ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

(Anjugramam-Kanyakumari Main Road, Palkulam,Variyoor P.O.-629 401, K.K.Dist.)

Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai

Accredited with A+ Grade by NAAC

MASTER OF COMPUTER APPLICATIONS

(MCA)

Curriculum & Syllabus

(*2024-2025 Admitted Students Onwards*)

Vision Statement of RCET

To be an academic institute of continuous excellence towards education and research in rural regime and provide service to nation in terms of nurturing potentially higher social, ethical and engineering companion graduands.

Mission Statement of RCET

To foster and promote technically competent graduands by imparting the state of art Engineering education in rural regime. To enunciate research assisted scientific learning by dissemination of knowledge towards science, agriculture, industry and national security.

Vision of the Department

Our Vision is to emerge as a Centre of Excellence and Research in the field of Computer Education and Application with distinct identity and character in all areas of its dimensions.

Mission of the Department

Our Mission is to provide very high quality education in Computer Applications and thereby develop a new and smart generation of Computer Application Professionals with proper transformation of leadership, commitment and moral values.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates will be able to:

I. Apply their computing skills to analyse, design and develop innovative software products to meet the industry needs and excel as software professionals.

II. Pursue lifelong learning and do research in the computing field based on solid technical foundations.

III. Communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context.

IV. Exhibit professional integrity, ethics and an understanding of responsibility to contribute technical solutions for the sustainable development of society.

PROGRAMME OUTCOMES (POs)

PO1 (Foundation Knowledge): Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.

PO2 (Problem Analysis): Identify, review, formulate and analyze problems for primarily focusing on customer requirements using critical thinking frameworks.

PO3 (Development of Solutions): Design, Develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.

PO4 (Modern tool usage): Select, adopt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.

PO5 (Individual and Team work): Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.

PO6 (Project Management and Finance): Use the principles of project management such as scheduling, work break down structure and be conversant with the principles of finance for profitable project management.

PO7 (Ethics): Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware.

PO8 (Lifelong learning): Change management skill and the ability to learn, keep up with contemporary technologies and ways of working.

CREDIT INFO		
Sl.No	Category	Credits
1.	Foundation Courses (FC)	4
2.	Professional Core Courses (PCC)	53
3.	Professional Electives Courses (PEC)	12
4.	Open Electives Courses (OEC)	3
5.	Employability Enhancement Courses (EEC)	16
6.	Mandatory Courses (MNC)	0
Total Credits		88

Foundation Courses (FC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA101	Mathematical Foundations for Computer Applications	FC	3	1	0	4
Professional Core Courses (PCC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA102	Advanced Data Structures And Algorithms	PCC	3	0	0	3
2.	24CA103	Unix Architecture And Programming	PCC	3	1	0	4
3.	24CA104	Web Application Development	PCC	3	0	2	4
4.	24CA105	Accounting and Financial Management	PCC	3	0	0	3
5.	24CA106	Python Programming	PCC	3	0	0	3
6.	24CA131	Advanced Data Structures And Algorithms Laboratory	PCC	0	0	4	2
7.	24CA132	Python Programming Laboratory	PCC	0	0	2	1
8.	24CA201	Object Oriented Programming Using Java	PCC	3	0	0	3
9.	24CA202	Cloud Computing Technologies	PCC	3	0	0	3
10.	24CA203	Artificial Intelligence	PCC	3	0	0	3
11.	24CA204	Software Engineering Methodologies	PCC	3	0	0	3
12.	24CA205	Mobile Application Development	PCC	3	0	0	3
13.	24CA206	Full Stack Web Development	PCC	3	0	0	3
14.	24CA231	Full Stack Web Development Laboratory	PCC	0	0	4	2
15.	24CA232	Java Programming Laboratory	PCC	0	0	4	2
16.	24CA233	Mobile Application Development Laboratory	PCC	0	0	4	2
17.	24CA301	Machine Learning	PCC	3	0	2	4
18.	24CA302	Internet Of Things	PCC	3	0	0	3
19.	24CA331	Advanced Java programming Laboratory	PCC	0	0	2	1
20.	24CA332	Internet Of Things Laboratory	PCC	0	0	2	1

Professional Electives Courses I - DATABASES AND ANALYTICS (PEC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA303	Distributed Databases	PEC	3	0	0	3
2.	24CA304	NoSQL Databases	PEC	3	0	0	3
3.	24CA305	XML and Web Services	PEC	3	0	0	3
4.	24CA306	Information Retrieval	PEC	3	0	0	3
5.	24CA307	Big data Analytics	PEC	3	0	0	3
6.	24CA308	Statistics Using R Programming	PEC	3	0	0	3
Professional Electives Courses II - FRAMEWORK AND SOFTWAREPROCESS (PEC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA311	Software Project Management	PEC	3	0	0	3
2.	24CA312	Software Quality Management	PEC	3	0	0	3
3.	24CA313	Software Testing	PEC	3	0	0	3
4.	24CA314	MS Bot Framework	PEC	3	0	0	3
5.	24CA315	C# and .Net Framework	PEC	3	0	0	3
6.	24CA316	Object Oriented Software Engineering	PEC	3	0	0	3

Professional Electives Courses III - DATA SCIENCE (PEC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA321	Data Analytics and Visualization	PEC	3	0	0	3
2.	24CA322	Data Mining & Data Warehousing	PEC	3	0	0	3
3.	24CA323	Data Analytics with Python	PEC	3	0	0	3
4.	24CA324	Neural Networks	PEC	3	0	0	3
5.	24CA325	Deep Learning	PEC	3	0	0	3
6.	24CA326	Digital Image Processing	PEC	3	0	0	3
Professional Electives Courses IV - SECURITY AND NETWORK (PEC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA341	Cryptography and Network Security	PEC	3	0	0	3
2.	24CA342	Cyber Security	PEC	3	0	0	3
3.	24CA343	Introduction to Block chain and Applications	PEC	3	0	0	3
4.	24CA344	Computer Networks	PEC	3	0	0	3
5.	24CA345	Wireless Communication Networks	PEC	3	0	0	3
6.	24CA346	Distributed Systems	PEC	3	0	0	3

Open Elective (OEC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA371	Data Analysis	OEC	3	0	0	3
2.	24CA372	Optimization using Spreadsheet	OEC	3	0	0	3
3.	24CA373	Graph Theory	OEC	3	0	0	3
4.	24CA374	Stochastic and Random Process	OEC	3	0	0	3
5.	24CA375	Number Theory and Queuing Theory	OEC	3	0	0	3
6.	24CA376	Numerical Methods	OEC	3	0	0	3
Employability Enhancement Courses (EEC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24CA151	Professional communication-I	EEC	0	0	2	1
2.	24CA351	Professional communication-II	EEC	0	0	2	1
3.	24CA352	Mini Project / Internship $	EEC	0	0	0	2
4.	24CA451	PROJECT WORK	EEC	0	0	24	12

Mandatory Courses (MNC)							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
1.	24MX501	English for Research Paper Writing	MNC	2	0	0	0
2.	24MX502	Disaster Management	MNC	2	0	0	0
3.	24MX503	Constitution of India	MNC	2	0	0	0
4.	24MX504	நற்றமிழ் இலக்கியம்	MNC	2	0	0	0
Bridge Courses							
S.No	Course Code	Course Title	Course Type	L	T	P	Credit
Classes are to be conducted and completed before the start of the class of first semester, Examinations will be conducted along with first semester							
1.	24BX001	Data Structures and Algorithms		3	0	2	4
2.	24BX002	Problem Solving and Programming in C		3	0	2	4
Classes are to be conducted and completed before the start of the class of second semester, Examinations will be conducted along with second semester							
1.	24BX101	Introduction to Computer Organization and Operating Systems		3	0	0	3
2.	24BX102	Database Management Systems		3	0	2	4

Classes are to be conducted and completed before the start of the class of third semester, Examinations will be conducted along with third semester							
1.	24BX201	Mathematical Foundations of Computer Science		3	0	0	3
2.	24BX202	Basics of Computer Networks		3	0	0	3

SCHEME OF INSTRUCTION FOR FIRST YEAR MCA

I SEMESTER

Sl.no	Course code	Course title	Category	L	T	P	C
FOUNDATION COURSES							
1.	24CA101	Mathematical Foundations for Computer Applications	FC	3	1	0	4
THEORY COURSES							
2.	24CA102	Advanced Data Structures And Algorithms	PCC	3	0	0	3
3.	24CA103	Unix Architecture And Programming	PCC	3	1	0	4
4.	24CA105	Accounting and Financial Management	PCC	3	0	0	3
5.	24CA106	Python Programming	PCC	3	0	0	3
THEORY COURSE WITH LABORATORYCOMPONENT							
6.	24CA104	Web Application Development	PCC	3	0	2	4
LABORATORY COURSES							
7.	24CA131	Advanced Data Structures And Algorithms Laboratory	PCC	0	0	4	2
8.	24CA132	Python Programming Laboratory	PCC	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
9.	24CA151	Professional communication-I	EEC	0	0	2	1
		TOTAL		18	2	10	25

