transformations - Normal. Oblique central projections – 3D Algorithms – Hidden lines and Hidden Surfaces removal. Animation Graphics: Simple animation - Usage of GETIMAGE() and PUTIMAGE() functions -Usage of buffering techniques — Manipulation of color lookup Table - Tweening.

Unit:5	GRAPHICS REALISM	11-- hours

Computer Graphics realism : Tiling the plane - Recursively defined curves - Koch curves - C curves & Dragons - Space tiling curves - Fractals and grafatals - Turtle graphics - Ray tracing. Graphics standards: The GKS international standards - GXD Standard for Microcomputers.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	**60-- hours**
Text Books		
1	John R. Rankin, ―Computer Graphics Software Construction‖, Prentice Hall of Australia Pvt., Ltd., 1989.	
2	William M. Newmann, Robert F. sproull, ―Principle of Interactive Computer Graphics‖, McGraw Hill International Book Company, 1989.	
3	F.S.Hill, JR., ―Computer Graphics‖, Maxwell Macmillan International editions, 1990.	
Reference Books		
1	James Alan Farrel, ―From Pixels to Animation: An Introduction to Graphics Programming‖, AP professional, 1994.	
2	Rod Salmman, Mel Slater, ―Computer Graphics: Systems and concepts‖, Addison Wesley Publishing Company, 1987.	
3	Roy, A. Plastock, Gordon Kalley , ― Theory and Problems of computer Graphics‖, Schaums outline series, McGraw hill International editions, 1986.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://onlinecourses.nptel.ac.in/noc20_cs90/preview	
2	https://www.tutorialspoint.com/computer_graphics/index.htm	
Course Designed By:		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	L	S	S	L	L	M	M	S
CO2	L	M	S	L	L	S	L	M	S	L
CO3	L	S	M	S	S	M	M	L	L	S
CO4	M	M	S	M	S	S	M	L	S	S
CO5	L	M	M	M	M	S	L	S	M	M

*S-Strong; M-Medium; L-Low

Course code		RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Students should know the understanding of data, primary memory, secondary memory, and data structures and algorithms.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. This course presents the introduction of database management systems , explains ER model, structure of relational database, indexing and advance data base concepts.
2. To enable the students to learn the basic functions, principals and concepts of Database management systems.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understood the basic principles of database management systems, parallel & distributed databases	K1, K2
2	Gained knowledge over various database models, schemas and SQL statements	K1, K2
3	Construct Logical database design	K2, K3, K4
4	Apply normalization and functional dependency in database design with security concern	K3, K4, K5
5	Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS	K3, K4, K5, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	OVERVIEW – DATABASE DESIGN	10-- hours

Overview of database systems: Managing data- A historical perspective – File systems versus a DBMS - Advantages of a DBMS- Describing and storing Data in a DBMS - Queries in a DBMS - Transaction management – Structure of a DBMS. Database design & ER diagrams – Entities, Attributes, and Entity Sets – Relationships and Relationship Sets- Additional feature of the ER model- conceptual Database design with the ER model.

Unit:2	RELATIONAL MODEL	12-- hours

Relational Model: Integrity constraints over relations – Enforcing integrity constraints – Querying relational data – Logical database design : ER to Relational –Introduction to Views – Destroying / Altering Tables & Views. Relational Algebra and Calculus: Relational Algebra – Relational Calculus

Unit:3	SQL	12-- hours

SQL: Queries, Programming, Triggers: The form of a basic SQL Query – UNION, INTERSECT and EXCEPT – Nested Queries – Aggregate operators – Null values –Complex integrity constraints in SQL - Triggers & Active data bases. Transaction Management Overview: The ACID Properties - Transactions & Schedules – Concurrent execution of Transactions – Lock-based concurrency control – Performance of Locking –Transaction support in SQL. .

Unit:4	SCHEMA AND SECURITY	12-- hours

Schema Refinement and Normal forms: Introduction to Schema refinement – Functional dependencies – Reasoning about functional dependencies – Normal forms –Properties of Decompositions – Normalization – Schema Refinement in data base design – other kinds of

dependencies. Security : Introduction to Database security -Access control – Discretionary Access control – Mandatory Access control – Additional issues to security. Concurrency control : 2PL, serializability and Recoverability – Introduction to Lock Management - Lock Conversions – Specialized Locking techniques - Concurrency control without locking.

Unit:5	**PARALLEL AND DISTRIBUTED DATABASE**	**12-- hours**

Parallel & Distributed databases: Introduction – Architecture for parallel databases – Parallel Query evaluation – Parallelizing individual operations –Parallel Query Optimization – Introduction to distributed Databases – Distributed DBMS architecture sorting data in a distributed DBMS. Object Database Systems: Motivation Example – Structured data types – Operation on structured data types – Encapsulation & ADTS – Inheritance - Objects, OIDS and Reference Types - Database design for and ORDBMS – OODBMS – Comparing RDBMS, OODBMS and ORDBMS

Unit:6	**Contemporary Issues**	**2 -- hours**

Webinar on Data Models

	Total Lecture hours	**60 -- hours**

Text Books

1	Raghu Ramakrishnan, Johannes Gehrke –"Database Management Systems", Third Edition, McGraw-Hill Higher Education.
2	Silberschatry, Korth, Sundarshan, "Database system Concepts", Fourth Edition, McGraw-Hill Higher Education.

Reference Books

1	Elmasri, Navathe, "Fundamentals of Database Systems", Third Edition, Pearson Education Asia.
2	S.S. Khandare, "Database Management and Oracle Programming", First Edition, 2004, S.Chand and Company Ltd. 5. Nilesh Shah, "Database Systems using Oracle", 2002, Prentice Hall of India. 6. Rajesh Narang, "Database Management Systems", 2004, Prentice Hall of India.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106/106/106106095/
2	https://www.mooc-list.com/course/database-systems-concepts-and-design-edx

Course Designed By:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	S	S	S	L	M
CO2	S	S	M	S	L	S	S	M	S	S
CO3	S	S	S	M	S	S	L	S	S	S
CO4	S	M	S	S	L	S	S	M	S	L
CO5	S	S	M	S	S	M	S	S	L	S

*S-Strong; M-Medium; L-Low

Course code		COMPUTER NETWORKS	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Internet was the base to grown up in the past decades, to understand a good slice of the state-of-the-art in network architecture, protocols, and networked systems.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the basis of networks and reference models
2. Analyze and design the Physical Layer Medium
3. Formulate the Data link layer Design issues
4. Create the Network Layer Design issues and develop the Transport protocol
5. Identify Session Layer design issues and Application layer design issues

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concept of Networks and formulate reference models	K2
2	Review and understand the various types of medium of Physical Layer	K5
3	Understand and apply the various types of protocols in data link layer	K2
4	Create the network layer algorithms and apply the protocols for Network Layer	K3
5	Analyze the session layer and evaluate the presentation layer design issues	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	INTRODUCTION – REFERENCE MODELS	15-- hours

Introduction: Use of computer networks – Network Hardware – Network software – Reference models – Example of networks.

Unit:2	PHYSICAL LAYER	15-- hours

The Physical Layer: The Theoretical basis for data communication – Guided transmission Media – Wireless transmission – Communication satellites – The Public switched Telephone network – Cable Television - Mobile telephone system.

Unit:3	DATA LINK LAYER	14-- hours

Data link layer: Data link layer design issues – Error detection and correction – Elementary data link protocols – Sliding window protocols – Protocol Verification - Example data link Protocols..

Unit:4	NETWORK LAYER	14-- hours

Network layer : Network layer design issues – Routing algorithms – Congestion, Control algorithms – Quality of service – Internetworking – Network layer in the internet. Transport layer: The transport service – Elements of transport protocol – A simple transport protocol - The internet Transport Protocols : UDP – The Internet Transport Protocols : TCP - Performance issues

Unit:5	SESSIONLAYER- PRESENTATION LAYER- APPLICATION LAYER	15-- hours

Session layer : Design issues, synchronization - Presentation layer :Design issues, cryptography – Application layer : Design issues, file transfer, E-mail.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**75-- hours**

Text Books	
1	Andrew S. Tanenbaum, ―Computer Networks‖, IV Edition, PHI/Pearson Education,
2	P. Green – Computer Network Architectures and Protocols, Plenum Press, 1982.
3	Harry Katzan – An Introduction to ―Distributed Data Processing‖, A Petrocelli Book, New York / Princeton
Reference Books	
1	Godbole – Data Communication & Networking, TMH.
2	Leon Garcia – Communication Networks : Fundamental Concepts & Key Architecture, TMH
3	Hari&Barani, ―Projects in Networking‖, 2005, SCITECH Publications

Related Online Contents [TUTORIAL POINT, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/105/106105183/
2	https://www.tutorialspoint.com/data_communication_computer_network/index.htm

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	M	L	L	S	S	M	M	S	M
CO2	L	M	M	M	L	M	S	S	M	L
CO3	S	M	S	M	S	S	L	L	M	M
CO4	S	M	S	S	S	S	M	M	L	M
CO5	M	L	M	S	S	L	S	M	S	L

*S-Strong; M-Medium; L-Low

Course code		STRUCTURED SYSTEM ANALYSIS AND DESIGN	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Students should know the basic knowledge of Programming languages, Object orientation and Databases	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Enable the lifecycle model, modeling tools and Data Models.
2. Understand the types of Models in the analysis process.
3. Understand the concept of Structured Design concepts
4. Create the design process of output and develop the database development
5. Apply the Structured implementation and create the testing methods

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Design and Create types of Data models and develop the modeling tools	K6
2	Analysis and formulate the Process of Essential, Environmental, Behavioral and Implementation Model	K5
3	Understand the conceptualization of problem into several well-organized elements of solution	K2
4	Analyze the Design process and evaluate the Database Development	K4
5	Formulate the Structured implementation and review the Testing Methods	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	INTRODUCTION/DATA MODELS	15-- hours

Introduction: Common types of systems - General systems principles - People involved in 3systems development project - The project lifecycle - Major issues in systems analysis and development. Modeling tools: Characteristics of modeling tools - Dataflow diagrams - The data dictionary - Process specifications - Entity relationship diagrams – State-transition diagrams - Balancing the models - Additional modeling tools - Modeling tools for project management.

Unit:2	ANALYSIS MODEL	15-- hours

The analysis process: Essential model - The environment model - Behavioral model - The user implementation model. Case study: The Yourdon Press Case study - The Elevator system

Unit:3	STRUCTURAL DESIGN	15-- hours

Structured design: Basic design principles: Objectives of structured design - The structure of computer programs - Structure and procedure - Principles of human problems solving - Coupling - Cohesion. Design techniques: The Morphology of simple systems - Design heuristics - Transform analysis - Transaction analysis - Alternative design strategies.

Unit:4	DESIGN PROCESS	14-- hours

The Design Process: Design of output: Human factors in screen design- Issues involving human interaction - Output layout design - Design of input & control: Date capturing - Input validation - Input design for online systems - File and database development - File organization - System development Databases - Design in On - Line and Distributed Environment.

Unit:5	STRUCTURED IMPLEMENTATION	14-- hours

Structured implementation, Maintenance & Evaluation: Testing & debugging techniques - Audit trails - System documentation manuals - Training - Conversion - Post - Implementation review. Case study:

Super market systems with the following subsystems: Order processing, inventory management and sales management.		
Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**75-- hours**

Text Books	
1	Edward Yourdon, —Modern Structured Analysis‖, Prentice-Hall inc., 1989.
2	Edward Yourdon, Larry L.Constantine, —Structured design: Fundamentals of a discipline of computer program and systems design‖, Prentice-Hall inc.,.
Reference Books	
1	Sitansu S. Mittra, —Structured techniques of system analysis, design and implementation‖, A. Wiley - Interscience publication 1988.
2	James A.Senn, —Analysis and design of information systems‖, McGrew Hill 1985.
3	C.Gane&Sarason, —Structured system analysis‖, Prentice-Hall.

Related Online Contents [TUTORIAL POINT, SWAYAM, W3 computing, Websites etc.]	
1	https://www.w3computing.com/systemsanalysis/
2	https://www.tutorialspoint.com/system_analysis_and_design/index.htm

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	S	S	M	S	S	M	L	S
CO2	S	M	S	S	S	S	L	L	M	L
CO3	M	L	S	L	S	L	M	S	L	S
CO4	M	M	L	S	L	M	L	S	M	M
CO5	S	M	M	S	M	L	S	M	L	S

*S-Strong; M-Medium; L-Low

Course code		GRAPHICS AND MULTIMEDIA LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Able to know the C++ concepts, graphical representations and animation Tools	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Aware the concept of modern Graphics and Multimedia
2. To develop programming skills in Graphics concepts
3. To develop, design and implement two and three dimensional algorithms
4. To Understand Multimedia concepts using Photoshop

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Create a graphical representation of various objects	K6
2	Apply the Various types of algorithms	K3
3	Create and Evaluate different Transformation Algorithms	K5
4	Evaluate and remember the pixel representation	K5
5	Create Various types images and apply the Animation	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

	Programs	**45 Hours**
	Graphics	
1.	Write a program to rotate an image	
2.	Write a program to draw a line using DDA Algorithm.	
3.	Write a program to draw a line using Bresenham‟s Algorithm.	
4.	Write a program to do the following 2D Transformations i) Translation ii) Rotation iii) Scaling iv) Reflection	
5.	Write a program to do the following 3D Transformations i) Translation ii) Rotation iii) Scaling	
6.	Write a program to test whether a given pixel is inside or outside of a polygon.	
	Multimedia	
1.	Create Sun Flower using Photoshop.	
2.	Animate Plane flying in the Clouds using Photoshop.	
3.	Create Plastic Surgery for the Nose using Photoshop.	
4.	Create See-through text using Photoshop.	
5.	Create a Web Page using Photoshop.	
6.	Convert Black and White Photo to Color Photo using Photoshop.	
	Total Lecture hours	**45-- hours**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	L	L	M	S	M	L
CO2	S	M	L	M	M	S	M	L	S	M
CO3	S	S	M	S	L	M	M	S	M	S
CO4	M	S	M	M	L	S	S	L	S	M
CO5	S	M	M	S	M	M	L	S	M	M

*S-Strong; M-Medium; L-Low

Course code		RDBMS LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Know to implement a basic knowledge of SQL and PL/SQL	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To facilitate the students in database Design
2. To understand the various concept of database design using SQL Queries
3. To understand procedural features of programming languages using PL/SQL

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the fundamental elements of relational database management system	K2
2	Create and understand the concepts of SQL and construct queries using SQL in database creation and interaction.	K6
3	Apply Various PL/SQL techniques for building business applications	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

	Programs	45 Hours
1.	Create a table for Employee details with Employee Number as primary key and following fields: Name, Designation, Gender, Age, Date of Joining and Salary. Insert at least ten rows and perform various queries using any one Comparison, Logical, Set, Sorting and Grouping operators.	
2.	Create tables for library management system which demonstrate the use of primary key and foreign key. Master table should have the following fields: Accno, Title, Author and Rate. Transaction table should have the following fields: User id, Accno, Date of Issue and Date of Return. Create a Report(Select verb) with fields Accno, Title, Date of Issue for the given Date of Return with column formats.	
3.	Create a table and perform the operations Views, Synonyms, Sequence, Indexes,Save point	
4.	Perform Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.	
5.	Create an Employee database and set various constraints.	
6.	Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table add a new field (Alter) called Number of items and place for values for the new field without using PL/SQL block.	
7.	Write a PL/SQL to split the student table into two tables based on result (One table for ―Pass and another for ―Fail). Use cursor for handling records of student table. Assume necessary fields and create a student details table..	
8.	Create a database trigger to implement on master and transaction tables which are based on inventory management system for checking data validity. Assume the necessary fields for both tables..	
9.	Write a PL/SQL to raise the following Exception in Bank Account Management table when deposit amount is zero.	
10.	Create a table and perform the following operations : a. Insert a record using triggers b. Group the records using functions.	
	Total Lecture hours	**45-- hours**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	L	M	S	S	L	M
CO2	S	S	S	M	S	S	L	M	M	M
CO3	S	M	S	M	L	L	M	L	M	S
CO4	M	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Fifth
Semester

Course code		WEB DESIGNING	L	T	P	C
Core/Elective/Supportive		Core	4	0	0	4
Pre-requisite		Basic Programming knowledge about the system and its environments such as network and etc.,	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

4. Gives the understanding about Internet and WWW concepts.
5. Develops Programming skill in HTML.
6. It enables students to gather knowledge on XML and XSL concepts.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the fundamentals of WWW and Internet environment	K1, K2
2	Design programs for developing web page using HTML	K2, K3
3	Formulate the advanced HTML concepts with creativity.	K2, K4
4	Apply the analysis skill of Data representation method using XML	K2, K5
5	Devolve a Interactive Dynamic Web page using XML and XSL.	K1, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTERNET, WWW AND E-MAIL	10 hours

Introduction to Internet – World Wide Web – *Browsers*: Introduction – Popular Web Browsers – know your browsers – *Electronic Mail*: Introduction – E-Mail networks and servers – E-mail protocols – Structure of an E-mail..