II SEMESTER

Sl.no	Course code	Course title	Category	L	T	P	C
THEORY COURSES							
1.	24CA201	Object Oriented Programming Using Java	PCC	3	0	0	3
2.	24CA202	Cloud Computing Technologies	PCC	3	0	0	3
3.	24CA203	Artificial Intelligence	PCC	3	0	0	3
4.	24CA204	Software Engineering Methodologies	PCC	3	0	0	3
5.	24CA205	Mobile Application Development	PCC	3	0	0	3
6.	24CA206	Full Stack Web Development	PCC	3	0	0	3
LABORATORY COURSES							
7.	24CA231	Full Stack Web Development Laboratory	PCC	0	0	4	2
8.	24CA232	Java Programming Laboratory	PCC	0	0	4	2
9.	24CA233	Mobile Application Development Laboratory	PCC	0	0	4	2
		TOTAL		18	0	12	24

Course Code:	24CA101	Course Title:	Mathematical Foundations for Computer Applications (MCA)
Credits:	4	L – T – P	3 – 1 – 0

Course objectives:

- To perform the operations associated with sets, functions, and relations.
- To learn logic and recursive functions and the basics of combinatory.
- To learn the basic graph theory and apply the graph centralities to some data sets.

Teaching-Learning Process:

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

- Lecture method does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the students' understanding.

UNIT I – Set Theory and Matrices	[12 hours]

Operations on sets - Cardinality of sets – Inclusion - Exclusion principle - Pigeonhole principle - Matrices: Finding Eigen values and Eigen vectors.

UNIT II – Mathematical Logic	[12 hours]

Logic - Prepositional Equivalence - Predicate and Quantifiers - Recursive Definitions and Recursive Algorithms - Basics of Counting - Pigeonhole Principle - Permutation and Combinations.

UNIT III – Relations and Functions	[12 hours]

Relations and Their Properties - n-array Relations and Their Application - Representing Relations, Closures of Relations, Equivalence Relations - Partial Orderings – Functions: Domain and Range of function, Types of functions

UNIT IV – Graph Theory	[12 hours]
Introduction to Graphs - Graph Operations - Graph Isomorphism, Connectivity - Graph centralities: Degree and distance-based centralities - Clustering and Eigenvalue centralities - Euler and Hamilton Paths	

UNIT V – Boolean Algebra	[12 hours]
Lattices - Definition and properties - special lattices - Boolean algebra - Boolean forms and free Boolean algebra - Boolean Expressions, Boolean forms and free Boolean algebra	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Apply the fundamentals of set theory and matrices for Engineering problems	K3
CO2	Solve the given real time problems by applying the Mathematical logic concepts.	K3
CO3	Use the relation matrix to check equivalence relation.	K3
CO4	Obtain isomorphism of graphs and spanning tree of a given graph using DFS / BFS. Also determine minimal spanning tree of a given graph.	K3
CO5	Apply the properties of Boolean algebra in minimization of switching circuits.	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	-	-	-	-	3
CO2	3	2	2	-	-	-	-	3
CO3	3	3	2	-	-	-	-	3
CO4	3	3	2	-	-	-	-	3
CO5	3	3	2	-	-	-	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	40	20	20
Apply	40	60	60
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Reference Books:

1. Ralph P Grimaldi, "Discrete and Computational Mathematics: An applied introduction", Pearson Education, 5th Edition, (2007).
2. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6th Edition, Tata McGraw-Hill, 2009.
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006.
4. C. Liu, "Elements of Discrete Mathematics: A Computer Oriented Approach", McGraw-Hill, 4th Edition (2012)

Equivalent NPTEL/SWAYAM Courses

S.No.	Course Title	Course Instructor	Host Institute
1	Discrete Mathematics	Dr. Aditi Gangopadhyay Dr. Sugata Gangopadhyay	IIT Roorkee
2	Advanced Engineering Mathematics	Dr. P. Panigrahi Prof. J. Kumar Prof. P.D. Srivastava Prof. Somesh Kumar	IIT Kanpur

Web Links and Video Lectures (E-Resources):

1. Principle of Inclusion and Exclusion

   https://www.nptelvideos.com/lecture.php?id=13710

2. System of Linear Equations, Eigenvalues and Eigenvectors:

   https://www.nptelvideos.com/lecture.php?id=13416

3. Graph Theory

   https://www.nptelvideos.com/lecture.php?id=13728

Course Code:	**24CA102**	**Course Title:**	Advanced Data Structures And Algorithms
Credits:	**3**	**L – T – P**	**3-0-0**

Course objectives:

To impart knowledge on the

- To understand the concept of data structures.
- To learn and use hierarchical data structures and its operations.
- To identify the usage of Tree, graph and its applications.
- To select and design data structures and algorithms that is appropriate for problems.
- To study about Back Tracking and Branch and Bound Technique

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I – Introduction	**[9 hours]**
Data structures - Abstract data types - Primitive data structures- – Performance analysis – Space complexity – Time complexity – Asymptotic notations – Performance measurement – Array as an abstract data type– Polynomial as an abstract data type- Sparse matrix abstract data type – String abstract data type.	

UNIT II – Stack, Queue And Linked List	**[9 hours]**
The Stack abstract data type- The queue abstract data type- A mazing problem- Evaluation of expressions - Evaluating postfix expression – Infix to postfix- Multiple stacks and queues -Singly linked lists - Dynamically linked stacks and queues- Doubly linked lists.	

UNIT III – Trees And Graph	**[9 hours]**
Introduction – Binary trees –The ADT – Properties of binary trees–Binary tree representations – Binary tree traversals – Inorder traversal – Preorder traversal – Postorder traversal – Binary search trees. GRAPHS - Graph representations - Graph operations – Minimum cost spanning tree -Shortest paths and transitive closure.	

UNIT IV – Divide &Conquer, Greedy And Dynamic Programming	**[10 hours]**
Divide and conquer: Merge sort - Quick sort - Binary search. Greedy method: Knapsack problem- Job sequencing with deadlines -Minimum cost spanning tree – Single source shortest path. dynamic programming: All pair shortest path- Knapsack problem – Traveling salesman problem -Flow shop scheduling.	

UNIT V – Backtracking and Branch and Bound	[8 hours]
Backtracking: N-Queens problem - Hamiltonian cycles – Graph coloring –Sum of subset. Branch and bound: The method – FIFO branch and bound- LC branch and bound – 0/1 Knapsack problem - Traveling salesman problem.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Infer the concepts of data types and linear structures to solve array related problems.	K2
CO2	Apply stack and queue data structures for storing and retrieving the values in the complex problems.	K3
CO3	Interpret the concept of non-linear data structures for tree and graph traversal.	K2
CO4	Illustrate the idea of greedy and dynamic programming technique for solving complex problems.	K2
CO5	Apply graph technique to solve back tracking and branch and bound problems.	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	1	-	-	-	3
CO2	3	2	3	1	-	-	-	3
CO3	3	3	2	1	-	-	-	3
CO4	3	3	2	1	-	-	-	3
CO5	3	3	2	1	-	-	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	60	60	60
Apply	20	20	20
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Ellis Horowitz, Sartaj Sahani, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Universities Press (India) Private Limited, Hyderabad.
2. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Computer Algorithms", Computer Science Press Inc., Galgotia Book Sources Publications, New Delhi, 2014.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", The MIT Press, 2022.
2. Tanaenbaum A. S., Langram Y. Augestein M. J., "Data Structures using C" Pearson Education, 2004.

3. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. Mark Allen Weiss, “Data Structures and Algorithms in C++”, Pearson Education, 3rd Edition, 2009.
5. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.