Unit:2	INTRODUCTION TO HTML	12 hours

HTML: Introduction – Getting started – Creating and saving an HTML document – Document Layout of HTML Page – HTML elements – Some other formatting Styles– Hypertext Links.

Unit:3	ADVANCED FEATURES OF HTML	12 hours

HTML (cont): URLs – Images – HTML tables – Frames - Forms – Special Characters - Meta tags - *Style Sheet Interactivity Tools and Multimedia*: Introduction – DHTML– Scripting Languages – Java – ASP.

Unit:4	BASIC CONCEPTS OF XML	12 hours

XML: XML basics – Introduction – need for XML – Advantages – Working with an XML Document – Structure of an XML Document – DTD - XML Schema

Unit:5	ADVANCED XML AND STYLE SHEET	12 hours

Working with XML Schema - Declaring Attributes – XML namespaces – Reusing Schema Components – Grouping elements and attributes. *XML Style sheets*: Introduction – CSS – eXtensible Style Sheet language – Formatting Data based on controls – Displaying data in a Tabular Format.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars - webinars

	Total Lecture hours	60 hours

Text Books

1.	ITL Education, **Internet and Web Design**, Macmillan India Ltd..
2.	NIIT, **HTML and XML - an Introduction**, Prentice Hall of India Pvt. Ltd
Reference Books	
1.	C.Xavier, **World Wide Web Design with HTML**, 2007, TMH.
2.	Steven Holzner, **Inside XML**, 2000 Edition, Techmedia Publishers.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.mooc-list.com/course/introduction-html5-coursera
2	https://onlinecourses.swayam2.ac.in/aic20_sp11/preview
3	https://www.mooc-list.com/course/introducci%C3%B3n-xml-unimooc
Course Designed By:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	L	M	M	M	M	S	M
CO2	M	S	L	M	S	S	M	M	M	M
CO3	M	L	S	S	M	S	M	M	M	S
CO4	S	M	S	S	M	S	M	M	M	M
CO5	S	S	L	M	S	S	M	S	S	M

*S-Strong; M-Medium; L-Low

Course code		CLIENT SERVER COMPUTING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Should have the basic knowledge on networking and its operations	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understood the client/server computing techniques
2. Understood the client/server application development and production environments
3. Gathers Knowledge on Operating systems and its related areas.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the client / server concept over Networking environment	K!, K2
2	Analyze the requirement of client/server hardware and software requirements	K2, K4
3	Interpret the overview of Networking and Operating Systems	K5
4	Applying and developing the various environment of Networking	K2, K6
5	Analyze the System and Network Management	K3, K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	OVERVIEW OF CLIENT / SERVER COMPUTING AND APPLICATIONS	12 hours

Overview of Client/Server computing: What is Client/Server Computing - Benefits of Client/Server Computing - *Evolution of Client/server Computing*: Hardware and Software Trends - *Overview of Client /Server Applications*: Components of Client/Server Application -Classes of client/server application - Categories of Client/Server Applications - Understanding Client /Server Computing: Obstacles - Open systems and standards - Factor for success

Unit:2	HARDWARE AND SOFTWARE OF CLIENT	12 hours

The Client Hardware and Software: Client Components - Client operating systems - GUI-X Windows versus Windowing – Database access - Application logical - *Client Software Products*: GUI Environment - Database access tools Client Requirements - The Server - Categories – Features of Server Machines - Classes of Server Machines - Server Environment.

Unit:3	SERVER MANAGEMENT	12 hours

Server Requirements - Server Data Management and Access Tools - Data Manager Features - Data Management Software - Database Gateways - Overview of Networking - *LAN Hardware and Software*: LAN Hardware - Network Operating Systems

Unit:4	DIFFERENT ENVIRONMENT	12 hours

Applications Development Environments - Managing the Production Environment - Distributed Transaction Management - Integrating Multivendor Environments

Unit:5	REQUIREMENT OF NETWORKING	10 hours

Production Requirements: System Management - Network Management – Runtime Specifications - Distributing Software Updates - Hardware and Software Trends

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	**60 hours**

Text Books

1.	Dawna Travis Dewire, **Client Computing**, Tata McGraw-Hill, 2003
2.	Robert Orfali, Dan Harkey and Jerri Edwards, **Essential Client/Server Survival Guide**, John Wiley & Sons Inc., 1996.

Reference Books

1.	Joe Salemi, **Client/Server Databases**.
2.	Patrick Smith et al., **Client/Server Computing**
3.	Larry I.Vaughn, **Client/Server System Design and Implementation**

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.tutorialspoint.com/Client-Server-Computing
2	https://www.coursera.org/courses?query=client%20server
3	https://nptel.ac.in/courses/106/106/106106168/

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	L	M	M	M	M	M
CO2	M	S	M	S	M	S	L	M	M	M
CO3	S	S	S	M	L	L	M	M	M	M
CO4	M	S	S	M	S	M	M	M	L	M
CO5	L	M	S	M	S	M	M	L	L	M

*S-Strong; M-Medium; L-Low

Course code		SOFTWARE ENGINEERING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Knowledge on Problem solving, Analysis an environment along with programming language for developing applications	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Understood the role of software engineering
2. Gathers knowledge on design concepts, testing methods and strategies
3. Learns method of software development and implementation

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the fundamentals of Software Engineering	K1, K2
2	Analyze the various requirement of Software Life Cycle	K3, K4
3	Designing of Architecture and Data collections method for development	K3, K4
4	Interpret the user interface and object oriented design	K4, K5
5	Identify the various software testing strategy and methods	K2, K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	BASICS OF SOFTWARE ENGINEERING	10 hours

The evolving role of software – Software – Software Crises and Myths – *Software Engineering*: Layered Technology – The software process model – Evaluating Software Process models – Component Based development – The formal methods model – 4GT – *Software Project Planning*: Project Planning objectives – Software Scope – resources – Software Project estimation – Decomposition Techniques – Empirical estimation models.

Unit:2	REQUIREMENT ANALYSIS	12 hours

Analysis concepts & Principles: Requirement Analysis – Analysis Principles – Software Prototyping – Specification. Analysis modeling: Data Modeling – Functional modeling & information flow – Behavioral modeling.

Unit:3	DESIGN AND ARCHITECTURAL	12 hours

Design concepts & Principles: The design process – Design Principles – Design concepts – Effective modular design. *Architectural design*: Software Architecture – Data design – Analyzing alternative Architectural design – Mapping requirements into software Architecture – Transform mapping– Transaction mapping.

Unit:4	VARIOUS TYPES OF DESIGN	12 hours

User interface design: The Golden Rules – User interface design – Task analysing and modeling – interface design activities – implementation tools – Design Evaluation. Component level design: Structured Programming – Comparison of Design notations. *Object-Oriented design*: Design for object – Oriented systems – the system design process – The object design process.

Unit:5	TESTING TECHNIQUES	12 hours

Software Testing Techniques: Software Testing Fundamentals – Test case design – White box Testing – Basis path Testing – Control structure testing – Black box Testing. *Software testing strategies*: A Strategic Approach to software testing – Strategic issues–

Unit Testing – integration testing – Validation testing – System testing.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1.	Roger S Pressman –**Software Engineering a Practioner‟s Approach**, Fifth Edition, McGraw-Hill Higher Education.
2.	Rajib Mall, **Fundamentals of Software Engineering**, PHI, Second Edition.
Reference Books	
1.	Sommerville, **Software Engineering**, Pearson Education, Sixth Edition.
2.	Richard Fairly, **Software Engineering Concepts**, Tata McGraw Hill, 1997
3.	Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, **Fundamentals of Software Engineering**, Second Edition, PHI/Pearson Education Asia.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc19_cs69/preview
2	https://www.edx.org/course/software-engineering-essentials
3.	https://nptel.ac.in/courses/106/105/106105182/

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	L	M	L	M	M	M
CO3	S	S	M	M	S	M	M	S	M	M
CO3	M	S	S	S	M	L	M	M	L	M
CO4	S	S	M	M	S	M	S	M	M	M
CO5	M	S	S	M	M	S	M	M	L	M

*S-Strong; M-Medium; L-Low

Course code		VISUAL PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Fundamental knowledge of GUI and basic of Visual Basic / Visual C++	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Gives idea on .NET Framework concept
2. Make to Understand the working of VB.NET
3. Helps in designing web page using ASP.NET

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the nature of .NET and its Framework	K1, K2
2	Evaluate the basic of VB.NET concepts – Statements and Functions	K2, K5
3	Understanding the Array, Designing the Menu and Creating Menus	K2, K4
4	Analyze the fundamentals of ASP.NET	K2, K5
5	Create the Web based applications using .NET	K3, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION TO .NET	15 hours

What is .NET Framework: What is .NET? – Requirement - What is .NET Built on? – Overview of the .NET Framework: .NET Framework Conceptual Overview – Common Language Runtime –Common Type System – Meta Data and Self describing Components – Cross- Language Interoperability – Assemblies in the Common Language Runtime – Application Domains - .NET Framework Class Library Overview – Runtime Hosts – Basic Structural Diagram of .NET Framework – Versions of .NET Framework.

Unit:2	VB.NET STATEMENTS AND CONTROLS	15 hours

Introduction to VB.NET – Properties windows and setting properties of forms and controls - Visual Basic.NET variables – Data Types – Constant – Building Project – Displaying Output – operators – Conditional statements – If-then, Select-case – Looping – Do, For next, nested loops. Import statement – Msg Box Functions – Input Box Functions – User defined and Built-in Functions – Controls.

Unit:3	ARRAYS AND FILES IN VB.NET	15 hours

Arrays – Menus – Built-in Dialog Boxes – Dialog classes – Files – Handling files using function and classes – Directory class – File class – File Processing.

Unit:4	INTRODUCTION TO ASP.NET	15 hours

Features of ASP.NET – Developing a Web Application: ASP.NET pages – provider model – coding model – code sharing – Compilation in ASP.NET. Applications and State: Structure of an application – The global .asax Application File – using states – HTTP handlers.

Unit:5	WEB AND HTML CONTROLS	13 hours

Web Forms - The control class – The web control class – creating buttons – Enabling and Disabling controls – Hyperlinks – The Tree view model – Menu control – Site map path control – wizard control – validation controls – Login controls – HTML controls – Developing web sites.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Books

1.	PankajAgarwal, **Principles of .NET Framework**, Vayu Education of India, 2009.
2.	Steven Holzner, **Visual Basic.NET Black Book**, Paraglyph Press, 2002.
3.	CharulShukla, **ASP.NET 2.0 black book**, Paraglyph Press, 2006.

Reference Books

1.	Cornell, **Visual Basic 6 From the Ground up,** Tata Mcgraw Hill Company Limited
2.	Dave Mercer, **ASP.NET A Beginner's Guide**, Tata Mcgraw Hill Company Limited, 2002.
3.	Matt J.Couch, **ASP.NET and VB.NET Web Programming**, Pearson Education, 2002.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106/105/106105084/
2	https://nptel.ac.in/courses/106/105/106105084/
3	https://www.mooc-list.com/course/build-web-apis-using-aspnet-edx

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	M	M	M	L	M	M	L
CO2	S	S	S	S	M	S	M	M	M	M
CO3	M	M	M	M	S	M	L	M	M	S
CO4	S	M	M	S	S	L	M	L	M	M
CO5	M	S	M	M	S	M	M	M	S	M

*S-Strong; M-Medium; L-Low

Course code		PRINCIPLES OF COMPILER DESIGN	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		Need basic idea on System Software and Mathematical skill along programming language related concepts.	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Students should have understood the different phases of a Compiler and its working.
2. Gets an idea on syntax and semantics of Programming language and parsing techniques
3. Acquires necessary knowledge to design a compiler

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understanding the basic of Compiler and Role of lexical analysis	K1, K3
2	Evaluate the various parsing method and context free grammar	K2, K5
3	Understand the role of LR Parse and construction.	K1, K2, K4
4	Analyze the concept of semantics and syntax in language	K2, K3, K4
5	Apply the concept of optimizing the Code generation process	K3, K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	STRUCTURE OF COMPILER	15 hours

Introduction: Structure of a compiler - Compiler writing tools - *Basic constructs of high level programming languages*: Data structures, parameter transmission. Lexical Analysis - Role of a lexical analyzer - Finite automata - Regular expressions to finite automata minimizing the number of states of a deterministic finite automaton - Implementation of a lexical analyzer.

Unit:2	PARSING METHODS	15 hours

Parsing techniques - Context free grammars - Derivations and parse - Capabilities of context free grammars. Top down bottom up parsing - Handles - Shift reduce parsing - Operator - Parsing -recursive descent parsing - Predictive parsing.

Unit:3	VARIOUS TYPES OF PARSING	15 hours

Automatic parsing techniques - LR parsers - Canonical collection of LR (0) items - Construction of SLR parsing tables - LR(l) sets of items construction - Construction of canonical LR parsing tables.

Unit:4	SYNTAX AND SEMANTIC ANALYSIS	15 hours

Syntax Directed Translation - Semantic actions - Implementation of syntax directed translators - Intermediate code: Postfix notation: quadruples: Indirect triples - methods of translation of assignment statements, Boolean expressions and control statements.

Unit:5	CODE GENERATIONS AND OPTIMIZATION	13 hours

Symbol tables and code generations - Representing information in symbol table - Data structures for symbol tables - Introduction to code optimization: Basic blocks: Dag representation - Error detection and recovery - Introduction to code generation.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	**75 hours**

Text Books

1.	Aho.A.V and Ullman.J.D, **Principles of Compiler Design**, Addison Wesley publishing company.
2.	Dhamdhere D.M, **Compiler Construction Principles and Practice**, MacMillan India Ltd, 1983.

Reference Books

1.	Holub Allen, **Compiler design in C**, Prentice Hall of India, 1990.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.udacity.com/course/compilers-theory-and-practice--ud168
2	https://nptel.ac.in/courses/106/108/106108113/

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	S	M	M	L	M	S	M
CO3	S	M	S	L	M	S	S	L	M	M
CO3	S	S	M	M	L	M	M	S	M	L
CO4	M	S	M	M	S	S	M	M	M	M
CO5	M	S	S	S	S	M	L	M	M	L

*S-Strong; M-Medium; L-Low

Course code		WEB DESIGNING LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Should have idea on Web page and Web sites and online and offline environment of networking	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

7. Understand the HTML working concept and designing web pages
8. Representing the Data using XML and XSL
9. Gives ability to create interactive web pages.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Design the Website for various organization **(Program 1)**	K2
2	Interpreting the Visual Design of Web pages along with images and Hyperlinks **(Program 2, 3)**	K3
3	Develop a documentation skill with various types of list and Frameset with HTML **(Program 4, 5)**	K6
4	Apply the knowledge of Web page design in various registration form and details collection **(Program 6, 7, 8)**	K4
5	Analyze the Data representation method and Creation of Dynamic web page creation **(Program 9, 10)**	K4

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs

13. Develop a website for your college using advanced tags of HTML.
14. Write names of several countries in a paragraph and store it as an HTML document, World.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India.
15. Design a photo gallery using HTML tags
16. Develop a HTML document to
    i. display Text with Bullets / Numbers - Using Lists
    ii. to display the Table Format Data
17. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML
18. Write a HTML document to print your Bio-Data in a neat format using several components
19. Develop a HTML document to display a Registration Form for an inter-collegiate function.
20. Develop a HTML document to design Alumni Registration form of your college.
21. Display customer details using XML with XSL transformation.
22. Display student personal details in XML format.

	Total Lecture hours	**45 hours**

Text Books

1.	NIIT, **HTML and XML - an Introduction**, Prentice Hall of India Pvt. Ltd

Reference Books

1.	C.Xavier, **World Wide Web Design with HTML**, 2007, TMH.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://onlinecourses.swayam2.ac.in/aic20_sp11/preview
2	http://www.nptelvideos.in/2012/11/internet-technologies.html

Course Designed By:

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	M	S	M	S	M	M	M	M
CO3	S	S	M	S	M	M	S	L	L	M
CO3	S	M	S	S	S	L	L	M	M	S
CO4	M	S	S	S	M	M	S	M	L	M
CO5	M	M	S	M	M	S	M	M	M	L

*S-Strong; M-Medium; L-Low

Course code		VISUAL PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Knowledge in Visual Basic, GUI Environment and its operations	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Create application software for various organization
2. Designing concept development skill
3. Knowledge on Online programming and applying in Website designing.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Apply the concept of GUI environment concepts. (**Program 1 and 2)**	K3
2	Able to Create application the for arithmetic calculation and handle the employee details (**Program 3 and 4)**	K6
3	Understand the process of Student Information and handling file (**Program 5 and 6).**	K2
4	Analyze the organizations websites and its design (**Program 7 and 9)**	K4
5	Evaluate the Dynamic Webpage design (**Program 8 and 10)**	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs

VB.NET Programs

1. Font Application
2. Notepad Application
3. Arithmetic Calculator
4. Employee Details
5. Students Information
6. Adding data into a text file

ASP.NET Programs

7. College Website
8. Online Examination System
9. Online Mobile Phone Shop
10. Online Registration form

	Total Lecture hours	**45 hours**

Text Books

1.	Steven Holzner, **Visual Basic.NET Black Book**, Paraglyph Press, 2002.
2.	CharulShukla, **ASP.NET 2.0 black book**, Paraglyph Press, 2006.

Reference Books

1.	Matt J.Couch, **ASP.NET and VB.NET Web Programming**, Pearson Education, 2002.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.udemy.com/topic/vbnet/
2	https://freevideolectures.com/course/3565/asp-net

Course Designed By:

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	S	M	M	L	M	S	M	M	M
CO2	S	S	M	S	M	M	M	M	S	M
CO3	S	S	M	S	S	M	S	S	M	S
CO4	M	M	S	S	M	S	M	M	S	M
CO5	S	M	M	M	L	S	M	M	M	S

*S-Strong; M-Medium; L-Low

Sixth
Semester

Course code		JAVA PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the students are familiar with programming language such as java	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the JAVA basics concepts
2. Ability to solve problems by applying OOPs concepts in JAVA Programming Language
3. Creates logical thinking on GUI based applications
4. Develop large and complex software
5. Apply platform independent, internet enabled concepts to develop applications

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Create coding to solve problems using Java Programming Language	K6
2	Understand the concepts and create applications and applets	K2
3	Remember the difference between other programming languages with Java	K1
4	Apply multithreading concepts to develop projects	K3
5	Evaluate stream Classes and File operations	K5

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Introduction	12-- hours

Java Evolution: History – Features – How Java differs from C and C++ – Java and Internet – Java and www –Web Browsers. Overview of Java: simple Java program – Structure – Java Tokens – Statements – Java Virtual Machine- Constants, Variables, Data Types – Operators and Expressions.

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Unit:2	Branching and Looping	12-- hours

Decision Making and Branching: if, if...else, nested if, switch, ? : Operator - Decision Making and Looping: while, do, for – Jumps in Loops - Labeled Loops – Classes, Objects and Methods.

Unit:3	Interfaces and Packages	12-- hours

Arrays, Strings and Vectors – Interfaces: Multiple Inheritance – Packages: Putting Classes together – Multithreaded Programming.

Unit:4	Applet Programming	12-- hours

Managing Errors and Exceptions – Applet Programming – Graphics Programming.

Unit:5	File Operations and Exceptions	12-- hours

Managing Input / Output Files in Java : Concepts of Streams- Stream Classes – Byte Stream classes – Character stream classes – Using streams – I/O Classes – File Class– I/O exceptions – Creation of files – Reading / Writing characters, Byte-Handling Primitive data Types – Random Access Files.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	**60 -- hours**
Text Books		
1	Programming with Java – A Primer - E. Balagurusamy, 3rd Edition,TMH.	
2	The Complete Reference Java 2 - Patrick Naughton& Hebert Schildt, 3rd Edition,TMH	
Reference Books		
3	Programming with Java – John R. Hubbard, 2nd Edition,TMH.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.tutorialspoint.com/java/index.htm	
2	NPTEL Course: Programming in JAVA	
Course Designed By:		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	L	S	M	M	M	M
CO3	S	S	S	M	M	M	M	S	S	S
CO3	S	S	S	M	M	S	S	M	M	S
CO4	S	S	S	L	M	M	M	S	S	M
CO5	S	S	S	L	M	M	M	M	M	M

*S-Strong; M-Medium; L-Low

Course code		PYTHON PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the students are familiar with python programming language	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds
2. Use functions for structuring Python programs
3. Understand different Data Structures of Python
4. Represent compound data using Python lists, tuples and dictionaries

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of Python Programming	K1,K2
2	Understand File operations, Classes and Objects	K2,K3
3	Acquire Object Oriented Skills in Python	K3,K4
4	Develop web applications using Python	K5
5	Develop Client Server Networking applications	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	12 hours

Python: Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets– Comparison.

Unit:2	CODE STRUCTURES	12 hours

Code Structures: if, elseif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.

Unit:3	MODULES, PACKAGES AND CLASSES	12 hours

Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes:** Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.

Unit:4	DATA TYPES AND WEB	12 hours

Data Types: Text Strings – Binary Data. **Storing and Retrieving Data:** File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores.
Web: Web Clients – Web Servers – Web Services and Automation

Unit:5	SYSTEMS AND NETWORKS	10 hours

Systems: Files –Directories – Programs and Processes – Calendars and Clocks.
Concurrency: Queues – Processes – Threads – Green Threads and gevent – twisted – Redis.
Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1	Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014.
2	Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.

Reference Books

1	David M. Beazley, “Python Essential Reference”, Developer’s Library, Fourth Edition, 2009.
2	SheetalTaneja, Naveen Kumar, “Python Programming-A Modular Approach”, Pearson Publications.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.programiz.com/python-programming/
2	https://www.tutorialspoint.com/python/index.htm
3	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	S	M
CO5	S	S	S	S	S	S	S	M	S	M

Course code		MOBILE COMPUTING	L	T	P	C
Core/Elective/Supportive		Elective	4			4
Pre-requisite			Syllabus		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Present the overview of Mobile computing, Applications and Architectures.
2. Describe the futuristic computing challenges.
3. Enable the students to learn the concept of mobile computing.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the need and requirements of mobile communication	K1,K2
2	Focus on mobile computing applications and techniques	K2,K3
3	Demonstrate satellite communication in mobile computing	K4
4	Analyze about wireless local loop architecture	K5,K6
5	Analyze various mobile communication technologies	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	15 hours

Introduction: Advantages of Digital Information - Introduction to Telephone Systems –Mobile communication: Need for Mobile Communication – Requirements of Mobile Communication – History of Mobile Communication.

Unit:2	MOBILE COMMUNICATION	15 hours

Introduction to Cellular Mobile Communication – Mobile Communication Standards –Mobility Management – Frequency Management – Cordless Mobile Communication Systems.

Unit:3	MOBILE COMPUTING	15 hours

Mobile Computing: History of data networks – Classification of Mobile data networks - CDPD System – Satellites in Mobile Communication: Satellite classification – Global Satellite Communication – Changeover from one satellite to other – Global Mobile Communication – Interferences in Cellular Mobile Communication.

Unit:4	MOBILE COMMUNICATION SYSTEM	15 hours

Important Parameters of Mobile Communication System – Mobile Internet: Working of Mobile IP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless Application Protocol.

Unit:5	COMMUNICATION TECHNOLOGY	13 hours

WCDMA Technology and Fibre Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system – Fourth Generation Mobile Communication systems.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars - webinars

	Total Lecture hours	75 hours

Text Books	
1	T.G. Palanivelu, R. Nakkeeran, "Wireless and Mobile Communication", PHI Limited, 2009.
2	Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2007.
Reference Books	
1	Asoke K Talukder, Hasan Ahmed, RoopaYavagal, "Mobile Computing", TMH, 2010.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/mobile_computing/index.htm
2	https://www.javatpoint.com/mobile-computing
3	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/
Course Designed By:	

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	M	L	L	M	S	M	M	M	M
CO2	S	S	S	M	M	S	M	S	S	S
CO3	S	S	S	S	M	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Course code		OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
Core/Elective/Supportive		Paper V	4			4
Pre-requisite		This course requires that the students are familiar about the OOPs concepts	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the concepts of Classes,Objects OOSD life cycle
2. Know the basic principles, functions of OOAD
3. Analyze the class diagrams and implement in UML
4. Apply different testing techniques

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts on data and design technique	K2
2	Remember the different Models for system development	K1
3	Analyze the class diagrams and apply in UML	K4
4	Apply various testing techniques for applications	K3
5	Implement projects using Object Oriented Concepts	K6

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Introduction	15-- hours

Object Orientation – System Development – Review of Objects – Inheritance – Object Relationships – Dynamic binding – OOSD life cycle – Process – Analysis- Design - Prototyping – Implementation – Testing – Overview of Methodologies

Unit:2	OMT	15-- hours

OMT – Booch methodology, Jacobson – Methodology – patterns – Unified approach – UML –Class Diagrams – Dynamic Modeling

Unit:3	Case Model	15-- hours

Using Case model – Creation of classes – Noun Phrase approach – responsibilities – Collaborators and relationships – Super – Sub class - Aggregation

Unit:4	Object Oriented Design	14-- hours

OO Design axioms – Class visibility – refining attributes- Methods – Access layer – OODBMS – Class mapping view layer

Unit:5	Testing	14-- hours

Quality Assurance testing – Inheritance and testing - Test Plan – Usability testing – User satisfaction testing

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	75 -- hours

Text Books

1. Ali Brahmi , ― Object Oriented System Development‖ , TMH IntlEdition
2. GradyBooch, –Object-Oriented AnalysisandDesign‖,Addison – Wesley

Reference Books

1. JamesRumbaugh,MichealBlaha,‖ObjectOrientedModellingandDesign‖,Prentice Hall

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	L	M	M	S	S	S	S
CO2	S	S	M	M	M	M	S	S	S	S
CO3	S	S	M	S	M	M	S	S	S	S
CO4	M	S	S	S	M	M	M	M	M	M
CO5	M	M	S	S	M	M	M	M	M	M

*S-Strong; M-Medium; L-Low

Course code		JAVA Programming Lab	L	T	P	C
Core/Elective/Supportive		Practical I			4	4
Pre-requisite		Basics of programming Language C++	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To practice the OOPs concepts, Branching and Looping Statements and Strings in JAVA programming
2. To implement and gain knowledge in Arrays, Vectors and File handling

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remember and Understand the logic for a given problem **(Program-1,2)**	**K1, K2**
2	Apply the concepts Exceptions, multithreading and polymorphism (**Program-3,4,5)**	**K2, K3**
3	Understand and Remember the logic used in Frames **(Program-6,7,8)**	**K1, K2**
4	Apply and Analyze the concepts of Menu bars and Mouse Clicks **(Program-9,10)**	**K3&K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs

1. Write a Java Application to extract a portion of a character string and print the extractedstring.
2. Write a Java Program to implement the concept of multiple inheritance usingInterfaces.
3. Write a Java Program to create an Exception called payout-of-bounds and throw the exception.
4. Write a Java Program to implement the concept of multithreading with the use of any three multiplication tables and assign three different priorities tothem.
5. Write a Java Program to draw several shapes in the createdwindows.
6. Write a Java Program to create a frame with four text fields name, street, city and pin code with suitable tables. Also add a button called my details. When the button is clicked its corresponding values are to be appeared in the textfields
7. Write a Java Program to demonstrate the Multiple SelectionList-box.
8. Write a Java Program to create a frame with three text fields for name, ageand qualification and a text field for multiple line foraddress
9. Write a Java Program to create Menu Bars and pull downmenus.
10. Write a Java Program to create frames which respond to the mouse clicks. For each events with mouse such as mouse up, mouse down, etc., the corresponding message to bedisplayed.

Total Lecture hours **45 hours**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	L	S	S	S	S	S
CO2	S	S	S	S	M	S	S	S	M	M
CO3	S	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	L	L	S	M	M
CO5	M	S	L	S	M	S	L	S	M	S

*S-Strong; M-Medium; L-Low

Course code		PRACTICAL II :PYTHON PROGRMMING LAB	L	T	P	C
Core/Elective/Supportive		Core			4	4
Pre-requisite		Need of Basic Programming Lanugages	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. This course presents an overview of elementary data items, lists, dictionaries, sets and tuples
2. To understand and write simple Python programs
3. To Understand the OOPS concepts of Python
4. To develop web applications using Python

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Able to write programs in Python using OOPS concepts	K1,K2
2	To understand the concepts of File operations and Modules in Python	K2,K3
3	Implementation of lists, dictionaries, sets and tuples as programs	K3,K4
4	To develop web applications using Python	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

LIST OF PROGRAMS	**45 hours**

Implement the following in Python:

1. Programs using elementary data items, lists, dictionaries and tuples
2. Programs using conditional branches,
3. Programs using loops.
4. Programs using functions
5. Programs using exception handling
6. Programs using inheritance
7. Programs using polymorphism
8. Programs to implement file operations.
9. Programs using modules.
10. Programs for creating dynamic and interactive web pages using forms.