Web Links and Video Lectures (E-Resources):

1. A Basic Course on Data Structures and Algorithms: **https://nptel.ac.in/courses/106102064**
2. Data Structures and Program Methodology: https://nptel.ac.in/courses/106103069
3. Programming, Data structures and Algorithms: https://nptel.ac.in/courses/106106133

Course Code:	**24CA103**	**Course Title:**	Unix Architecture and Programming
Credits:	**4**	**L – T – P**	**3-1-0**

Course objectives:

To impart knowledge on the

- To learn the basic concepts of Unix Structure, file system and basic commands.
- To learn advance file concepts, commands related to Shell script and filter commands.
- To study the kernel architecture and buffer storage.
- Familiar with the concepts of Unix process control in the operating system.
- To gain an understanding of important aspects related to the SHELL and the process.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I – Introduction	[12 hours]
Unix structure: File system – Essential commands – Directory and file commands – General purpose utilities - Bourne Shell – Shell wild cards – Simple filters – Regular expressions – Grep family - Advanced filters – Sed, awk- Process - Communication and scheduling.	

UNIT II - File System Structure	[12 hours]
Kernel architecture - Kernel data structure - Buffer cache - Structure of buffer pool – Scenarios for buffer retrieval - Reading and writing disk blocks - Allocation of disk blocks - Advantages and disadvantages of buffer cache - Inode - Structure of regular file - Conversion of a pathname to an inode - Inode assignment to a new file.	

UNIT III – Process System	[12 hours]
Process states and transitions - Context of a process - Saving the context of a process –Manipulating process address space - Process creation and termination – Signals – Awaiting process termination – System boot and init process - Process scheduling – Functions of a clock Interrupt handler.	

UNIT IV – Programming With Shell	[12 hours]
Shell scripts – Command line arguments, positional parameters – Decision making and looping constructs – Redirection – File system architecture.	

UNIT V – Memory Management	[12 hours]
Swapping - Allocation of swap space – Swapping processes out – Swapping processes in – Demand paging - Data structures of demand paging - Page stealer process - Page faults.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Outline the concept of Unix architecture, file systems and the usage of basic commands.	K2
CO2	Infer the Unix commands that are used for file handling and process control.	K2
CO3	Apply Unix system calls to create and control signals in operating system.	K3
CO4	Apply Shell commands to devise a Shell script for problem solving.	K3
CO5	Determine a Shell Program for allocation and deallocation of memory resources	K2

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	1	-	-	-	3
CO2	3	2	2	1	-	-	-	3
CO3	3	2	2	1	-	-	-	3
CO4	3	2	2	1	-	-	-	3
CO5	3	2	2	1	-	-	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

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Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Sumitabha Das, "Unix System V.4 - Concepts and Applications", Tata McGraw Hill, 2014.
2. Maurice J Bach, "Design of the UNIX Operating System", Pearson, 2015.

Reference Books:

1. Richard F Gilberg, Behrouz A Forouzan, “Unix and Shell Programming - A Text Book”, Cengage Learning India Private Limited, 2016.
2. UreshVahalia, "UNIX Internals: The New Frontiers", Pearson Education, 2011.
3. Keith Haviland, Dina Gray, “Unix System Programming”, Addison Wesley, 2007

Web Links and Video Lectures (E-Resources):

- A basic course on Linux BASH (shell scripting): https://onlinecourses.swayam2.ac.in/aic20_sp05/preview

Course Code:	**24CA104**	**Course Title:**	Web Applications Development
Credits:	**4**	**L – T – P**	**3-0-2**

Course objectives:

To impart knowledge on the

- Students will be able to learn the Internet usage and web applications.
- To study the fundamentals of HTML and DHTML commands.
- To understand the concept of Client-Side Programming.
- To be familiar with the Server Side Programming using DOM and Java Servlet
- To identify the principles of SOAP, XML and WSDL.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I – Introduction	[15 hours]
Web Essentials: Clients, Servers, and communication: The Internet-Basic internet protocols -The WWW-HTTP Request message- Response Message-Web clients -Web Servers. Markup Languages: XHTML. An Introduction to HTML – History and Versions-Basic XHTML Syntax and semantics-Some fundamental HTML Elements-Relative URLs.	
Practical Topics: 1. Demonstrate the program using HTML elements & attributes 2. Write a program using HTML tables, forms & canvas 3. Develop a program using HTML multimedia, APIs	

UNIT II – Client Side Programming	[15hours]
Style sheets: Introduction to cascading style Sheets-Features-Core Syntax-Style Sheets and HTML - Style rule cascading and Inheritance-Text Properties-Box Model Normal- Flow Box Layout. Client Side Programming: JavaScript in Perspective-Syntax-Variables and Data types -Statements-Operators- Literals-Functions-Objects.	
Practical Topics: 1. Demonstrate the program using CSS selectors. 2. Demonstrate the program using CSS for embedded stylesheets, external stylesheets and inline styles. 3. Demonstrate the program using JavaScript for validating registration form.	

UNIT III – Server Side Programming	[15 hours]
Host objects: Introduction to the document object model – DOM -Intrinsic event handling - Modifying element style-The Document tree-DOM Event Handling - Properties of window. Server Side Programming: Java Servlets architecture overview - Servlet generating dynamic Content - Life cycle -Parameter data – Sessions - Cookies.	
Practical Topics: 1. Demonstrate the program for implementing XML document for customer details. 2. Demonstrate the program using servlet that displays a message. 3. Write a servlet program to display cookie id.	

UNIT IV – Representing Web Data	[15 hours]
XML Documents and vocabularies -Declaration – Namespaces - JavaScript and XML: Ajax-DOM based XML processing - Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in	

Browsers. Programming and Presentation: Introduction to JSP -JSP and Servlets-Running JSP Applications
Practical Topics: 1. Demonstrate the program using JSP that reads parameters from user login page. 2. Write an XML file to display the Book information which includes the following: 1)Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price 3. Write a JSP program to create check boxes..

UNIT V – Web Services	**[15 hours]**
Concepts - Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema- Communicating Object Data: SOAP Related Technologies	
Practical Topics: 1. Demonstrate the program using servlet that connects to the database and retrieves the data and displays it. 2. To Develop Content Management System. 3. To implement Online quiz.	

Laboratory Component: **[30 hours]**

Any 12 experiments have to be completed from the following list of experiments.

S.No.	Name of the Experiment
1	Demonstrate the program using HTML elements & attributes
2	Write a program using HTML tables, forms & canvas
3	Develop a program using HTML multimedia, APIs
4	Demonstrate the program using CSS selectors.
5	Demonstrate the program using CSS for embedded stylesheets, external stylesheets and inline styles.
6	Demonstrate the program using JavaScript for validating registration form.
7	Demonstrate the program for implementing XML document for customer details.
8	Demonstrate the program using servlet that displays a message.
9	Write a servlet program to display cookie id.
10	Demonstrate the program using JSP that reads parameters from user login page.
11	Write an XML file to display the Book information which includes the following:

	1)Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price
12	Write a JSP program to create check boxes..
13	Demonstrate the program using servlet that connects to the database and retrieves the data and displays it.
14	To Develop Content Management System.
15	To implement Online quiz.

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Utilize the basic HTML commands to develop programs.	K3
CO2	Use the concepts of CSS and JavaScript for designing the web pages.	K3
CO3	Make use of java Servlet to implement a server side program for storage purpose.	K3
CO4	Apply server side technologies to develop a software that is accessed using a web browser.	K3
CO5	Apply client and server side programming to design software for web application.	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	3	-	-	-	3
CO2	3	2	2	3	-	-	-	3
CO3	3	2	2	3	-	-	-	3
CO4	3	2	2	3	-	3	-	3
CO5	3	2	3	3	-	3	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max Marks**	**Reduced Marks**	**Total**	**Final marks**
Continuous Internal Examination (CIE) - Theory	CIE – I	100	50	100	25
	CIE – II	100			
	MCQ	20	10		

	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	25
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Theory Exam	100	35	50	50
	Lab Exam	100	15		
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	20	20	20
Apply	60	60	60
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Ralph F. Grove PhD, Web Based Application Development, ISBN-13: 9780763759407, 2010

Reference Books:

1. Carles Mateu, "Introduction to Web Applications Development" Publisher: Free Technology Academy - Fundacio per a la Universitat Oberta de Catalunya (February, 2010)
2. Wang-Thomson, "An Introduction to WEB Design and Programming"
3. Steven Holzner , "PHP: The Complete Reference", TataMcGraw-Hill.
4. Thomas Powell, "Web Design the Complete Reference", Tata McGraw Hill

Web Links and Video Lectures (E-Resources):

1. A Basic Course on Web Based Technologies and Multimedia Applications: https://onlinecourses.swayam2.ac.in/nou20_cs05/preview
2. Web Technology : https://onlinecourses.swayam2.ac.in/nou24_cs18/preview
3. HTML: https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

Course Code:	24CA105	Course Title:	Fundamentals of Accounting
Credits:	3	L – T – P	3-0-0

Course objectives:

To impart knowledge on the

- To understand the basic principles of Accounting.
- To understand the Double entry system and the preparation of ledger.
- To understand the process and importance of the electronic accounting system.
- To Prepare the estimate for various business activities such as purchase, sale, production and cash budgets.
- To understand the computerized accounting environment.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. NPTEL and Other Videos
3. Smart Class Room
4. Field visit
5. Project based learning
6. Industrial Visit

UNIT I -INTRODUCTION TO ACCOUNTING	[9 hours]

Introduction to Financial, Cost and Management Accounting – Objectives of Financial Accounting – Accounting Principles, Concepts and Conventions- Bookkeeping and Accounting.