Total Lecture hours	**45 hours**

Text Books

1	Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014.
2	Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.

Reference Books

3	David M. Beazley,“Python Essential Reference”, Developer’s Library, Fourth Edition, 2009.
4	SheetalTaneja, Naveen Kumar, ”Python Programming-A Modular Approach”, Pearson Publications.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

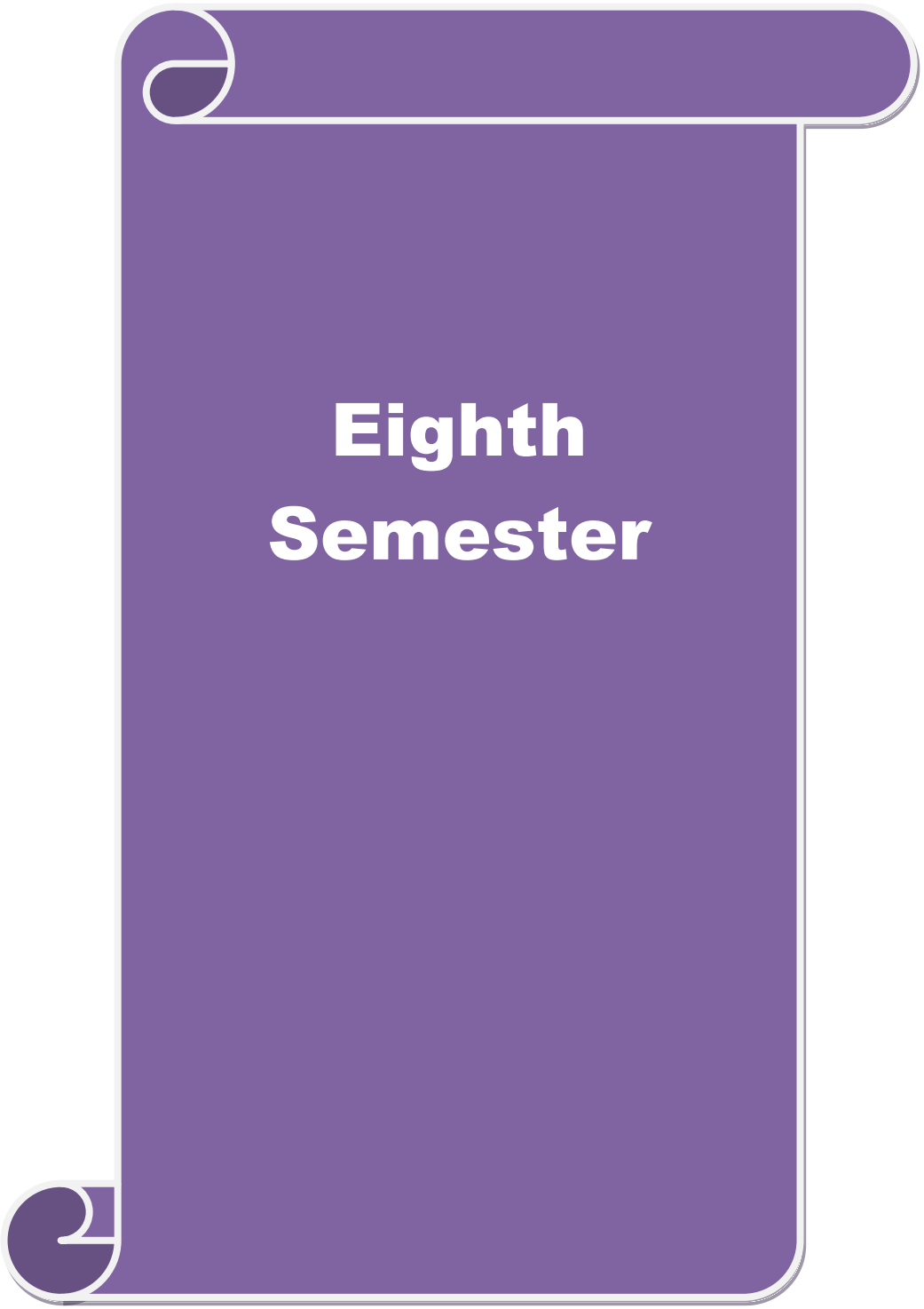
1	https://www.programiz.com/python-programming/
2	https://www.tutorialspoint.com/python/index.htm
3	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Course Designed By:

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

Seventh
Semester

Project Work and Viva Voce –I


Eighth
Semester

Course code		DATA MINING AND WAREHOUSING	L	T	P	C
Core/Elective/Supportive		core	4			4
Pre-requisite		This course requires that the students are familiar about the data mining	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.
2. Develop skills of using recent data mining software for solving practical problems.
3. Develop and apply critical thinking, problem-solving, and decision-making skills.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic data mining techniques and algorithms	K1,K2
2	Understand the Association rules, Clustering techniques and Data warehousing contents	K2,K3
3	Compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining	K4,K5
4	Design data warehouse with dimensional modeling and apply OLAP operations	K5,K6
5	Identify appropriate data mining algorithms to solve real world problems	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	BASICS AND TECHNIQUES	12 hours

Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective.

Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.

Unit:2	ALGORITHMS	12 hours

Classification: Introduction – Statistical – based algorithms - distance – based algorithms- decision tree - based algorithms - neural network – based algorithms –rule - based algorithms – combining techniques.

Unit:3	CLUSTERING AND ASSOCIATION	12 hours

Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms - Partitional Algorithms.

Association rules: Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches- incremental rules – advanced association rules techniques – measuring the quality of rules.

Unit:4	DATA WAREHOUSING AND MODELING	11 hours

Data warehousing: introduction - characteristics of a data warehouse – data marts – other aspects of data mart. Online analytical processing: introduction - OLTP & OLAP systems

Datamodeling –star schema for multidimensional view –data modeling – multifactstar schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.

Unit:5	APPLICATIONS OF DATA WAREHOUSE	11 hours

Developing a data WAREHOUSE: why and how to build a data warehouse –data warehouse

architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education,2003.
2	C.S.R. Prabhu, "Data Warehousing Concepts,Techniques, Productsand Applications", PHI, Second Edition.
3	ArunK.Pujari, "Data Mining Techniques", Universities Press (India) Pvt. Ltd.,2003.
Reference Books	
1	Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", TMCH, 2001.
2	Jiawei Han &MichelineKamber, "Data Mining Concepts & Techniques", 2001, Academicpress.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/data-warehouse
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3	https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		**ADVANCED JAVA PROGRAMMING**	*L*	*T*	*P*	*C*
Core/Elective/Supportive		*Core*	**4**			**4**
Pre-requisite		**Students must know at least the basics of how to use a Java language and should be able to start a command line shell.**	***Syllabus Version***			**2021-22**

Course Objectives:

The main objectives of this course are to:

1. Provide the ability to design console based, GUI based and web based applications
2. Identify java language components and how they work together in applications
3. Learn how to use Event handling and networking concepts in Java applications
4. *Develop huge amount of software using JQuery*
5. *Learn how to design a servlets programs*

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Apply integrated development environment to write, compile, run, and test simple and complex object-oriented Java programs.	*K4*
2	Apply Remote objects and methods to develop component-based Java software	*K4*
3	Understand JDBC principles to update and retrieve the data from the databases	*K2*
4	Create server side programs in the form of Servlets	*K6*
5	Remember the Java language for writing well-organized, complex computer programs with both commandline and graphical user interfaces.	*K1*

***K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create*

Unit:1	**Java Basics**	**11-- hours**

Java Basics Review: Components and event handling – Threading concepts – Networking features – Media techniques

Unit:2	**Remote Objects**	**12-- hours**

Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons-Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces

Unit:3	**Databases**	**11-- hours**

Java in Databases- JDBC principles – database access- Interacting- database search – Creating multimedia databases – Database support in web applications

Unit:4	**Servlets and JSP**	**12-- hours**

Java Servlets: Java servlet and CGI programming- A simple java servlet-Anatomy of a java servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP pageExpressions-Scriptlets-Directives-Declarations-A complete example

Unit:5	**JAR and JQuery**	**12-- hours**

JAR file format creation – Internationalization – Swing Programming – JQuery: IntroductionAddingJQuery to Web pages- JQuery Editor-JQuery Selectors and Elements-Animations and Events handling in JQuery

Unit:6	**Contemporary Issues**	**2-- hours**

Online seminars - webinars

	Total Lecture hours	***60 – hours***

Text Books

1	Jamie Jaworski, ―Java Unleashed‖ , SAMS Techmedia Publications, 1999
2	Campione, Walrath and Huml, ―The Java Tutorial‖, Addison Wesley,1999

Reference Books

1	Jim Keogh,‖ The Complete Reference J2EE‖, Tata McGrawHill Publishing Company Ltd,2010
2	David Sawyer McFarland, ―Javascript And Jquery- The Missing Manual‖, Oreilly Publications, 3rd Edition,2011

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
2	https://www.youtube.com/watch?v=hBh_CC5y8-s

Course Designed By:

COs	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***
CO1	*S*	*S*	*S*	*M*	*S*	*S*	*S*	*S*	*S*	*M*
CO2	*M*	*S*	*S*	*M*	*M*	*M*	*S*	*M*	*S*	*S*
CO3	*S*	*S*	*M*	*M*	*S*	*S*	*S*	*S*	*M*	*S*
CO4	*S*	*S*	*S*	*M*	*S*	*S*	*M*	*S*	*S*	*M*
CO5	*S*	*S*	*S*	*L*	*S*	*S*	*S*	*S*	*S*	*S*

*S-Strong; M-Medium; L-Low

Course code		**ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**	*L*	*T*	*P*	*C*
Core/Elective/Supportive		*Core*	4			4
Pre-requisite		Students should have the strong knowledge of Mathematics and Ability to understand complex algorithms.	***Syllabus Version***		**2021-22**	

Course Objectives:

The main objectives of this course are to:

1. Introduce the basic principles, techniques, and applications of Artificial Intelligence.
2. Increase a historical perspective of AI and its fundamentals
3. Investigate the current scope, potential, limitations, and implications of intelligent systems.
4. Explore present and upcoming applications for this new technology
5. *Applyplatformindependent,internetenabledconceptstodevelopapplications*
6. Discover the difficulties associated with the development of an expert system

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Create basic knowledge and awareness in AI problem	*K6*
2	Understand responsiveness of learned search process.	*K2*
3	Apply basic principles of AI in Game playing problems.	*K3*
4	*Evaluate the concept of Knowledge representations*	*K5*
5	*Analyze the concept of Expert systems with major applications*	*K4*

***K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create*

Unit:1	***Introduction***	***15-- hours***

Introduction to Artificial Intelligence (AI): Computerized reasoning - Artificial Intelligence - Characteristics of an Al problem - Problems representation in AI - State space representation — Problem reduction.

Unit:2	***Search Process***	***15-- hours***

Search process: Al and search process - Brute force search techniques. Hill climbing - Best inst - - Beam search - Constraint satisfaction.

Unit:3	***Al and game playing***	***15-- hours***

Al and game playing - Major components of game playing program - plausible move generator - Static evaluation - Function generator - Minimax strategy - Alpha-beta techniques - Problems on computer game playing program.

Unit:4	***Knowledge Representation***	***15-- hours***

Knowledge Representation: Logic ,prepositional logic - Tautology - Contradiction and contingencies - Normal form - Predicate logic - Form - Rules of inference - Resolution - Unification algorithm.

Unit:5	***Expert Systems***	***13-- hours***

Introduction to EXPERT SYSTEM: Definition - Characteristics, Architecture and descriptions of various modules. Knowledge engineering - Expert system life cycle - Difficulties in knowledge acquisition - Knowledge acquisition - strategies - Expert systems - Major application areas. Qualitative study of expert system like DENDRAL, MYCIN and RI

Unit:6	***Contemporary Issues***	***2-- hours***
	Expert lectures, webinars	
	Total Lecture hours	***75 -- hours***

Text Books

1	*Dr. K. Sarukesi and Dr. V. Janakiraman, "Foundation of Artificial Intelligence & Expert System", Macmillan Ltd., 1993.*
2	*Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH, 1991.*
Reference Books	
3	*Donald A Waterman, "Building Expert System", 1986.*
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=oV74Najm6Nc
2	https://www.simplilearn.com/artificial-intelligence-masters-program-training-course
Course Designed By:	

COs	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***
CO1	*S*	*S*	*M*	*L*	*S*	*M*	*M*	*M*	*M*	*M*
CO2	*M*	*S*	*S*	*L*	*S*	*M*	*M*	*M*	*M*	*M*
CO3	*S*	*S*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*M*
CO4	*S*	*S*	*S*	*M*	*M*	*M*	*M*	*M*	*M*	*M*
CO5	*S*	*S*	*S*	*M*	*L*	*M*	*M*	*M*	*M*	*M*

*S-Strong; M-Medium; L-Low

Course code		INFORMATION SECURITY	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course presents the Programming techniques in C, explains data types, arrays, pointers, files.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Learn security from multiple perspectives.
2. Promote a more comprehensive understanding of security requirements within an organization *CreateslogicalthinkingonGUIbasedapplications*
3. Make students aware of the various technologies to implement appropriate security measures *Applyplatformindependent,internetenabledconceptstodevelopapplications*
4. Provide an understanding of how to inspect and protect information assets as well as how to plan and respond to information security from technical and managerial perspectives.
5. Promote legal and ethical considerations of information security

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Analyze, define and delimit different terms in the field of information security.	K4
2	Evaluate activities for the protection of valuable information assets and mitigate various risks to information coming from all aspects of the organizations environment	K5
3	Create standards and practices for security	K6
4	Apply the security technology and management process	K3
5	Understand security, cryptography, system attacks and defenses	K2

***K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create*

Unit:1	Introduction	15-- hours

INTRODUCTION: History, What is Security, CNSS Security Model, Components of an Information System, Balancing Information Security and Access, The Systems Development Life Cycle, The Security Systems Development Life Cycle. Communities of interest-Need for security: Threats, Attacks

Unit:2	Legal, Ethical And Professional Issues	15-- hours

LEGAL, ETHICAL AND PROFESSIONAL ISSUES: Law and Ethics in Information Security, International Laws and Legal Bodies, Ethics and Information Security, Codes of Ethics and Professional Organizations Risk Management: An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control Strategies, Selecting a Risk Control Strategy

Unit:3	Planning For Security	15-- hours

PLANNING FOR SECURITY: Information Security Policy, Standards and Practices, The Information Security Blueprint, Security Education, Training and Awareness Program, Continuity Strategies

Unit:4	Security Technology	15-- hours

SECURITY TECHNOLOGY: Firwalls and VPNs- Intrusion Detection and Prevention Systems, Honeypots, Honeynets and padded cell systems -Scanning and Analysis Toolsbio metric access control.

Unit:5	Cryptography	13-- hours

Cryptography: Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for secured communication-Attacks on Cryptosystems.