UNIT II - MANAGEMENT ACCOUNTING AND BOOKKEEPING	[9 hours]

Meaning – Objectives of Management Accounting – Accounting System – Preparation of Journal, Ledger, Cash Book and Trial Balance- Errors disclosed and not disclosed by Trial Balance –Final Accounts – Ratio Analysis.

UNIT III - BUDGETS AND BUDGETRY CONTROL	[9 hours]
Budgets and Budgetary Control – Meaning – Types – Sales Budget – Production Budget – Cost of Production Budget – Flexible Budgeting – Cash Budget –Master Budget – Zero Base Budgeting.	

UNIT IV- FINANCIAL MANAGEMENT	[9 hours]
Objectives of Financial Management –Preparation of Suspense Account – Depreciation – Meaning and Types – Methods of Charging and providing depreciation – Inventory management.	

UNIT V- ACCOUNTING IN COMPUTERISED ENVIRONMENT	[9 hours]
Significance of Computerized Accounting System – Codification and Grouping of Accounts – Maintaining the hierarchy of ledgers – Prepacked Accounting software.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Able to understand the basic concepts of accounting standards.	K2
CO2	Able to understand the process of maintain Accounts in an organization.	K2
CO3	Able to understand and calculating the financial position of an organization.	K2
CO4	Able to understand financial management concepts and various methods depreciation.	K2
CO5	It helps to understand the computerized accounting environment.	K2

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	-	1	1	1	3
CO2	3	2	2	-	1	2	1	3
CO3	3	3	2	-	1	2	1	3
CO4	3	3	2	-	1	2	1	3
CO5	3	3	2	2	2	1	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	60	100	40
	CIE – II	100			
	Skill Assessment – I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	80	80	80
Apply	0	0	0
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Reddy and Murthy, Financial Accounting by Margham Publications, 2015, Chennai.
2. S.N.Maheswari, "Financial and Management Accounting", Sultan Chand & Sons, 5 edition . 2010.

Reference Books:

1. I.M. Pandey, "Financial Management", Vikas Publishing House Pvt. Ltd., 9th Edition 2009.
2. M.Y.Khan and P.K.Jain, "Financial Management", Text, Problems and Cases", Tata McGraw Hill, 5th Edition, 2008.
3. I.M.Pandey, "Management Accounting", Vikas Publishing House Pvt. Ltd., 3rd Edition 2009.
4. Advanced Accounting, R.L.Gupta and P.K.Gupta, Advanced Accounting, Sultan Chand, New Delhi.

Web Links and Video Lectures (E-Resources):

1.Foundations of Accounting : https://youtu.be/VLSTb9bykzM

Course Code:	24CA106	Course Title:	Python Programming
Credits:	3	L – T – P	3-0-0

Course objectives:

To impart knowledge on the

- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python.
- To use different modules and packages

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. NPTEL and Other Videos
3. Smart Class Room
4. Field visit
5. Project based learning
6. Industrial Visit

UNIT I - PYTHON BASICS	[10 hours]

Introduction to Python Programming – Python Interpreter and Interactive Mode – Variables and Identifiers – Values and Types – Statements. Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If - Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – BreakStatement-Continue statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions.

UNIT II - DATA TYPES IN PYTHON	[9 hours]

Lists – List Operations. Methods – Tuples – variable length arguments, Strings – Dictionary

UNIT III -FILE HANDLING AND EXCEPTION HANDLING	[8 hours]
Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files –File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions	

UNIT IV- MODULES, PACKAGES	[9 hours]
Modules: Importing Module – User Define Module – The Python Standard Libraries Modules – The Python Libraries for data processing, data mining and visualization- NUMPY, Pandas, Matplotlib	

UNIT V-OBJECT ORIENTED PROGRAMMING IN PYTHON	[9 hours]
Concepts – Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Interpret the basic Python programming structure for solving decision making and looping problems.	K2
CO2	Utilize the compound data types lists, tuples, dictionaries to access collective data.	K3
CO3	Implement the file operations and exceptions to handle runtime errors in program	K3
CO4	Utilize the different functions used in python libraries for data processing	K3
CO5	Summarize the object oriented concepts for reusability and to organize complex programs.	K2

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1	-	-	3
CO2	3	2	2	2	1	-	-	3
CO3	3	3	2	2	1	-	-	3
CO4	3	3	2	3	1	-	-	3
CO5	3	3	2	2	1	-	-	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	60	100	40
	CIE – II	100			
	Skill Assessment – I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	20	20	20
Apply	60	60	60
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff, O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2, Network Theory Ltd., First edition, 2011
3. Wes McKinney, "Python for Data Analysis", O 'Reilly Publishers

Reference Books:

1. ReemaThareja, "Python Programming using Problem Solving Approach", Oxford University Press, First edition, 2017
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition,MIT Press, 2013

3. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley IndiaEdition, First Edition, 2016
4. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd.,First edition,2011
5. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, Cengage Learning,second edition,2012

Web Links and Video Lectures (E-Resources):

1. Python Programming: https://onlinecourses.nptel.ac.in/noc24_cs78/preview

Course Code:	**24CA131**	**Course Title:**	Advanced Data Structures And Algorithms Laboratory
Credits:	**2**	**L – T – P**	**0-4-0**

Course objectives:

To impart knowledge on the

- To learn the usage of algorithms for computing.
- To study the concept of hierarchical data structures and its operations.
- Familiar with the concept of tree and graph traversal.
- To select and design data structures and algorithms that is appropriate for problems.
- To learn the concept of back tracking and branch and bound technique

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

S.No	**Name of the Experiment**
1.	Write a program using C ++ to perform stack operations.
2.	Implement the program using C ++ to perform queue operations.
3.	Write a C++ program to sort N numbers using merge sort and quick sort.

4.	Demonstrate the program using C ++ to perform recursive function for tree traversal
5.	Program using C ++ to perform graph traversal.
6.	Write a C++ program to perform minimum spanning tree using Prim's algorithm.
7.	Demonstrate the C++ program to perform minimum spanning tree using kruskal's algorithm.
8.	C ++ program to find the solution for knapsack problem using dynamic programming approach.
9.	Implement the program using C ++ to perform the solution of 8 Queens Problem using backtracking.
10.	Demonstrate the C++ program to find the solution of traveling salesperson problem using branch and bound technique
11.	Write a C++ program to perform coloring problem using backtracking

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Apply linear data structures stack and queue to store and retrieve the values.	K3
CO2	Make use of non-linear structures to perform tree and graph operation.	K3
CO3	Apply divide and conquer technique to sort the numbers.	K3
CO4	Apply the greedy and dynamic programming to graphical problems.	K3
CO5	Use back tracking and branch and bound technique to solve real time complex problem.	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1	-	1	3
CO2	3	2	2	2	1	-	1	3
CO3	3	3	2	2	1	-	1	3
CO4	3	3	2	2	1	2	1	3
CO5	3	3	2	2	2	2	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	60
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Lab Exam	100	40	40	40
				Total	100

Course Code:	**24CA132**	**Course Title:**	**Python Programming Laboratory**
Credits:	**1**	**L – T – P**	**0-0-2**

Course objectives:

To impart knowledge on the

- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries
- Implement object oriented concepts

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

S.No	Name of the Experiment
1.	Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).

2.	Scientific problems using Conditionals and Iterative loops
3.	Linear search and Binary search.
4.	Selection sort, Insertion sort
5.	Merge sort, Quick Sort
6.	Implementing applications using Lists, Tuples
7.	Implementing applications using Sets, Dictionaries.
8.	Implementing programs using Strings.
9.	Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
10.	Implementing real-time/technical applications using File handling.
11.	Implementing real-time/technical applications using Exception handling
12.	Creating and Instantiating classes

Hardware/Software Requirements

1	Operating systems: Windows 7,macOS and Linux
2	Python versions:2.7, 3.6, 3.8

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Apply the Python language syntax including control statements, loops and functions to solve a wide variety of problems in mathematics and science	K3
CO2	Use the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data	K3
CO3	Create files and perform read and write operations	K4
CO4	Illustrate the application of python libraries	K2
CO5	Handle exceptions and create classes and objects for any real time applications.	K2

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	3	1	-	1	3
CO2	3	2	2	3	1	-	1	3
CO3	3	3	2	2	1	-	1	3

CO4	3	3	2	2	1	-	1	3
CO5	3	3	2	2	1	-	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	60
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Lab Exam	100	40	40	40
				Total	100

Course Code:	**24CA151**	**Course Title:**	**PROFESSIONALCOMMUNICATION I**
Credits:	**1**	**L – T – P**	**0-0-2**

Course Objectives

- To provide opportunities to learners to practice active listening
- To enable learners read and comprehend materials
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology
- To improve the performance of learners' writing skills
- To improve the performance of learners' presentation and communication skills

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk / Demonstrations
2. Language learning softwares / Language Lab
3. Online Resources
4. Smart Class Room
5. Flipped classrooms
6. Expert Lecture sessions

UNIT I – LISTENING - ATTITUDE, ATTENTION AND ADJUSTMENT		**[6 hours]**
Listening and practicing neutral accents - Listening to short talks and lectures and completing listening comprehension exercises , Listening to TED Talks		
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	**Topic**	**Hours**
1	"Your Body Language May Shape Who You Are" by Amy Cuddy Amy Cuddy's TED Talk on how adopting powerful postures can affect your mind and improve your confidence. (https://www.youtube.com/watch?v=Ks_Mh1QhMc).	
2	Podcasts The English We Speak" (BBC Learning English, Short episodes focusing on English phrases and idioms, spoken in clear, neutral British English. Listen https://www.bbc.co.uk/programmes/p02pc9zn/episodes/downloads	2
3	5 Minute English" (BBC Learning English, Discussions on a variety of topics with transcripts available, ideal for practicing listening skills. Listen https://www.bbc.co.uk/programmes/p02pc9kn/episodes/downloads	
4	The English Language Podcast" (English Language Club Conversations about the English language and tips for learners, spoken in neutral accents. Listen https://www.englishlanguageclub.co.uk/englishlanguagepodcast/	
5	YouTube Channels English Addict with Mr. Duncan" Mr. Duncan speaks in a clear, neutral British accent, discussing various aspects of English language learning. Watch https://www.youtube.com/user/duncaninchina	
6	Rachel's English" Focuses on American English pronunciation and listening practice with a neutral accent. Watch https://www.youtube.com/user/rachelsenglish	
7	English with Lucy" Lucy offers lessons on British English pronunciation and listening skills, spoken in a neutral accent. Watch https://www.youtube.com/channel/UCz4tgANd4yy8Oe0iXCdSWfA	
8	Audiobooks LibriVox" Free public domain audiobooks read by volunteers from around the world. Many readers use neutral accents.	

	Listen https://librivox.org/	
9	Audible Free Audiobooks Audible offers a selection of free audiobooks, often read in clear, neutral accents. Titles like "Pride and Prejudice" by Jane Austen are a good starting point. Explore https://stories.audible.com/startlisten	
10	Interactive Websites ESL Lab" Listening exercises with conversations and quizzes to test comprehension. Features speakers with neutral accents. Visit https://www.esllab.com/	
11	Elllo" A vast collection of listening exercises with speakers from different English speaking countries using neutral accents. Visit https://www.elllo.org/	
	CLASSROOM ACTIVITY	
	Exercise – LISTENING COMPREHENSION EXERCISES Activities 1. Transcription Practice Choose a podcast or YouTube video with a neutral accent and transcribe it. Compare your transcription with the provided transcript to check for accuracy. 2. Shadowing Technique Listen to a short segment (12 minutes from a neutral accented podcast or video and try to repeat it exactly as you hear it, imitating the accent, intonation, and rhythm. 3. Listening and Summarizing Listen to a podcast episode or video, and then summarize it in your own words. This helps improve both listening comprehension and the ability to articulate thoughts clearly.	4

UNIT II: READING		**[6 hours]**
Reading Comprehension -Reading subject specific material -Technical Vocabulary- skimming – scanning – technical articles		
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	**TOPIC**	**HOURS**
	https://learnenglish.britishcouncil.org/skills/reading/b2-reading	4
	https://learnenglish.britishcouncil.org/business-english/english-emails	
	Compose and send emails	
	https://www.vocabulary.com	
	CLASSROOM ACTIVITY	

	Exercise: Read Aloud	**2**

UNIT III: USEFUL WEBTOOLS FOR LANGUAGE LEARNING		**[6 hours]**
1	https://lingro.com/?authuser=0	4
2	https://quillbot.com/?authuser=0	
3	https://www.csgenerator.com/?authuser=0	
4	https://www.thesaurus.com/?authuser=0	
5	https://translate.google.com/?sl=en&tl=ta&op=translate&hl=en&authuser=0	
6	https://rewordify.com/?authuser=0	
7	https://www.grammarly.com/?authuser=0	
8	https://smallseotools.com/plagiarism-checker/?authuser=0	
9	https://www.google.co.in/inputtools/try/?authuser=0	
10	https://youglish.com	
11	https://www.scribbr.com/citation/generator/	
	CLASSROOM ACTIVITY	
	Panel Discussion : Present day Technology : boon or bane ?	2

UNIT IV: WRITING		**[6 hours]**
Nuances of effective - writing Formal vs Informal Writing - Paragraph Writing - Essay Writing - Email Writing		
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	**TOPIC**	**HOURS**
1	Website review	3
2	Literature review	
3	Professional blogs	
4	Data Analysis Reports	
	CLASSROOM ACTIVITY	
	Exercise: Write letters , Technical papers	3

UNIT V : SPEAKING		**[6 hours]**
Giving one minute talks, participating in small Group Discussions, Making Presentations		
LIST OF EXERCISES		
LAB ACTIVITIES		
Sl. No.	**TOPIC**	**HOURS**
1	Group Discussion Skills "Group Discussion Tips" by Welingkar Online video offers practical tips	2

	and strategies for participating effectively in group discussions. Watch https://www.youtube.com/watch?v=yyTkdE6UXm4	
2	"Group Discussion Do's and Don'ts" by Learn English Lab Covers the essential do's and don'ts for group discussions, helping participants understand how to contribute meaningfully. Watch https://www.youtube.com/watch?v=whwe0KD_rGw	
3	. "How to Ace Group Discussions" by Study IQ Education Provides a detailed guide on how to prepare for and excel in group discussions, including how to structure your arguments and engage with others. Watch https://www.youtube.com/watch?v=WXKj5a8hoG0	
4	Making Effective Presentations 1. "How to Make an Effective Presentation" by Mind Tools Focuses on the key elements of creating and delivering effective presentations, including planning, structure, and delivery techniques. Watch https://www.youtube.com/watch?v=puHvNWIuavU	
5	"Top Tips for Effective Presentations" by Jeff Davidson Offers tips on presentation design, body language, and engaging your audience. Watch https://www.youtube.com/watch?v=ENWBlqN1vqo	
6	"How to Create a Presentation in Canva" by Canva A stepbystep tutorial on using Canva to create professional and engaging presentation slides. Watch https://www.youtube.com/watch?v=_Akp7APaFr8	
7	"Mastering Public Speaking" by Dale Carnegie Training Covers the essentials of public speaking, including confidencebuilding techniques, clear communication, and audience engagement. Watch https://www.youtube.com/watch?v=i9bXhV7ml_M	
8	"Presentation Skills Training" by Skillopedia A comprehensive guide to improving presentation skills, including voice modulation, slide design, and handling Q&A sessions. Watch https://www.youtube.com/watch?v=jl8FEpMcfrs	
9	"How to Conduct a Group Discussion" by CareerRide Detailed advice on leading and participating in group discussions, with tips on how to present your ideas effectively within a group setting. Watch https://www.youtube.com/watch?v=Z0r3HUn_jvs	
10	Public Speaking **A well-educated mind vs a well-formed mind: Dr. Shashi Tharoor at TEDx Gateway 2013** https://www.youtube.com/watch?v=kcW4ABcY3zI&authuser=0	
11	**Malala Yousafzai UN Speech: Girl Shot in Attack by Taliban Gives Address | The New YorkTimes** https://www.youtube.com/watch?v=5SClmL43dTo&authuser=0	
	CLASSROOM ACTIVITY	
	Exercise – Self introduction - Giving one minute talks, participating in small Group Discussions, Making Presentations – public speaking	4