Unit:6	Contemporary Issues	2-- hours
	Online seminars, webinars	

	Total Lecture hours	***75 -- hours***
Text Books		
1	Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, 4th Edition, Course Technology, Cengage Learning.	
2	Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2008	
3	Stuart McClure, Joel Scrambray, George Kurtz, ”Hacking Exposed”, Tata McGraw-Hill, 2003	
Reference Books		
1	William Stallings,” Cryptography and Network Security”, Pearson Education, 2000	
2	Nina Godbole, “Information Systems Security”, Wiley-2009.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.youtube.com/watch?v=6MYF6Zo6i6A	
2	https://www.edx.org/course/unlocking-information-security-part-i	
Course Designed By:		

COs	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***
CO1	*M*	*S*	*M*	*S*	*M*	*M*	*L*	*M*	*M*	*M*
CO2	*M*	*S*	*S*	*M*	*M*	*M*	*M*	*M*	*M*	*M*
CO3	*S*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*M*
CO4	*M*	*S*	*L*	*S*	*M*	*M*	*M*	*M*	*M*	*M*
CO5	*S*	*S*	*M*	*L*	*M*	*L*	*M*	*M*	*M*	*M*

*S-Strong; M-Medium; L-Low

Course code		**DATA MINING USING R**	*L*	*T*	*P*	*C*
Core/Elective/Supportive		*Core*			4	4
Pre-requisite		Language features and techniques that are integral to lab exercises include interfaces and abstract classes, threading, generics and collections, and recursive methods.	***Syllabus Version***		**2021-22**	

Course Objectives:

The main objectives of this course are to:

1. Learn to perform data mining tasks using a data mining toolkit such as R
2. Understand the data sets and data preprocessing
3. Express the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression.
4. Exercise the data mining techniques with varied input values for different parameters.
5. Find Practical Experience Working with all real data sets

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Apply classification, clustering and etc. in large data sets.	*K3*
2	Analyze mining techniques for realistic data.	*K4*
3	Understand mining algorithms as a component to the R tool.	*K2*
4	Understand various tools of Data Mining and their techniques to solve the real time problems.	*K2*
5	Remember Advance relevant programming skills.	*K1*

***K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create*

	Programs	***45 hours***

1. Perform statistical operations (Mean, Median, Mode and Standard deviation).
2. To get the input from user and perform numerical operations (MAX, MIN, AVG,SUM, SQRT, ROUND).
3. Perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
4. Implement Apriori algorithm to extract association rule of data mining.
5. Implement k-means clustering technique.
6. Implement any one Hierarchal Clustering.
7. Implement Classification algorithm.
8. Implement Decision Tree.
9. Linear Regression.
10. Data Visualization.

	Total Practical hours	***45 -- hours***

Course Designed By:

COs	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***
CO1	*S*	*S*	*S*	*M*	*M*	*M*	*S*	*M*	*S*	*S*
CO2	*S*	*S*	*M*	*S*	*M*	*M*	*M*	*S*	*M*	*M*
CO3	*M*	*S*	*M*	*S*	*S*	*M*	*M*	*M*	*S*	*S*
CO4	*S*	*L*	*S*	*M*	*S*	*M*	*M*	*S*	*M*	*M*
CO5	*S*	*S*	*S*	*L*	*M*	*M*	*M*	*M*	*M*	*M*

*S-Strong; M-Medium; L-Low

Course code		**ADVANCED JAVA PROGRAMMING LAB**	*L*	*T*	*P*	*C*
Core/Elective/Supportive		*Core*			4	4
Pre-requisite		Language features and techniques that are integral to lab exercises include interfaces and abstract classes, threading, generics and collections, and recursive methods.	***Syllabus Version***		2020 - 2021	

Course Objectives:

The main objectives of this course are to:

1. Provide advanced training in developing software using the Java Platform, Standard Edition, or J2SE
2. Develop error-free, well-documented Java programs
3. Learn how to write, test, and debug advanced-level Object-Oriented programs using Java.
4. Develop and test Java network, search engine, and web framework programs.
5. *Increase appropriate data model and database scheme*

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the knowledge of Java servlets to find the solution for complex problems.	*K2*
2	*Remember JSP concept to create Real time applications*	*K1*
3	Evaluate JSP principles to manage projects in multidisciplinary environments.	*K5*
4	Apply JDBC to provide a program level interface for communicating with database using java programming.	*K3*
5	*Analyze Java RMI as a way of distributing java objects in a business tier.*	*K4*

***K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create*

	Programs	***45 hours***

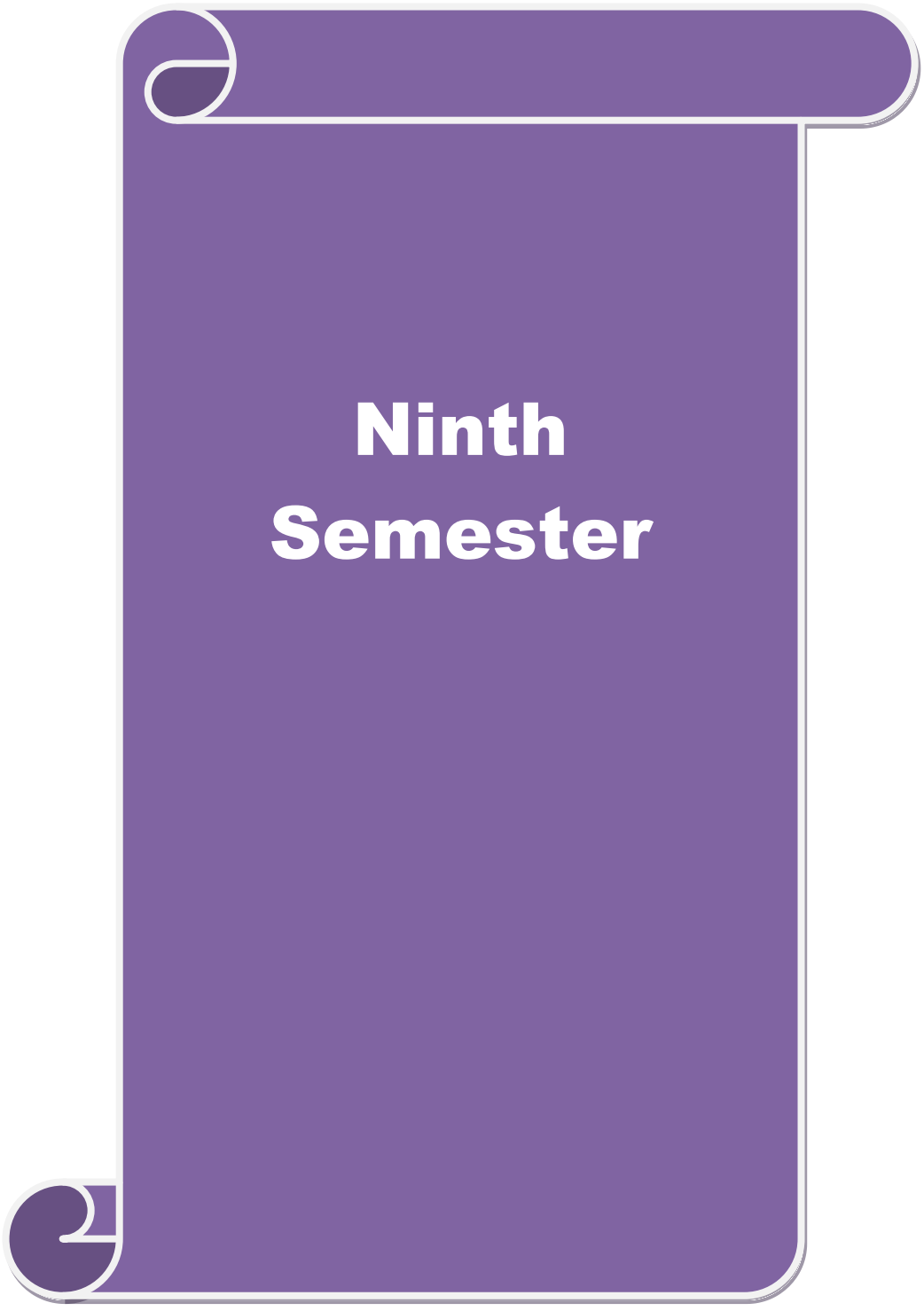
1. Display a welcome message using Servlet.
2. Design a Purchase Order form using Html form and Servlet.
3. Develop a program for calculating the percentage of marks of a student using JSP.
4. Design a Purchase Order form using Html form and JSP.
5. Prepare a Employee pay slip using JSP.
6. Write a program using JDBC for creating a table, Inserting, Deleting records and list out the records.
7. Write a program using Java servlet to handle form data.
8. Write a simple Servlet program to create a table of all the headers it receives along with their associated values.
9. Write a program in JSP by using session object.
10. Write a program to build a simple Client Server application using RMI.

	Total Practical hours	***45 -- hours***

Course Designed By:

COs	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***
CO1	*S*	*S*	*M*	*L*	*M*	*M*	*S*	*S*	*S*	*S*
CO2	*S*	*M*	*S*	*S*	*M*	*S*	*S*	*M*	*M*	*M*
CO3	*M*	*S*	*M*	*S*	*M*	*S*	*M*	*S*	*S*	*S*
CO4	*S*	*L*	*S*	*M*	*M*	*S*	*S*	*M*	*S*	*M*
CO5	*S*	*S*	*S*	*L*	*M*	*S*	*M*	*M*	*M*	*M*

*S-Strong; M-Medium; L-Low


Ninth
Semester

Course code		PRINCIPLES OF MANAGEMENT AND MARKETING	L	T	P	C
Core/Elective/Supportive		Supportive	4			4
Pre-requisite		This course requires that the students are familiar with basic knowledge about management and marketing.	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Understand the primary functions of management and the work of major contributors to the field of management.
2. Learn the application of the principles in an organization and its structure.
3. Recongnise the role of communication, importance of employee motivation and controlling techniques in an organization.
4. Know the fundamental marketing concept,theories, and principles in areas of marketing.
5. Understand the life cycle concept, to forecast future sales and new marketing strategies.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remember the theories and principles of modern management and apply the concepts in organizations.	K1,K3
2	Understand the planning process in the organizationand demonstrate the ability to directing,leadership and communicate effectively.	K2,K5
3	Apply control ling techniques to monitor the performance, comparing with goals, and taking corrective action.	K3,K4
4	Understand concepts of marketing and the role of marketing in business and society.	K2,K3
5	Analyseand develop marketing strategies based on product, price and promotion purpose.	K4,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction To Management	12-- hours

Management And Administration –Evolution Of Management Thought, Scientific Management And Modern Administrative Management -Management Process.

Planning:

Steps In Planning Process- Types Of Plans And Planning Premises Objectives- Characteristics And Hierarchy of Objectives - Management By Objectives (MBO).

Unit:2	Theories Of Organization and planning	12-- hours

Organizing: Formal Organization Theory. Acceptance Theory Of Organization - Bases Of Departmentation - Span Of Control.

Staffing: Recruitment And Selection — Training And Development.

Unit:3	Co-Ordination Functions In Organization	12- hours

DirectingPrinciples Of Direction - Elements Of Direction- Motivation - Leadership And Communication. Controlling. Controlling Process - Traditional And Modern Controlling Techniques (Budgeting Control. CPM/PERT).

Unit:4	Basics Of Marketing	11-- hours

Marketing: Marketing Concepts - Modern Marketing - Marketing And Selling - Market Segmentation And Forecasting Market Demand. New Product Development - Product Life Cycle - Brands, Packaging, And Other Product Features.		
Unit:5	**Strategic Management And Marketing Channels**	**11-- hours**
Management Strategies And Policies - Channels Of Marketing -Procedure And Methods.		
Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**60-- hours**

Text Books	
1	KoonthandWeihrich ,–Management‖,McGraw–Hill.
Reference Books	
2	Philip Kotler, Gary Armstron, Principles ofMarketing.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	NPTEL Course: Principles of Management
2	NPTEL Course: Introduction to Market essentials, Marketing Management.
3	https://www.tutorialspoint.com/management_principles/management_principles_tutorial.pdf
4https://www.tutorialspoint.com/marketing_management/marketing_management_tutorial.pdf	
Course Designed By:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	M	S	M	M	S	M	M	S	S
CO2	L	M	M	M	L	M	S	S	M	M1
CO3	M	M	S	S	S	S	S	S	S	S
CO4	M	L	M	L	M	M	S	M	M	S
CO5	M	M	M	S	M	S	M	M	M	S

*S-Strong; M-Medium; L-Low

Course code		PHP PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the students are familiar about the PHP and AJAX	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Understand the features like functions, forms in PHP.
2. Understand concepts, Cookies, Sessions and Data base, draw images on the server with AJAX.
3. Acquired skills to write PHP programs.
4. Know the concepts OOPs and File Handling
5. Understand how to use database in PHP

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of PHP functions	K2
2	Design the PHP structure program	K4
3	Interpret cookies with PHP and the Web	K1
4	Apply AJAX and Drawing Images to the server side	K3
5	Evaluate the usage Data base in PHP	K5

K1 - Interpret; **K2** - Understand; **K3** - Apply; **K4** - Design; **K5** - Evaluate; **K6** – Identify

Unit:1	PHP- Introduction	12-- hours

PHP: Introduction – Essential PHP – Operators and Flow control: Working with math, assignment, increment and decrement, string, bitwise, execution, comparison and logical operators, Working with loops – Strings and Arrays.

Unit:2	PHP-Functions	12-- hours

PHP Functions and Browser handling power: Creating Functions, passing functions, passing arrays, pass by reference, default arguments, returning data, arrays, lists, references, accessing global data, working with static variables, PHP conditional functions, variable functions, nesting functions – Reading data in web pages: Handling text fields, areas, check boxes, radio buttons, list boxes, password controls, hidden controls, image maps, file uploads, buttons – PHP Browser handling power.

Unit:3	File handling	12-- hours

Working with Object oriented programming and File handling: Object oriented programming: creating classes, objects, setting access to properties and methods, using constructors and destructors, inheritance, overriding and overloading methods, auto loading classes – File Handling: open, read, close, parsing files, copy, delete, write and append files.

Unit:4	Cookies and FTP	11-- hours

Working with databases and setting sessions, cookies and FTP: Databases: creating, accessing, updating, inserting, deleting and sorting databases – Setting sessions, cookies and FTP: setting , reading, deleting cookies, working, downloading, uploading, deleting, creating and removing directories with FTP.