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Make use of active listening skills and comprehend lectures in English	K3
CO2	Utilize reading skills and comprehend literature in English	K3
CO3	Choose appropriate technology to support language skills	K3
CO4	Apply linguistic skills to Communicate effectively in formal and informal writing	K3
CO5	Plan and present proficient lectures and presentations	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	-	-	-	-	2	-	1	3
CO2	-	-	-	-	2	-	1	3
CO3	-	-	-	-	2	-	1	3
CO4	-	-	-	-	3	-	1	3
CO5	-	-	-	-	3	-	2	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max Marks**	**Reduced Marks**	**Total**	**Final marks**
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	60
	Model Lab Exam	25	25		
End Semester (Based on skill activity suggested)	Lab Exam	100	40	40	40
				Total	100

Web Links and Video Lectures (E-Resources):

MANUALS / SOFTWARE: Open Sources / British Council / Cambridge Websites

Course Code:	24CA201	Course Title:	Object Oriented Programming Using Java
Credits:	3	L – T – P	3-0-0

Course objectives:

To impart knowledge on the

- Study the basic concepts and fundamentals of platform independent object oriented language.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
- To demonstrate skills in writing programs using exception handling. techniques and multithreading.
- To introduce the design of Graphical User Interface
- Able to design a framework using AWT Components.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I – Basic Concepts	[9 hours]

Object orientation programming - Benefits of OOP – Applications of OOP. Java fundamentals: Features of java – Java development environment – Bytecode - Data types- Variables -Operators – Expressions – Functions – Static Members - Arrays – Strings -– Classes and objects – Constructing objects using constructors.

UNIT II – Inheritance And Polymorphism	[9 hours]

Inheritance: Types - Access rules, super classes and sub classes – Overriding methods - Overriding vs overloading. Polymorphism: Static binding – Dynamic binding – Method overloading - Runtime polymorphism. Package: Create - Import – Exception handling: Exception - Types – Try and catch - Multiple catch - Nested try – throw - throws – finally - User defined exception.

UNIT III – Input / Output	[9 hours]
Streams classes: Byte – Character - File class - File operations - Console class – Serialization. Multithreading: Java thread model – Creating thread – Creating multi thread - Thread priorities – Synchronization - Inter thread communication.	

UNIT IV – AWT Controls	[9 hours]
AWT classes – Windows fundamentals – Working with frame windows - Control fundamentals - AWT containers and components - Layout managers – Menu bars and menus- Handling events by extending AWT Components.	

UNIT V – Collections Framework	[9 hours]
Collection overview – Recent changes to collection - Collection interface – Collection classes – Working with maps –Collection algorithms - The legacy classes and interfaces. Applet class: Types – Basics – Architecture – Skeleton – Display methods – repainting – Status window – HTML applet tag – Passing parameter - Creating a swing applet - Painting in swing - A paint example, Exploring swing	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Make use of the basic OOPs concepts and the syntax of arrays, class and object to develop programs.	K3
CO2	Utilize the concept of multithreading and polymorphism to develop programs.	K3
CO3	Apply Inheritance, Polymorphism and Exception handling methods to solve the real time complex problems.	K3
CO4	Apply thread concept for synchronization to complete the task.	K3
CO5	To determine the java framework for real world problem using AWT and interface.	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	1	2	-	1	3
CO2	3	2	2	1	2	-	1	3
CO3	3	3	2	1	2	-	1	3
CO4	3	3	2	1	2	-	1	3
CO5	3	3	2	2	2	-	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	20	20	20
Apply	60	60	60
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Herbert Schildt, "JAVA - The Complete Reference", 7 th Edition, Tata McGraw Hill, 2017.
2. Y. Daniel Liang, Pearson, "Introduction to JAVA Programming, 7th Edition, Tata McGraw Hill, 2017.

Reference Books:

1. Cay S Horstmann and Gary Cornell, "Core Java Volume I & 2", 10th Edition, Pearson Education, 2017.
2. Deitel and Deitel, "JAVA - How to Program", 11th Edition, Prentice Hall International Inc, 2017.

Web Links and Video Lectures (E-Resources):

1. A Basic course on Programming in Java: https://onlinecourses.nptel.ac.in/noc22_cs47/preview
2. Java: https://onlinecourses.swayam2.ac.in/aic20_sp13/preview

Course Code:	24CA202	Course Title:	Cloud Computing Technologies
Credits:	3	L – T – P	3-0-0

Course objectives:

To impart knowledge on the

- To understand the basic concepts of Distributed systems.
- To learn about the current trend and basics of Cloud computing.
- To be familiar with various Cloud concepts.
- To expose with the Server, Network and storage virtualization.
- To be aware of Microservices and DevOps.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. NPTEL and Other Videos
3. Smart Class Room
4. Field visit
5. Project based learning
6. Industrial Visit

UNIT I - DISTRIBUTED SYSTEMS	[9 hours]

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models –Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical Clock Synchronization – Logical Time and Logical Clocks.

UNIT II - BASICS OF CLOUD COMPUTING	[9 hours]

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning - Applications – Benefits – Cloud Components: Clients, Data Centers & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim.

UNIT III -CLOUD INFRASTRUCTURE	[9 hours]
Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system - NIST Cloud computing Reference Architecture – Public, Private and Hybrid clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers - Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.	

UNIT IV- CLOUD ENABLING TECHNOLOGIES	[9 hours]
Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS - Federation in the Cloud.	

UNIT V-MICROSERVICES AND DEVOPS	[9 hours]
Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree – Challenges with Microservices - SOA vs Microservice – Microservice and API – Deploying and maintaining Microservices – Reason for having DevOps – Overview of DevOps – Core elements of DevOps – Life cycle of DevOps – Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Utilize Distributed systems in Cloud Environment to split the task across multiple computers.	K3
CO2	Articulate the main concepts, key technologies, strengths and limitations of Cloud Computing for globalization of resources.	K3
CO3	Illustrate the Architecture, Infrastructure and delivery models of Cloud computing to reduce the time and resources	K2
CO4	Use the appropriate current technology for the implementation of Cloud	K3
CO5	Adopt Microservices and DevOps in Cloud environments for faster development and deployment.	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1	-	1	3

CO2	3	2	2	2	1	-	2	3
CO3	3	2	2	2	1	-	1	3
CO4	3	2	2	3	1	-	2	3
CO5	3	2	2	2	1	-	2	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	60	100	40
	CIE – II	100			
	Skill Assessment – I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	20	20	20
Apply	60	60	60
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Kai Hwang, Geoffrey C. Fox & Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition, 2012
2. Andrew S. Tanenbaum & Maarten Van Steen,"Distributed Systems - Principles and Paradigms", Third Edition, Pearson, 2017.

Reference Books:

1. Thomas Erl, Zaigham Mahood & Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture", Prentice Hall, SecondEdition, 2013.
2. Richard Rodger, "The Tao of Microservices", ISBN 9781617293146, Manning Publications, First Edition, December 2017.
3. Magnus Larsson, "Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy microservices using spring cloud, Istio and kubernetes", Packt Publishing Ltd, First Edition, September 2019.
4. Jim Lewis, "DEVOPS: A complete beginner's guide to DevOps best practices", ISBN-13:978-1673259148, ISBN-10: 1673259146, First Edition,2019

Web Links and Video Lectures (E-Resources):

1. Advance Distributed Databases:

   https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc24_cs99/preview
2. Cloud Computing: https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc24_cs118/preview

Course Code:	**24CA203**	**Course Title:**	**Artificial Intelligence**
Credits:	**3**	**L – T – P**	**3-0-0**

Course objectives:

To impart knowledge on the

- To understand the fundamentals of Artificial Intelligence
- To understand the reasoning methods in Intelligent systems.
- To develop semantic-based and context-aware systems to acquire, organize process.
- Apply AI Expert System methods with the real world Problems.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I – Overview Of Artificial Intelligence	[9 hours]
AI problems, foundation of AI and history of AI - Intelligent agents- Agents and Environments-the concept of rationality, the nature of environments, structure of agents, problem solving agents– Searching for Solution- Uninformed Search Strategies - Informed Search Strategies -Heuristic Functions.	

UNIT II – Adversarial Search And Constraint Satisfaction	[9 hours]
Optimal Decisions in Games-Alpha Beta Pruning-Imperfect Real-Time Decisions-Stochastic Games-Partially Observable Games-State-of-the Art Game Programs-Alternative Approaches. Constraint Satisfaction Problems- Propagation-Backtracking-Local Search-Structure of Problems.	

UNIT III – Knowledge, Reasoning, And Planning	[9 hours]
Logical Agents- Propositional Logic- First-order predicate Logic –Backward Chaining - Forward Chaining – Resolution – Planning and Acting in the real World-Hierarchical Planning- Multi agent Planning –real world Applications.	

UNIT IV – Communicating, Perceiving, And Acting	[9 hours]
Natural Language Processing-Language Models-Classification-Retrieval-Extraction- Natural Language for Communication-Structure Grammars-Parsing-Semantic Interpretation-Machine Translation-Speech recognition- Computer Vision-Image Formation-Operation-Recognitions-Robotics-Perception-Uncertain Movement-Software Architecture-Application Domain in Robotics.	

UNIT V – Expert Systems	[9 hours]
Strong method problem Solving-Overview of Expert System- Architecture - Rule Based Expert Systems-Model Based, Case Based, and Hybrid Systems-Analyze the models with the real world examples.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Define the Artificial Intelligence Concepts and Components	K2
CO2	Formulate a problem and find the solution using searching techniques	K2
CO3	Use the knowledge and the process of inference to derive new facts.	K3
CO4	Apply Syntax and Semantic Interpretation to the Problem	K3
CO5	Analyze the Expert System Models.	K4

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1	-	1	3
CO2	3	2	2	2	1	-	1	3
CO3	3	3	2	2	1	-	1	3
CO4	3	3	2	2	1	-	2	3
CO5	3	3	2	2	1	-	2	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	60	20	20
Apply	20	40	40
Analyse	0	20	20
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Stuart Russel and Peter Norvig, "Artificial Intelligence – A modern approach", Prentice Hall, Third Edition, 2010.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.

Reference Books:

1. Elaine Rich, Kevin Knight and Shiva shankar B Nair, "Artificial Intelligence", McGraw Hill, 2008.
2. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
3. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.

Web Links and Video Lectures (E-Resources):

1. A Basic course on Artificial Intelligence Search Methods for Problem Solving https://nptel.ac.in/courses/106106226
2. An Introduction to Artificial Intelligence: https://nptel.ac.in/courses/106102220

Course Code:	**24CA204**	**Course Title:**	**Software Engineering Methodologies**
Credits:	**3**	**L – T – P**	**3-0-0**

Course objectives:

To impart knowledge on the

- To learn the basic knowledge about the software Engineering and process model.
- Students will be able to choose appropriate process model depending on the user requirements.
- To plan a software engineering process to account for quality issues and non-functional Requirements.
- Students will be able to know various processes used in all the phases of the product.
- Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning

6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

UNIT I – Introduction	[9 hours]
Nature of software – Software engineering – Software process – Software myths. Process model: Generic process model – Assessment and improvement – Prescriptive process models – Specialized process models- Unified process – Agile process – Extreme programming – other Agile process models - Requirement analysis – Scenario based modeling – UML model – Data modeling concepts- Class based modeling.	

UNIT II – Modeling	[9 hours]
Modeling strategies – Flow oriented modeling – Behavioral model – Patterns for requirement model – Design process – Design concept –Design model – Software architecture – Style – Design – Mapping using data flow – Class based components.	

UNIT III – Software Quality Management	[9 hours]
Software quality – Software quality dilemma – Achieving software quality – Cost impact of software defects – Defect amplification and removal – Review metrics and their use – Formality spectrum – Informal review – Formal technical reviews – Elements of software quality assurance – SQA tasks, goals and metrics – Formal approaches to SQA – Statistical SQA – ISO 9000 quality standard.	

UNIT IV – Software Testing Strategies	[9 hours]
Strategic approach to software testing – Strategic issues – Test strategies for conventional software – Test strategies for object oriented software – Test strategies for webapps – Validation testing – System testing – Debugging – white Box testing- Basic path testing –Control structure testing – Black box testing – Model based testing – Patterns for software testing.	

UNIT V – Software Maintenance	[9 hours]
Maintenance – Supportability – Business process reengineering – Software reengineering – Reverse engineering- Restructuring – Forward engineering – Software process improvement Process -. CMMI – Other SPI frameworks.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Outline the basic concepts of Software engineering for software design.	K2
CO2	Interpret the model and its use to design the software project.	K3
CO3	Apply quality metrics for the project to ensure the quality of the software.	K3
CO4	Utilize the software testing principles on the software project to determine the performance of the software.	K3
CO5	Infer the concepts of reengineering and restructuring for the software project.	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	1	2	-	1	3
CO2	3	2	2	1	2	-	1	3
CO3	3	2	3	2	2	-	1	3
CO4	3	2	3	2	2	2	1	3
CO5	3	2	3	2	2	2	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max Marks**	**Reduced Marks**	**Total**	**Final marks**
Continuous Internal Examination (CIE)	CIE – I	100	50	100	40
	CIE – II	100			
	MCQ	20	10		
	Skill Assessment - I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Roger Pressman S and Bruce Maxim "Software Engineering: A Practitioner's Approach", Tata McGraw-Hill, 2020.

Reference Books:

1. Ian Sommerville, "Software Engineering", Pearson Education, 2018.
2. Pankaj Jalote's "Software Engineering: A Precise Approach", Wiley,2010
3. James Rumbaugh, Ivar Jacobson and Grady Booch, "The Unified Modeling Language Reference Manual", Pearson Education, 2009.

Web Links and Video Lectures (E-Resources):

1. A Basic course on Software Engineering: https://nptel.ac.in/courses/106105182
2. Software testing: https://nptel.ac.in/courses/106101163

Course Code:	**24CA205**	**Course Title:**	**Mobile Application Development**
Credits:	**3**	**L – T – P**	**3-0-0**

Course objectives:

To impart knowledge on the

- To facilitate students to understand about Mobile OS
- To help students to gain basic understanding of Android application development
- To understand how to work with various mobile application development frameworks
- To inculcate working knowledge of Android Studio development tool
- To learn the basic and important design concepts and issues of development of mobile applications

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. NPTEL and Other Videos
3. Smart Class Room
4. Field visit
5. Project based learning
6. Industrial Visit

UNIT I - MOBILE PLATFORM AND APPLICATIONS	[9 hours]
Mobile Device Operating Systems — Special Constraints & Requirements — Commercial Mobile Operating Systems — Software Development Kit: iOS, Android, BlackBerry, Windows Phone — MCommerce — Structure — Pros & Cons — Mobile Payment System — Security Issues	

UNIT II - INTRODUCTION TO ANDROID	[9 hours]
Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.	

UNIT III - ANDROID APPLICATION DESIGN ESSENTIALS	[9 hours]
Anatomy of Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	

UNIT IV- ANDROID USER INTERFACE DESIGN & MULTIMEDIA	[9 hours]
User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures	

UNIT V-ANDROID APIs	[9 hours]
Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Summarize various mobile operating systems that make it unique for various platforms	K2
CO2	Build Android application by setting up Android development	K3
CO3	Demonstrate methods in Android programming for storing, sharing and retrieving data in applications	K3
CO4	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces	K3
CO5	Construct interactive applications in android using databases with multiple activities including audio, video and notifications and deploy them in marketplace	K4

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1		1	3
CO2	3	2	2	2	1		1	3
CO3	3	3	2	2	1		1	3
CO4	3	3	2	2	1		1	3
CO5	3	3	2	2	1		1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max Marks**	**Reduced Marks**	**Total**	**Final marks**
Continuous Internal Examination (CIE)	CIE – I	100	60	100	40
	CIE – II	100			
	Skill Assessment – I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	20	20	20
Apply	60	40	40
Analyse	0	20	20
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.

Reference Books:

1. Prasanth Kumar Pattnaik,Rajib Mall,"Fundamentals of Mobile Computing",PHI Learning Pvt.Ltd,New Delhi-2012
2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2010
3. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 2009
4. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O"Reilly SPD Publishers, 2015. ISBN-13: 978-9352131341
5. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014. ISBN-13: 978-8126547197.