Unit:5	AJAX	11-- hours

AJAX and Drawing Images on the server: Ajax: Handling AJAX requests, downloading images using AJAX, downloading javascript with AJAX– Drawing images on the server: creating and displaying images, drawing lines, rectangles, ellipse, arcs, polygons, figures, individual pixels, text, virtual text, working with image files, tiling images, copying images.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	**60 -- hours**
Text Books		
1	The Complete Reference PHP Covers PHP 5.2—, Steven Holzner, Tata McGraw-Hill Edition 2008.	
2	PHP6 and MySQL6 Bible – Steve Svehring	
Reference Books		
1	PHP Programming Solutions – VickramViswani	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://onlinecourses.swayam2.ac.in/aic20_sp32/preview	
2	https://www.smart-academy.in/course/web-development-course/?gclid=EAIaIQobChMIrq3Xmu3H7AIVBA4rCh0d5A5mEAAYBCAAEgIxwvD_BwE#	
Course Designed By:		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	S	S	M	L	L	M
CO3	S	S	S	S	M	M	L	L	M	M
CO3	M	S	S	M	S	S	M	M	M	M
CO4	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	S	S	S	M	L

*S-Strong; M-Medium; L-Low

Course code		SOFTWARE TESTING	L	T	P	C
Core/Elective/Supportive		Core	4			4
Pre-requisite		This course requires that the students are familiar with Principles of Software Testing and about tools	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To study fundamental concepts in software testing, including software testing objectives, process and methods.
2. Ability to solve the problems by using the skill of software testing.
3. Exposed to software testing tools.
4. Identify large and complex software Problems.
5. Apply testing tools to different types of program.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understanding and knowledge of contemporary issues in software testing.	K2
2	Ability to use software testing methods and modern software testing tools for their testing projects.	K6
3	Understand and identify various software testing problems.	K2, K5
4	Design and conduct a software test process for a software testing project.	K1
5	Develop and apply a testtoolto support test automation.	K4, K3

K1 - Design; **K2** - Understand; **K3** - Apply; **K4** - Develop; **K5** - Identify; **K6** – Ability

Unit:1	Purpose of Software testing	12-- hours

Purpose of Software testing – Some Dichotomies – a model for testing – Playing pool and consulting oracles – Is complete testing possible – The Consequence of bugs – Taxonomy of Bugs.

Unit:2	Software testing Fundamentals	12-- hours

Software testing Fundamentals – Test case Design – Introduction of Black Box Testing and White Box testing – Flow Graphs and Path testing – Path testing Basics - Predicates, Path Predicates and Achievable Paths - Path Sensitizing – Path Instrumentation – Implementation and Application of Path Testing.

Unit:3	Transaction Flow and Syntax testing	12-- hours

Transaction Flow testing – Transaction Flows – techniques – Implementation Comments – Data Flow Testing – Basics – Strategies – Applications, Tools and effectiveness – Syntax Testing – Why, What, How – Grammar for formats – Implementation – Tips.

Unit:4	Logic Based Testing	11-- hours

Logic Based Testing – Motivational Overview – Decision tables – Path Expressions – KV Charts – Specifications – States, State Graphs and transition Testing – State Graphs – Good & bad states – state testing Metrics and Complexity.

Unit:5	Testing for Real-time System	11-- hours

Testing GUIs – Testing Client – Server Architecture – Testing for Real-time System – A Strategic Approach to Software testing – issues – unit testing – Integration Testing – Validation testing – System testing – The art of Debugging.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	60 -- hours

Text Books	
1	Boris Beizer, Software testing techniques, Dreamtech Press, Second Edition – 2003.
2	Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979
Reference Books	
1	Roger.S.Pressman, Software Engineering – A Practitioner‘s Approach ,Mc-Graw Hill, 5th edition, 2001
2	Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India,2007
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc19_cs71/preview
2	https://alison.com/course/introduction-to-software-testing-revised
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	L	L	M	L	M
CO2	S	S	S	S	M	S	M	L	M	S
CO3	S	S	S	S	S	S	M	L	L	S
CO4	S	S	M	S	S	S	M	M	M	M
CO5	S	S	S	S	S	S	M	M	L	S

*S-Strong; M-Medium; L-Low

Course code		PHP PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Practical			4	4
Pre-requisite		Students gain knowledge in testing tools and critical path analysis.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To practice the testing concepts using different testing tools like WinRunner, Silk Test
2. To implement and gain knowledge in error findings.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the testing process through testing tool.	**K2**
2	Apply and analyze the different testing tools to the critical problems.	**K3, K4**
3	Identify and evaluate the logical path errors easily and quickly.	**K5, K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Identify

Programs

1. Write a PHP Program for String handling.
2. Write a PHP Program for associative array.
3. Write a PHP Program to use various Functions of PHP.
4. Write a PHP Program to read form data.
5. Write a PHP Program to implement Overloading and overriding.
6. Write a PHP Program to implement Inheritance.
7. Write a PHP Program for File handling.
8. Develop PHP Program to Create a Database and to Insert , Delete and List the records.
9. Write a PHP Program to implement cookies.
10. Write a PHP Program for Drawing images on a webpage.

Total Lecture hours **45 hours**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	M	M
CO2	S	S	S	S	M	M	M	L	S	M
CO3	S	S	S	S	M	M	M	M	M	M
CO4	S	S	S	S	S	M	M	L	S	M
CO5	S	S	S	S	M	M	S	M	M	M

*S-Strong; M-Medium; L-Low

Course code		SOFTWARE TESTING LAB	L	T	P	C
Core/Elective/Supportive		Practical			4	3
Pre-requisite		Students gain knowledge in testing tools and critical path analysis.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To practice the testing concepts using different testing tools like WinRunner, Silk Test
2. To implement and gain knowledge in error findings.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the testing process through testing tool.	**K2**
2	Apply and analyze the different testing tools to the critical problems.	**K3, K4**
3	Identify and evaluate the logical path errors easily and quickly.	**K5, K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Identify

Programs

SOFTWARE TESTING LAB Running and testing in any one of the following Testing tools :

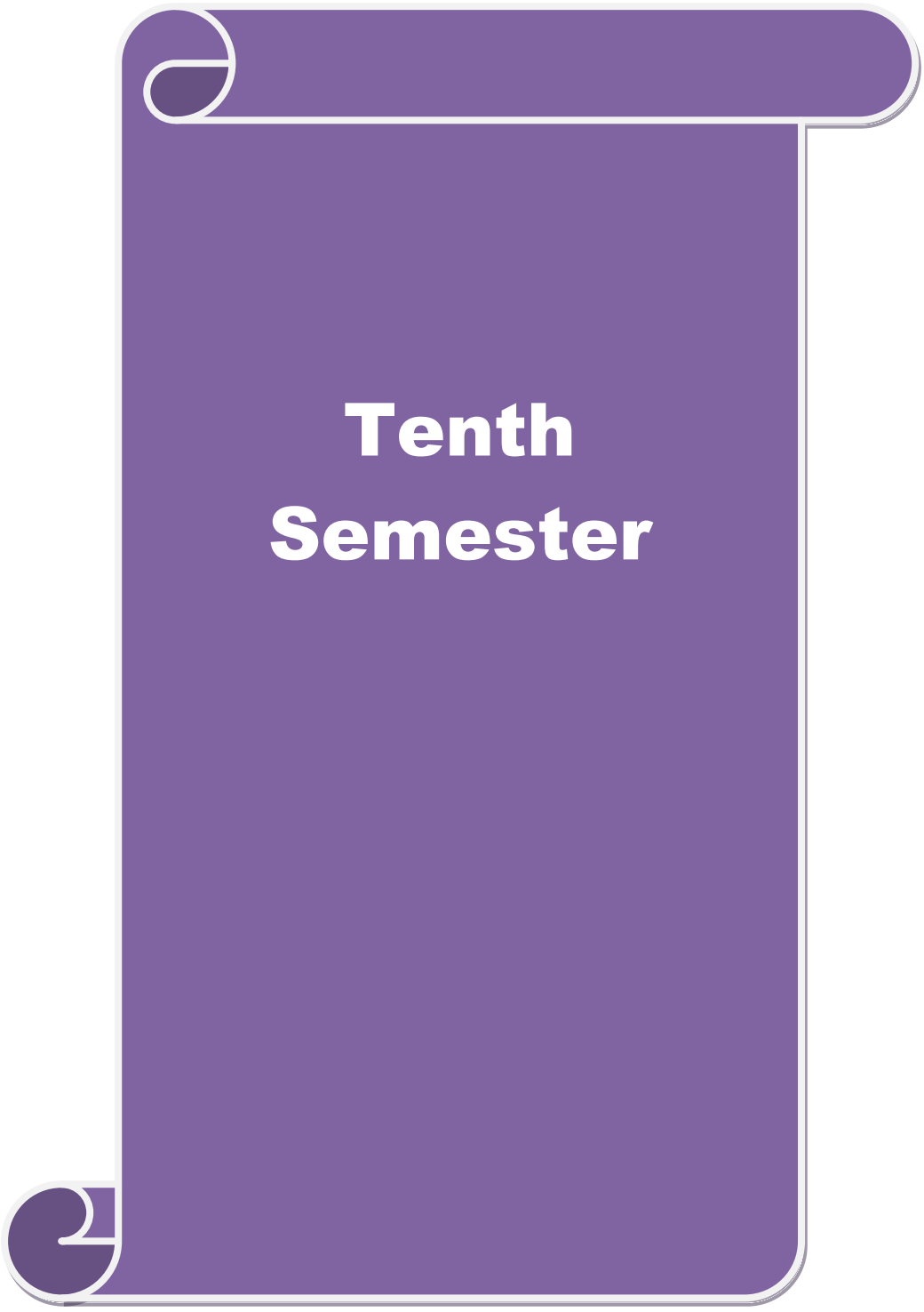
- WinRunner
- Silk Test
- SQA Robot
- LoadRunner
- JMeter
- TestDirector
- GNU Tools (Source Code Testing Utilities in Unix / Linux)
- Quick Test Professional

	Total Lecture hours	**45hours**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	M	M
CO2	S	S	S	S	M	M	M	L	S	M
CO3	S	S	S	S	M	M	M	M	M	M
CO4	S	S	S	S	S	M	M	L	S	M
CO5	S	S	S	S	M	M	S	M	M	M

*S-Strong; M-Medium; L-Low


Tenth
Semester

Project Work and Viva Voce – II

Elective Courses

Course code		Principles of ProgrammingLanguages	L	T	P	C
Core/Elective/Supportive		Elective - I	4			4
Pre-requisite		This course requires that the students are familiar about the programming languages	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the basic elements of programming Languages
2. Able to analyze and solve problems using different techniques
3. Implement OOPs concepts

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the elements of Programming Languages	K2
2	Evaluating various assignment structure Programming	K5
3	Understand the functions of Procedures	K2
4	Analyze the OOPs concepts with C++	K4
5	Create concurrent Programming concepts	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Programming Structure	15-- hours

The role of structure in programming Von Neumann machine syntactic Structure - Organization of language -Description. Elements of a programming language - Introduction to ML

.

Unit:2	Assignment Structure	15-- hours

Programming with assignments. The effect of an assignment structured programming. Data types in Modula-2, control flow in Modula - 2. C. Type names and type equivalence.

Unit:3	Procedures	15-- hours

Procedure activations- Parameter passing methods - Macro expansion - Activation trees- Lexicon scope in C - Dangling pointers - Tail - Recursion elimination

Unit:4	Basics of C++	14-- hours

Data encapsulation - Constructs for program structuring - Information hiding and program development. Data invariants. Classes in C++ Header flies - Constructors for automatic initialization. Derived classes. The Smalltalk and C++.

Unit:5	Concurrent Programming	14-- hours

Concurrent programming implicit synchronization - The pipe nstruct concurrency as interleaves

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	75 -- hours

Text Books

1 Ravi Sethi, –ProgrammingLanguagesconceptsand constructs‖,‘‘, Addison Wesley1990.

Reference Books

1 Doris Apply, Programming Languages‘‘, paradigm and practice, McG raw Hill,1991.

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	L	S	M	M	M	M	M
CO2	S	S	L	M	S	M	M	M	M	M
CO3	M	S	S	S	S	M	M	M	M	M
CO4	S	S	S	S	S	M	M	M	M	M
CO5	S	S	S	S	S	M	M	M	M	M

*S-Strong; M-Medium; L-Low

Course code		PC TESTING AND TROUBLESHOOTING	L	T	P	C
Core/Elective/Supportive		Elective I	4			4
Pre-requisite		Basic Hardware Components of Computer	Syllabus		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Knowledge on hardware components of Personal Computer
2. Identify the Storage Drives and study of debugging
3. Know the multimedia input devices
4. Understand various types of Output devices
5. Handle the different issues by diagnostic software

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remember the main components of Computer	K1
2	Understand the various Disk drives	K2
3	Know to handle different input devices	K4
4	Analyze and choose the output devices	K4
5	Debug the issues in hardware and software	K3

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Components of Personal Computer	12-- hours

Personal Computer-Introduction-PC System-Personal Computer System; Functional Blocks- Study of PC Configurations- System Unit; Display Unit; Keyboard-Inside PC-Motherboard; BIOS; CMOS-RAM-Motherboard types; Processors -Chipsets; USB On-Board Memory-PC's Memory Organization-Memory packaging; I/O Ports; USB Port.

Unit:2	Disk Drive and Multimedia Extensions	12-- hours

Floppy Disk Drive and Controller-Hard Disk Drive and Controller-Formatting a hard disk-MMX - Multimedia Extensions-Installing of typical software-Study of debug utility and debugging.

Unit:3	Input Devices	12-- hours

Input Devices-Keyboard; Mouse; Scanner-Digitizer; Digital Camera-Monitors and Display Adapters-Display; Video Basics; VGA Monitors-Digital Display technology; CRT Controller; Graphicscards.

Unit:4	Output Devices	11-- hours

Output Devices-Dot matrix printer; Printer controller-Laser Printer; Inkjet printer-Computer Installation-Power supply-PC Installation -Assembling of PC for a given configuration-Identification of cards and systems-Study and usage of diagnostic software.

Unit:5	Troubleshooting and Servicing	11-- hours

Troubleshooting and Servicing-POST; Trouble shooting the Motherboard-Trouble shooting the Keyboard-Trouble shooting the disk Devices-Trouble shooting the PrinterIdentification of faulty cards through modular diagnosis approach-Maintenance - Cleaning of viruses through software-Diagnostic Software's; Data Security-Data recovery through Norton disk doctor-Computer and Communication-Networking Modem; Internet.

Unit:6	CONTEMPORARY ISSUES	2 Hours

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	60 -- hours

Text Books

1 D.Balasubramanian, *"Computer Installation and servicing"*, 2nd Edition, 2010.

Reference Books
1 B. Govindarajalu, *"IBM PC and Clones"*, Tata McGraw Hill, 2nd Edition, 2002
Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	S	S	L	S	S	S	M	M	S
CO2	S	M	S	M	S	S	S	M	M	S
CO3	S	S	S	S	S	S	S	M	M	S
CO4	S	S	SS	S	S	S	S	M	M	S
CO5	S	M		S	S	S	S	M	M	S

*S-Strong; M-Medium; L-Low

Course code		E-COMMERCE	L	T	P	C
Core/Elective/Supportive		Elective I	4			4
Pre-requisite		This course requires that the students are familiar to the Business transactions through e-commerce	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Ability to understand the Framework of E-Commerce
2. Identify various Applications for consumer and Mercantile models
3. Understand and apply Electronic payment Systems
4. Analyze and solve the issues behind Marketing in E-commerce tools
5. Handle Electronic Commerce techniques for Business

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	E-commerce framework well defined	K2
2	Apply various architectural frameworks for Electronic Commerce	K3
3	Identify and know different types Electronic Payment Systems	K2
4	Analyze and Evaluate the types of Digital documents	K4
5	Apply E-commerce tools in Marketing	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	E-Commerce Framework	15-- hours

Electronic Commerce framework – Electronic Commerce of Media convergence- The Anatomy of E-commerce applications – Electronic Commerce Applications – Electronic Commerce Organization Applications – Masket Forces Influencing the I-way – components of the I-way – Network Access Equipment – the Last Mile: Local roads and access Ramps – Global Information Distribution Networks – Public policy Issues shaping the I-way

.

Unit:2	E-Commerce in WWW	15-- hours

Architectural framework for electronic commerce – World Wide web (WWW) as the architecture – Web background: Hypertext publishing – Technology behind the web – security and the web – Consumer-oriented applications – Mercantile models from the consumer‟s perspective – Mercantile models from the Merchant‟sPerspective

Unit:3	Electronic Payment Systems	15-- hours

Types of Electronic payment systems – Digital Token-Based Electronic Payment Systems – Smart cards and Electronic Payment Systems – Credit Card based Electronic Payment systems – Risk and Electronic Payment Systems – Designing electronic payment systems - Electronic data interchange – EOI Applications in Business – EDI: Legal, Security, and Privacy issues – EDI and Electronic Commerce.

Unit:4	Internal Commerce	14-- hours

Internal Information systems – Macroforces and Internal Commerce – Work Flow Automation and Coordination Customization and Internal commerce – Supply chain commerce systems – making a business case for a document Library – Types of digital documents – Issues behind Document Infrastructure – corporate Data warehouses.

Unit:5		14-- hours

The New Age of Information-Based Marketing – Advertising on the Internet- charting the Online Marketing process – Market Research – Search and Resource DiscoveryParadigms - Information search and Retrival – Electronic commerce Catalogs or Directories– Information Filtering – Consumer – Data Interface EmergingTools.

Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**
Expert Lectures – Online Seminars - Webinars		
	Total Lecture hours	**75 -- hours**

Text Books

1. Ravi Kalakota, Andrew B. Whinston, ― Frontiers of Electronic Commerce‖, PearsonEducation Asia, 2003.
2. Jeffery F. Rayport, Bernard J. Jaworski, ―E- Commerce‖, TMCH,2002.

Reference Books

1. P.T. Joseph, –E-Commerce– AManagerialPerspective‖, PHI, 2003.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/110/105/110105083/
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-mg54/

Course Designed By:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	L	S	S	S	S
CO3	S	M	S	M	S	M	S	S	S	S
CO3	S	M	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	M	S	S	S	S
CO5	S	S	S	S	S	L	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		E.2.1 GREEN COMPUTING	L	T	P	C
Core/Elective/Supportive		Elective II	4			4
Pre-requisite		Students should know the use of Green IT Strategies and metrics for ICT development.	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. To effectively make use of cloud resources
2. Software level energy optimization are implemented in operating system through Green Scheduling techniques
3. reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime
4. Design energy efficient and environmentally sound components, computers and servers
5. Understand the principles and practices of Green IT.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts to increase the product's life.	K2
2	*Understand the concepts and create applications and applets*	K2
3	Analyze energy conservation by application of different techniques at software and hardware level.	K4
4	Create Optimizations for energy conservation can be made at hardware and software levels.	K6
5	*Apply the concept of Green computing in real time applications*	K3

***K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create*

Unit:1	Fundamentals of Green IT	15-- hours

Fundamentals of Green IT :Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics - Approaches to green computing - Middleware Support - Compiler Optimization - Product longevity - Software induced energy consumption - its measurement and rating.

Unit:2	Green Assets and Modeling	15-- hours

Green Assets and Modeling : Green Assets: Buildings, Data Centers, Networks, and Devices – Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

Unit:3	Grid Framework	15-- hours

Grid Framework :Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

Unit:4	Green Compliance and Green Mobile	15-- hours

Green Compliance and Green Mobile :Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future - Green mobile - optimizing for minimizing battery consumption - Web, Temporal and Spatial Data Mining Materials recycling.

Unit:5	Case Studies	13-- hours

Case Studies :The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

Unit:6	***Contemporary Issues***	***2-- hours***
	Expert lectures, online seminars, webinars	
	Total Lecture hours	***75 -- hours***

Text Books	
1	*BhuvanUnhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2011.*
2	*Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.*
3	*Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.*
4	*John Lamb, "The Greening of IT", Pearson Education, 2009.*
Reference Books	
1	*Jason Harris , "Green Computing and Green IT Best Practices on Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting", Emereo Publishing.*
2	*Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.*
3	*Wu Chun Feng , "Green computing: Large Scale energy efficiency", CRC Press, 2012.*
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.greenit.net/greenit_training.html
2	https://bharatgogreen.com/green-computing/
Course Designed By:	

COs	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***
CO1	*S*	*S*	*S*	*M*	*M*	*S*	*M*	*M*	*M*	*M*
CO3	*S*	*M*	*S*	*M*	*M*	*S*	*M*	*S*	*S*	*S*
CO3	*L*	*M*	*L*	*S*	*M*	*S*	*S*	*S*	*S*	*S*
CO4	*M*	*M*	*S*	*L*	*M*	*M*	*M*	*S*	*S*	*M*
CO5	*S*	*S*	*S*	*M*	*M*	*M*	*M*	*S*	*M*	*S*

*S-Strong; M-Medium; L-Low

Course code		EMBEDDED SYSTEMS	L	T	P	C
Core/Elective/Supportive		*Elective II*	4			4
Pre-requisite		This course requires that the students are familiar about the embedded system	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Present the introduction to 8051 Microcontroller Instruction Set, concepts on RTOS & Software tools.
2. Gain the knowledge about the embedded software development.
3. Learn about Microcontroller and software tools in the embedded systems.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concept of 8051 microcontroller	K1,K2
2	Understand the Instruction Set and Programming	K2,K3
3	Analyze the concepts of RTOS	K3,K4
4	Analyze and design various real time embedded systems using RTOS	K5
5	Debug the malfunctioning system using various debugging techniques	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	8051 MICROCONTROLLER	15Hours

8051 Microcontroller: Introduction - 8051 Architecture-Input/Output Pins, Ports and Circuits - External Memory - Counters / Timers - Serial Data Input / Output –Interrupts

Unit:2	PROGRAMMING BASICS	15Hours

Instruction Set and Programming Moving Data-Addressing Modes-Logical operations-Arithmetic Operation-Jump and Call Instructions-Simple Program. Applications: Keyboard Interface- Display Interface-Pulse Measurements-DIA and AID Conversions-Multiple Interrupts.

Unit:3	CONCEPTS ON RTOS	125Hours

CONCEPTS ON RTOS: Introduction to RTOS- -Task and Task states - Tasks and data- Semaphores and shared data. MORE operating systems services: Interrupt Process communication - Message Queues, Mailboxes and pipes- Timer Functions-Events - Memory Management-Interrupt Routines in an RTOS Environment.

Unit:4	DESIGN USING RTOS	15Hours

Basic Design using a RTOS: Principles - Encapsulating semaphores and Queues-Hard real time scheduling considerations-Saving memory space and power- introductions to RTL &QNX.

Unit:5	SOFTWARE TOOLS	13Hours

SOFTWARE TOOLS: Embedded software Development Tools:Hosts and Target Machines-Linker/Locators for Embedded software-getting Embedded software into the Target systems. Debugging Techniques: Testing on your Host machine -Instruction set simulators- The assert macro- using laboratory tools.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	75Hours

Text Books	
1	David E. Simon, "An Embedded Software primer" Pearson Education Asia, 2003.
2	Kenneth J Ayala, "The 8051 Microcontroller and Architecture programming and application", Second Edition, PenramInternational.
Reference Books	
1	Raj Kamal, "Embedded Systems – Architecture, programming and design", Tata McGraw – Hill, 2003.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc20_cs14/preview
2	https://www.javatpoint.com/embedded-system-tutorial
3	https://www.tutorialspoint.com/embedded_systems/index.htm
Course Designed By:	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	L	L	S	M	S	S	M	M	S
CO2	M	M	S	S	M	S	M	S	S	S
CO3	M	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		CLOUD COMPUTING	L	T	P	C
Core/Elective/Supportive		Elective	4			4
Pre-requisite		This course requires that the students are familiar about the essential of cloud computing	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the cloud computing architectures, applications and challenges.
2. Know how the data is stored in the cloud and the various services offered by the cloud.
3. Develop the skills in Web Application Development using cloud technologies.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic knowledge on virtualization	K1,K2
2	Understand the concept of cloud computing services and its business value	K2,K3
3	Analyze various web based applications for collaborating everyone in cloud computing	K4,K5
4	Assess various industrial platforms for the developments	K5,K6
5	Analyze on cloud mobility and governance	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	INTRODUCTION	15 hours

Introduction – Essentials – Benefits – Why cloud – Business and IT perspective – cloud and virtualization – cloud service requirements – dynamic cloud infrastructure – cloud computing characteristics – cloud adoption – cloud rudiments. Cloud deployment models: introduction – cloud characteristics – measured service accounting – cloud deployment models – security in a public cloud – public versus private clouds – cloud infrastructure self-service.

Unit:2	SERVICES AND SOLUTIONS	15 hours

Cloud as a service: introduction – gamut of cloud solutions – principal technologies- cloud strategy – cloud design and implementation using SOA – conceptual cloud model – cloud service defined. Cloud solutions: introduction – cloud ecosystem – cloud business process management – cloud service management – – computing on demand.

Unit:3	VIRTUALIZATION	15 hours

Cloud offerings: Introduction – introduction storage, retrieval archive and protection-cloud analytics – testing under cloud – information security – virtual desktop infrastructure-storage cloud. Cloud Management: Introduction – resiliency – provisioning – asset management-cloud governance – high availability and disaster recovery – charging models – usage reporting, and metering. Cloud Virtualization Technology: Introduction – virtualization demand – virtualization benefits – server virtualization – virtualization for x86 architecture – hypervisor management software – virtual infrastructure requirements.

Unit:4	INFRASTRUCTURE	15 hours

Cloud Infrastructure: Introduction – storage virtualization – storage area networks-network-attached storage – cloud server virtualization – networking essential to the cloud. Cloud and SOA: Introduction – SOA Journey to Infrastructure – SOA and the cloud – SOA Defined – SOA and infrastructure as a service – SOA based cloud infrastructure steps – SOA Business and IT services.

Unit:5	**MOBILITY**	**13 hours**

Cloud Mobility: Introduction – the business problem – mobile enterprise application platforms – mobile application architecture overview. Cloud Governance: Introduction – service level agreement and compliance – data privacy and protection risks – enterprise governance – risk management – third party management – information management.

Unit:6	**Contemporary Issues**	**2 hours**

Expert lectures, online seminars – webinars

	Total Lecture hours	**75 hours**

Text Books

1	Dr. Kumar Saurabh "Cloud Computing-Unleashing Next Gen Infrastructure to Application", 3rd Edition, Wiley India Pvt Ltd, 2014.
2	RajkumarBuyya, James Broberg, AndrzejGoscinski , "Cloud computing principles and paradigms", Wiley India, 2014.

Reference Books

1	Michael Miller, "Cloud computing web based application that change the way you work & collaborate online", Pearson Education, 2013.
2	Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business"

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.htm
3	https://www.javatpoint.com/cloud-computing-tutorial

Course Designed By:

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	S	M	S	M	S	M	M	M	S
CO2	M	S	M	S	S	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		SOFTWARE PROJECT MANAGEMENT	L	T	P	C
Core/Elective/Supportive		Elective III	4			4
Pre-requisite		This course requires that the students are familiar about the **software project management Process**	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Understand andLeant the software project design process
2. Learnt the evaluation & estimation of software project
3. Acquired skills and knowledge about Project management
4. Know the importance of project development
5. Gain knowledge in project development.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Identify and understand types of projects	K2,K6
2	Understanding and design project activity plan	K4,K2
3	Design and identify resource allocation of a project	K4,K6
4	Identify risk management and project planning	K6
5	Analyze standard of a project	K1

K1 - Analyze; **K2** - Understand; **K3** - Apply; **K4** - Design; **K5** - Evaluate; **K6** – Identify

Unit:1	**Software projects**	**15-- hours**

Introduction - Software projects - Various other types of projects - Problems with software projects - An overview of project planning - Project evaluation - Project analysis and technical planning - Software estimation.

Unit:2	**Project schedules**	**15-- hours**

Activity planning - Project schedules - Sequencing and scheduling projects - Network planning model - Shortening project duration - Identifying critical activities**,.**

Unit:3	**Risk management**	**15-- hours**

Risk management - Resource allocation - Monitoring and control - Managing people and organizing teams - Planning for small projects.

Unit:4	**configuration management**	**15-- hours**

Software configuration management - Basic functions - Responsibilities - standards - Configuration management - Prototyping - Models of prototyping.

Unit:5	**Case study**	**13-- hours**

Case study - PRINCE Project management.

Unit:6

Expert lectures, online seminars – webinars 2-- hours

	Total Lecture hours	**75 -- hours**

Text Books

1 Mike Cotterell, Bob Hughes, ―Software Project Management‖, Inclination Thomas Computer Press,

Reference Books

2 Darrel Ince. H.Sharp and M.Woodman. ―Introduction to Software Project Management and Quality Assurance‖, Tate McGraw-Hill, 1995.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc19_cs70/preview
2	https://nptel.ac.in/courses/110/104/110104073/
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	S	S	M	L	L	M
CO3	S	S	S	S	M	M	L	L	M	M
CO3	M	S	S	M	S	S	M	M	M	M
CO4	S	S	S	S	S	S	S	S	M	L
CO5	S	S	S	S	S	S	S	S	M	L

*S-Strong; M-Medium; L-Low

Course code		INTERNET OF THINGS	L	T	P	C
Core/Elective/Supportive		Elective III	4			4
Pre-requisite		This course requires that the students are familiar about the Internet of things	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain.
2. Enable students to learn the Architecture of IoT and IoT Technologies
3. Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand about IoT, its Architecture and its Applications	K1,K2
2	Understand basic electronics used in IoT& its role	K2,K3
3	Develop applications with C using Arduino IDE	K4
4	Analyze about sensors and actuators	K5,K6
5	Design IoT in real time applications using today's internet & wireless technologies	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	15 hours

Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT – Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT

Unit:2	BASIC ELECTRONICS FOR IoT	15 hours

Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.

Unit:3	PROGRAMMING USING ARDUINO	15 hours

Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.

Unit:4	SENSORS AND ACTUATORS	13 hours

Sensors and Actuators: Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.

Unit:5	SENSOR DATA IN INTERNET	15 hours

Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars - webinars

	Total Lecture hours	**75 hours**

Text Books	
1	ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach", 2014. ISBN: 978-0996025515
2	Boris Adryan, DominikObermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017.
3	Michael Margolis, "Arduino Cookbook", O"Reilly, 2011
Reference Books	
1	Marco Schwartz, "Internet of Things with ESP8266", Packt Publishing, 2016.
2	DhivyaBala, "ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit", 2018.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2	https://www.javatpoint.com/iot-internet-of-things
3	https://www.tutorialspoint.com/internet_of_things/index.htm

Course Designed By:

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		DIGITAL IMAGE PROCESSING	L	T	P	C
Core/Elective/Supportive		Elective III	4			4
Pre-requisite		Students to learn the fundamentals of Digital Image Processing, image compression and segmentation	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Learn basic image processing techniques for solving real problems.
2. Gain knowledge in image transformation and Image enhancement techniques.
3. Learn Image compression and Segmentation procedures.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the fundamentals of Digital Image Processing	K1,K2
2	Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement	K2,K3
3	Apply, Design and Implement and get solutions for digital image processing problems	K3,K4
4	Apply the concepts of filtering and segmentation for digital image retrieval	K4,K5
5	Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	15 hours

Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.