Web Links and Video Lectures (E-Resources):

1. Mobile Application Development: https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc24_cs118/preview

Course Code:	24CA206	Course Title:	Full Stack Web Development
Credits:	3	L – T – P	3-0-0

Course objectives:

To impart knowledge on the

- To understand the fundamentals of web programming and client side scripting.
- To learn server side development using NodeJS.
- To understand API development with Express Framework.
- To understand and architect databases using NoSQL and SQL databases.
- To learn the advanced client side scripting and ReactJS framework

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. NPTEL and Other Videos
3. Smart Class Room
4. Field visit
5. Project based learning
6. Industrial Visit

UNIT I - INTRODUCTION TO EXPRESS FRAMEWORK	[9 hours]
Introduction – RESTful Services – Introducing Express – Building Your First Web Server – Nodemon – Environment Variables – Route Parameters – Handling HTTP GET Requests – Handling HTTP POST Requests – Calling Endpoints Using Postman – Input Validation – Handling HTTP PUT Requests – Handling HTTP Delete Requests	

UNIT II - SERVER SIDE PROGRAMMING WITH NODE JS	[9 hours]
Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files – async/await – Fetching JSON from Express	

UNIT III - ADVANCED NODE JS AND DATABASE	[9 hours]
Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS MongoDB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS	

UNIT IV- ADVANCED CLIENT SIDE PROGRAMMING	[9 hours]
React JS: ReactDOM – JSX – Components – Properties – Fetch API – State and Lifecycle – JS Localstorage – Events – Lifting State Up – Composition and Inheritance	

UNIT V- APP IMPLEMENTATION IN CLOUD	[9 hours]
Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes	

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Utilize the web application framework to build a single, multi and hybrid pages	K3
CO2	Build server side programs of the web application to store information in the database and access dynamically.	K3
CO3	Utilize NoSQL databases with MongoDB for developing scalable applications with evolving data schemas.	K3
CO4	Construct a complete web application using React, NodeJS and MongoDB and deploy on Cloud.	K4
CO5	Utilize the facilities of cloud providers for creating and launching applications	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1	-	1	3
CO2	3	2	2	2	1	-	1	3
CO3	3	3	2	2	1	-	1	3
CO4	3	3	2	2	2	-	1	3
CO5	3	3	2	2	2	-	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max Marks	Reduced Marks	Total	Final marks
Continuous Internal Examination (CIE)	CIE – I	100	60	100	40
	CIE – II	100			
	Skill Assessment – I	40	40		
	Skill Assessment - II	40			
End Semester Examination (ESE)	Theory Exam	100	60	60	60
				Total	100

End semester Examination: (QP PATTERN)

- Each unit consists of two 2 marks questions and one 16 marks question (either or).
- All the fifteen questions have to be answered.

Assessment Pattern

Bloom's Category	Continuous Internal Examination		End Semester Examination
	I	II	
Remember	20	20	20
Understand	20	20	20
Apply	60	40	40
Analyse	0	20	20
Evaluate	0	0	0
Create	0	0	0

Text Books:

1. David Flanagan, "Java Script: The Definitive Guide", O'Reilly Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019

Reference Books:

1. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020
2. Marc Wandschneider, "Learning Node", Addison-Wesley Professional, 2nd Edition, 2016
3. Joe Beda, Kelsey Hightower, Brendan Burns, "Kubernetes: Up and Running", O'Reilly Media,1st edition, 2017
4. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, "Cloud Without Compromise", O'Reilly Media, 1st edition, 2021

Web Links and Video Lectures (E-Resources):

1. Full Stack Web Development: https://nptel.ac.in/courses/106106156
2. Full Stack Web Development: https://www.udemy.com/topic/full-stack-web-development/
3. Full Stack Web Development : https://www.coursera.org/professional-certificates/ibm-full-stack-cloud-developer

Course Code:	24CA231	Course Title:	Full Stack Web Development Laboratory
Credits:	2	L – T – P	0-0-4

Course objectives:

To impart knowledge on the

- Usage of various front and back end Tools
- They can understand and create applications on their own
- Demonstrate and Designing of Websites can be carried out.
- Develop web based applications using suitable client side and server side code.
- Implement web based applications using effective database access.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

S.No	Name of the Experiment
1.	Create a form and validate the contents of the form using JavaScript.
2.	Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3.	Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4.	Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5.	Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.
6.	Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7.	Create a counter using ReactJS
8.	Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
9.	Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
10.	Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11.	Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

Hardware/Software Requirements

1	NodeJS/Express JS, ReactJS, Docker, any IDE like NOTEPAD++/visual studio code/sublime text etc.
2	MySQL, MongoDB

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Implement and deploy the client side of the web application	K3
CO2	Develop and deploy server side applications using NodeJS	K4
CO3	Use Express framework in web development	K3
CO4	Implement and architect database systems in both NoSQL and SQL environments.	K3
CO5	Develop a full stack single page application using React, NodeJS, and a Database and deploy using containers.	K4

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	3	2	-	1	3
CO2	3	2	2	3	2	-	1	3
CO3	3	3	2	3	2	-	1	3
CO4	3	3	2	3	2	-	1	3
CO5	3	3	2	3	2	-	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max Marks**	**Reduced Marks**	**Total**	**Final marks**
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	60
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Lab Exam	100	40	40	40
				Total	100

Reference Books:

1. David Flanagan, "Java Script: The Definitive Guide", O'Reilly Media, Inc, 7th Edition, 2020
2. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020
3. Marc Wandschneider, "Learning Node", Addison-Wesley Professional, 2nd Edition, 2016
4. https://www.geeksforgeeks.org/best-full-stack-developer-courses/

Course Code:	**24CA232**	**Course Title:**	Java Programming Laboratory
Credits:	**2**	**L – T – P**	**0-4-0**

Course objectives:

To impart knowledge on the

- To learn the basic concepts of platform independent object oriented language.
- To study the principles of inheritance and polymorphism to demonstrate how to design the abstract classes.
- Familiar with the skills for developing programs using exception handling techniques and multithreading.
- To study the concept of Graphical User Interface
- Able to design a framework using AWT Components.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

S.No	**Name of the Experiment**
1.	Write a java program using array and control structures.
2.	Implement the program using java classes.
3.	Demonstrate the java program using class and constructors.
4.	Write a java program using method overloading.
5.	Demonstrate the java program using inheritance. (Single, Multilevel)
6.	Write a java program using inheritance and show method overriding.
7.	Demonstrate the java program using interface.
8.	Write a java program using exception handling.

9.	Demonstrate the java program using package.
10.	Implement the java program using file operations.
11.	Write a java program using multithreading.
12.	Demonstrate the java program to implement operations on objects using Collections framework.

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Utilize the OOPs concepts and the syntax of arrays, class and object to develop programs.	K3
CO2	Make use of multithreading and polymorphism to develop programs.	K3
CO3	Apply Inheritance, Polymorphism and Exception handling methods to solve the real time complex problems.	K3
CO4	Use thread concept for synchronization to complete the task.	K3
CO5	To determine a java framework for real world problem using AWT and interface.	K4

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1	-	1	3
CO2	3	2	2	2	1	-	1	3
CO3	3	3	2	2	1	-	1	3
CO4	3	3	2	3	1	-	1	3
CO5	3	3	2	3	1	-	1	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max Marks**	**Reduced Marks**	**Total**	**Final marks**
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	60
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Lab Exam	100	40	40	40
				Total	100

Course Code:	24CA233	Course Title:	Mobile Application Development Laboratory
Credits:	2	L – T – P	0-0-4

Course objectives:

To impart knowledge on the

- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile applications.
- To understand the design issues in the development of mobile applications.
- To understand the development procedure for mobile applications.
- To develop mobile applications using various tools and platforms.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Lab experiment videos
3. Blended Mode of Learning
4. Project based Learning
5. Experiential Learning
6. NPTEL and Other Videos
7. Smart Class Room
8. Flipped Class

S.No	Name of the Experiment
1.	Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.
2.	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.
3.	Drawing graphics in android, creating animations with androids graphics API, Playing audio & video, Capturing media
4.	Write a program to create an activity with two buttons START and STOP. On pressing the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter
5.	Using Location Manager and Location Provider, working with maps, Working with GPS, Bluetooth and Wi-Fi, Integrating Google maps, services for push notification Google ads
6.	Develop a simple application with one Edit Text so that the user can write some text in it. Create a button called “Convert Text to Speech” that converts the user input text into voice.

7.	Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.

Hardware/Software Requirements

1	JDK, ECLIPSE IDE / equivalent, ANDROID STUDIO

Course outcomes:

On completion of the course, the student will have the ability to:

CO1	Understand the basics of mobile application development frameworks and tools	K2
CO2	Develop a UI for mobile applications	K4
CO3	Design mobile applications that manage memory dynamically	K4
CO4	Build applications based on mobile OS like Android.	K3
CO5	Build location based services	K3

COs and POs Mapping:

Course Outcomes	Programme Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	1	-	2	3
CO2	3	2	2	2	1	-	2	3
CO3	3	2	2	2	1	-	2	3
CO4	3	2	2	2	1	-	2	3
CO5	3	2	2	3	1	-	2	3

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max Marks**	**Reduced Marks**	**Total**	**Final marks**
Continuous Internal Examination (CIE) - Laboratory	Continuous Assessment	75	75	100	60
	Model Lab Exam	25	25		
End Semester Examination (ESE)	Lab Exam	100	40	40	40
				Total	100