Unit:2	IMAGE ENHANCEMENT	15 hours

Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

Unit:3	IMAGE RESTORATION	15 hours

Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.

Unit:4	IMAGE COMPRESSION	13 hours

Image Compression: Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.

Unit:5	IMAGE SEGMENTATION	15 hours

Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The

use of motion in segmentation.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Books	
1	Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Second Edition, PHI/Pearson Education.
2	B. Chanda, D. DuttaMajumder, "Digital Image Processing and Analysis", PHI, 2003.
Reference Books	
1	Nick Efford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/117/105/117105135/
2	https://www.tutorialspoint.com/dip/index.htm
3	https://www.javatpoint.com/digital-image-processing-tutorial

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	S	M	M	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING	L	T	P	C
Core/Elective/Supportive		Elective	4			4
Pre-requisite		Students to learn the fundamentals of critical thinking.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Learn critical thinking and its related concepts
2. Learn design thinking and its related concepts
3. Develop Thinking patterns, Problem solving & Reasoning

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of Critical thinking and its related technology	K1,K2
2	Focus on the explicit development of critical thinking and problem solving skills	K2,K3
3	Apply design thinking in problems	K3,K4
4	Make a decision and take actions based on analysis	K4,K5
5	Analyze the concepts of Thinking patterns, Problem solving & Reasoning in real time applications	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	CRITICAL THINKING	15 hours

Critical Thinking: Definition, Conclusions and Decisions, Beliefs and Claims, Evidence – finding, evaluation, Inferences, Facts – opinion, probable truth, probably false, Venn diagram. Applied critical thinking: Inference, Explanation, Evidence, Credibility, Two Case Studies, critical thinking and science, critical evaluation, self assessment.

Unit:2	DESIGN THINKING	15 hours

Design Thinking: Introduction, Need of Design Thinking, problem to question - design thinking process, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, problem exploration, Stake holder assessment, design thinking for manufacturers, smart Idea to implementation.

Unit:3	CASE STUDY	15 hours

Thinking to confidence, fear management, duty Vs passion, Team management, Tools for Thinking, prototype design, Relevance of Design and Design Thinking in engineering, human centered design, case study: apply design thinking in problem.

Unit:4	PROBLEM SOLVING	13 hours

Problem solving: problem definition, problem solving methods, selecting and using information, data processing, solution methods, solving problems by searching, recognizing patterns, spatial reasoning, necessity and sufficiency, choosing and using models, making choices and decisions.

Unit:5	REASONING	15 hours

Reasoning: Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Books

1	John Butterworth and Geoff Thwaites, Thinking skills: Critical Thinking and Problem Solving, Cambridge University Press, 2013.
2	H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008.
3	A. Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999.

Reference Books

1	M. Levine, Effective Problem Solving, 2nd edition, Prentice Hall, Upper Saddle River, NJ, 1994.
2	Michael Baker, The Basic of Critical Thinking, The Critical Thinking Co press, 2015.
3	David Kelley and Tom Kelley, Creative Confidence, 2013.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.tutorialspoint.com/critical_thinking/index.htm
2	https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm
3	https://nptel.ac.in/courses/109/104/109104109/

Course Designed By:

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	S	S	S
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Course code		MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Core/Elective/Supportive		Elective - IV	4		0	4
Pre-requisite		This course requires that the students are familiar about the Android application development and iOS	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the importance of mobile strategies.
2. Develop mobile applications to analyze and solve real world problems.
3. Acquired skills and knowledge about Android.
4. Know the importance of SMS and E-mail.
5. Gain knowledge in iOS Apps.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Identify and understand Mobile Applications	K2, K6
2	Understanding and design Mobile Platforms	K4, K2
3	Design and identify android user interfaces	K4, K6
4	Identify web services and web activities.	K6
5	Analyze new Ios project and Apps	K1

K1 - Analyze; **K2** - Understand; **K3** - Apply; **K4** - Design; **K5** - Evaluate; **K6** – Identify

Unit:1	Importance of Mobile strategies	15-- hours

Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in Business World – Mobile Web Presence – Mobile Applications – Marketing – Web Services for Mobile Devices – Creating Example Web Service _ Debugging Web Service

Unit:2	Mobile Platforms	15-- hours

Effective Use of Screen Real Estate – Understanding Mobile Application Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools for Mobile Interface Design – Choosing a Mobile Web Option – Adaptive Mobile Website – Mobile Web Applications with HTML 5

Unit:3	Android User Interfaces	15-- hours

Getting to know the Android User Interfaces – Designing Your User interface using Views – Displaying Pictures and Menus with Views – Using Image views to Display pictures – Using menus with views – Data Persistence –Saving and loading user performances - Persisting data to files – Creating and using Data bases – Content Providers.

Unit:4	Web Services	15-- hours

SMS Messaging, Sending E-mail – Networking – Downloading Binary Data, Text Files- Accessing Web Services – Performing Asynchronous Calls – Location Based Services – Displaying Maps – Getting Location Data – Creating your own services – Communicating between a service and an activity – Binding activities to Services

Unit:5	Ios Project	13-- hours

Getting started with iOS – iOS Project – Debugging iOS Apps – Objective C Basics – Hello Word App – Building the derby app in iOS – Windows Phone 7 Project – Building Derby App in Windows Phone 7.

Unit:6		
Expert lectures, online seminars – webinars		2-- hours
	Total Lecture hours	**75 -- hours**
Text Books		
1	Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wrox 2012.	
2	Wei – Meng Lee, Beginning Android Application Development, Wiley 2011	
Reference Books		
1	Charlie Collins, Michael Galpin and Matthias Kappler, Android in Practice, Dream Tech. 2012	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/106/106/106106156/	
2	https://www.itcareerfinder.com/it-careers/mobile-application-developer.html	
Course Designed By:		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	S	S	M	L	L	M
CO3	S	S	S	S	M	M	L	L	M	M
CO3	M	S	S	M	S	S	M	M	M	M
CO4	S	S	S	S	S	S	S	S	M	L
CO5	S	S	S	S	S	S	S	S	M	L

*S-Strong; M-Medium; L-Low

Course code		SOFT COMPUTING	L	T	P	C
Core/Elective/Supportive		**Elective** - IV	4			4
Pre-requisite		This course requires that the students are familiar to the basic neuron, kohenen self-organizing network, hop field networks, associative memory, fuzzy.	**Syllabus Version**		**2021-22**	

Course Objectives:

The main objectives of this course are to:

1. Understood the pattern classification in Neural Networks.
2. Understood the fuzzy relation and fuzzy logic
3. Get the exposure to Testing for Real-time System.
4. To study fundamental concepts Fuzzy logic in Fuzzy controller design.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understanding and knowledge about theneural network.	K2
2	Apply the Neural Network & Fuzzy Logic models to handle uncertainty and solve engineering problems.	K3
3	Develop and apply Fuzzy operation	K3, K4
4	Identify and review the Defuzzication concepts	K5, K1
5	Analyze the Application of Neural Networks in different model.	K6

K1 - Review; **K2** - Understand; **K3** - Apply; **K4** - Develop; **K5** - Identify; **K6** – Analyze

Unit:1	**Structure of neural networks**	**15-- hours**

Pattern classification - Learning and Generalization - Structure of neural networks - ADA line, Delta rule - input output value - perceptions - Linear separability - Back propagation - XOR Function - Introduction to Boolean neural networks.

Unit:2	**Hamming Network**	**15-- hours**

Hopfield Networks - Energy - The Hamming Network - RAM -Boltzmann machine - Instar, outstar network - ART - Kohonen's Network Neocognitron.

Unit:3	**Fuzzy matrices**	**15-- hours**

Fuzzy relation - Member function - Fuzzy matrices - Fuzzy entropy - Fuzzy operation - Fuzzy composition.

Unit:4	**Fuzzy variables**	**52-- hours**

Fuzzy variables - Linguistic variables - Measure of fuzziness - Transition Matrix - Concept of Defuzzication and Applications

Unit:5	**Testing for Real-time System**	**15-- hours**

CASE STUDY: Application of Neural Networks in character recognition, drug discovery, speech recognition; Application of Fuzzy logic concepts in Fuzzy controller design and Fuzzy querying in Relational database model.

Unit:6	**CONTEMPORARY ISSUES**	**2 Hours**

Expert Lectures – Online Seminars - Webinars

	Total Lecture hours	**75 -- hours**

Text Books	
1	P.D.Wasserman, "Neural computing and practice", Van Nostran Reinhold, New York, 1991.
2	Limin Fu, "Neural Network in computer Intelligence ", McGraw Hill International editions, 1994.
Reference Books	
1	B Kosko, " Neural Network and Fuzzy systems", Prentice Hall, 1996.
2	Klir& Yuan, "Fuzzy sets and Fuzzy logic", Theory and Applications, Prentice Hall of India, 1996.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/127/105/127105006/
2	https://www.youtube.com/watch?v=xbYgKoG4x2g
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	M	M	L	S
CO2	S	S	S	S	M	S	M	L	M	S
CO3	S	S	S	S	M	S	L	M	M	S
CO4	S	M	S	S	L	S	M	M	M	M
CO5	S	M	S	S	L	S	M	L	M	M

*S-Strong; M-Medium; L-Low

Course code		BIG DATA ANALYTICS	L	T	P	C
Core/Elective/Supportive		Elective - IV	4			4
Pre-requisite		This course requires that the students are familiar about the data collection and big data analysis	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Understand andLeant the big data handling concepts
2. Learnt R Programming, Map Reduce and Hadoop based analytics.
3. Acquired skills and knowledge about the HDFS architecture
4. Know the importance of Big data collection and analyze
5. Gain knowledge in project development under big data.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Identify and understand importance of big data	K2,K6
2	Understanding and design R Language	K4,K2
3	Design and identify Hadoop on Linux	K4,K6
4	Understanding Hadoop features	K2
5	Analyze HDFSandMapReduce architecture by plot	K1

K1 - Analyze; **K2** - Understand; **K3** - Apply; **K4** - Design; **K5** - Evaluate; **K6** – Identify

Unit:1	Importance of Big Data	15-- hours

Importance of Big Data: A Flood of Mythic ―Start-Up‖ Proportions- A convergence of Key Trends- A Wider Variety of Data – The Expanding Universe of Unstructured Data. Industry Examples of Data: Digital Marketing and the Non - line World – Database Marketers, Pioneers of Big Data – Big Data and the New School of Marketing.

Unit:2	R packages	15-- hours

Installing R - Installing RStudio - Understanding the features of R language - Using R packages - Performing data operations - Increasing community support - Performing data modeling in R

Unit:3	Hadoop	15-- hours

Installing Hadoop - Understanding different Hadoop modes - Understanding Hadoop installation steps - Installing Hadoop on Linux, Ubuntu flavor (single node cluster) - Installing Hadoop on Linux, Ubuntu flavor (multinode cluster) - Installing ClouderaHadoop on Ubuntu

Unit:4	HDFS	15-- hours

Understanding Hadoop features - Understanding HDFS - Understanding the characteristics of HDFS - Understanding MapReduce -Learning the HDFS and MapReduce architecture.

Unit:5	MapReduce architecture	13-- hours

Understanding the HDFS architecture - Understanding HDFS components - Understanding the MapReduce architecture - Understanding MapReduce components - Understanding the HDFS and MapReduce architecture by plot - Understanding Hadoop subprojects

Unit:6

Expert lectures, online seminars – webinars 2-- hours

	Total Lecture hours	75-- hours

Text Books

1. Michael Minelli , Michele Chambers , AmbigaDhiraj, ― BIG DATA BIG ANALYTICS ― , Wiley Publications, Indian Reprint 2014

Reference Books

1. VigneshPrajapathi,‖ Big Data Analytics with R and Hadoop‖, PACKT Publishing, 2013.

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs33/
2	https://nptel.ac.in/courses/110/106/110106072/
Course Designed By:	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	S	S	M	L	L	M
CO3	S	S	S	S	M	M	L	L	M	M
CO3	M	S	S	M	S	S	M	M	M	M
CO4	S	S	S	S	S	S	S	S	M	L
CO5	S	S	S	S	S	S	S	S	M	L

*S-Strong; M-Medium; L-Low

Course code		BLOCK CHAIN TECHNOLOGY	L	T	P	C
Core/Elective/Supportive		Elective	4			4
Pre-requisite		This course requires that the students are familiar about the block chain technology	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Understand the fundamentals of block chain and cryptocurrency.
2. Understand the influence and role of block chain in various other fields.
3. Learn security features and its significance.
4. Identify problems &challenges posed by Block Chain.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Demonstrate block chain technology and crypto currency	K1,K2
2	Understand the mining mechanism in block chain	K2
3	Apply and identify security measures, and various types of services that allow people to trade and transact with bitcoins	K3,K4
4	Apply and analyze Block chain in health care industry	K4,K5
5	Analyze security, privacy, and efficiency of a given Block chain system	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	15 hours

Introduction to Block chain - The big picture of the industry – size, growth, structure, players. Bitcoin versus Cryptocurrencies versus Block chain - Distributed Ledger Technology (DLT). Strategic analysis of the space – Block chain platforms, regulators, application providers. The major application: currency, identity, chain of custody.

Unit:2	NETWORK AND SECURITY	15 hours

Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Blockchain 1.0, 2.0 and 3.0 – transition, advancements and features. Privacy, Security issues in Block chain.

Unit:3	CRYPTOCURRENCY	15 hours

Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Block chain

Unit:4	CRYPTOCURRENCY REGULATION	14 hours

Cryptocurrency Regulation - Stakeholders, Roots of Bit coin, Legal views - exchange of cryptocurrency - Black Market - Global Economy. Cyrptoeconomics – assets, supply and demand, inflation and deflation – Regulation.

Unit:5	CHALLENGES IN BLOCK CHAIN	14 hours

Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machine to machine communication – Data management in industry 4.0 – future prospects. Block chain in Health 4.0 – Blockchain properties - Healthcare Costs - Healthcare Quality - Healthcare

Value - Challenges for using blockchain for healthcare data		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Books	
1	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press (July 19, 2016).
2	Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies"
Reference Books	
1	Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System"
2	Rodrigo da Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, "Blockchain Technology for Industry 4.0" Springer 2020.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/blockchain-tutorial
2	https://www.tutorialspoint.com/blockchain/index.htm
3	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/
Course Designed By:	

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Annexure

M.Sc. SOFTWARE SYSTEM

Syllabus
(With effect from 2021 -2022)

Program Code

DEPARTMENT OF COMPUTER SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

MISSION

To educate, articulate students to apply knowledge in software systems and make them a successful, effective problem solvers and continuous learners who would contribute to the society.

ELECTIVE– I (VISEMESTER)

1.1 Principlesof Programming Languages
1.2 PCTestingandTrouble Shooting
1.3 E-Commerce

ELECTIVE– II (VIIISEMESTER)

2.1 Green Computing
2.2 Embedded Systems
2.3 Cloud Computing

ELECTIVE– III (IXSEMESTER)

3.1 SoftwareProject Management
3.2Internet of Things
3.3 DigitalImageProcessing
3.4 Critical Thinking, Design Thinking and Problem Solving

ELECTIVE– IV (IX-SEMESTER)

4.1 Mobile Application Development
4.2 Soft Computing
4.3 BigDataAnalytics
4.4 Block Chain Technology