



Vivekanand Education Society's College of Arts, Science & Commerce (Autonomous)

Syllabus

For the

Program: S.Y.B.Sc. Sem - III & IV (Revised)

CBCS Course: Computer Science

(Choice Based and Credit System with effect from the academic year 2023-24)

Preamble

The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the current industry needs in terms of skills sets demanded under new technological environment. It also endeavors to align the programme structure and course curriculum with student aspirations and corporate expectations. The proposed curriculum is more contextual, industry affable and suitable to cater the needs of society and nation in present day context.

The Core Subjects offers to develop strong theoretical foundations in Computer Science to build computational thinking, analytical, and problem solving skills. Principles of Operating Systems course provides an overview of computer operating systems, their functionalities, processes, and computing resource management. Linear Algebra course covers concepts crucial to many areas of computer science, such as graphics, image processing, cryptography, machine learning, computer vision, optimization, graph algorithms, quantum computation, computational biology, information retrieval and web search. Data Structures course provides an understanding of different types of data structures and how to use them per the requirements of a given application. Advanced Database Concepts course touches the touches security, recovery, and transaction aspects of database. Theory of Computation course helps to develop capabilities to design and develop formulations for computing models and identify its applications in diverse areas.

Computer Networks course include topics such as application layer protocols, Internet protocols, network interfaces, local and wide area networks, wireless networks, bridging and routing, among other current topics. Software Engineering course embodies an engineering approach to the development of software. It discusses the nature of software and software projects, software development models, software process maturity, project planning, management, and estimations along with topics on software testing and quality assurance. The course on IoT Technologies will definitely open future area as Embedded Engineer, involvement in IoT projects, Robotics and many more.

Skill Enhancement courses such as Java based Application Development, Web Technologies, Android Application Development and Advanced Application Development cater to present day needs of web and mobile based platforms and applications. These courses aims to produce skilled graduates with a creative mind-set who can recognize a computational problem either in IT industry or society, and develop effective solutions. The General Elective courses offers the students the option to explore disciplines of interest beyond the choices they make in Core and Discipline Specific Elective papers. The course on Creative Content Writing prepare students to comprehend, refine, and enhance their writing abilities and enter the industry with enhanced skill and substantial competence. The course on Green Technologies emphasizes the use of principles and practices of green services and regulatory standards for addressing the carbon issues and related concerns. The Research Methodology instills basic research skills for students who wish to pursue a research or an academic career. Management & Entrepreneurship course aims to focus on giving students the business management and innovation skills required to succeed in a startup.

We sincerely believe that any student taking this programme will get very strong foundation and exposure to basics, advanced and emerging trends of the subject.

Academic year 2023-2024

	Semester – III			
Course Code	Course Type	Course Title	Credits	Lectures/ Week
VESUCS301	Core Subject	Principles of Operating Systems	2	3
VESUCSP301	Core Subject Practical	Principles of Operating Systems —Practical	1	3
VESUCS302	Core Subj <mark>ect</mark>	Linear Algebra	2	3
VESUCSP302	Core Subject Practical	Linear Algebra – Practical	1	3
VESUCS303	Core Sub <mark>jec</mark> t	Data Structures	2	3
VESUCSP303	Core Sub <mark>jec</mark> t Practical	Data Structures – Practical	1	3
VESUCS304	Core Sub <mark>jec</mark> t	Advanced Database Concepts	2	3
VESUCSP304	Core Sub <mark>jec</mark> t Practical	Advanced Database Concepts – Practical	1	3
VESUCS305	Skill Enhancement Course (SEC)	Java based Application Development	2	3
VESUCSP305	Skill Enhancement Course (SEC) Practical	Java based Application Development – Practical	1	3
VESUCS306	Skill Enhancement Course (SEC) Practical	Web Technologies	2	3
VESUCSP306	Skill Enhancement Course (SEC) Practical	Web Technologies- Practical	1	3
VESUCS3071	Generic Elective	Creative Content Writing	2	3
VESUCS3072	Generic Elective	Green Technologies	2	3

^{*} Any one Generic Elective has to be selected by the student.

	Semester – IV			
Course Code	Course Type	Course Title	Credits	Lectures/ Week
VESUCS401	Core Subject	Theory of Computation	2	3
VESUCSP401	Core Subject Practical	Theory of Computation – Practical	1	3
VESUCS402	Core Subject	Computer Networks	2	3
VESUCSP402	Core Subject Practical	Computer Networks – Practical	1	3
VESUCS403	Core Subj <mark>ect</mark>	Software Engineering	2	3
VESUCSP403	Core Subj <mark>ect</mark> Practical	Software Engineering – Practical	1	3
VESUCS404	Core Subj <mark>ect</mark>	IoT Technologies	2	3
VESUCSP404	Core Subj <mark>ect</mark> Practical	IoT Technologies – Practical	1	3
VESUCS405	Core Subj <mark>ect</mark>	Android Application Development	2	3
VESUCSP405	Core Subject Practical	Android Application Development – Practical	1	3
VESUCS406	Skill Enhancement Course (SEC)	Advanced Application Development	2	3
VESUCSP406	Skill Enhancement Course (SEC) Practical	Advanced Application Development – Practical	1	3
VESUCS4071	Generic Elective*	Research Methodology	2	3
VESUCS4072	Generic Elective*	Management & Entrepreneurship	2	3

^{*} Any one Generic Elective has to be selected by the student.

Course Code	Course Title	Credits	Lectures / Week
VESUCS 301	Principles of Operating Systems	2	3

About the Course: The purpose of this course is to provide an overview of computer operating systems, their functionalities, processes, and computing resource management. In particular, the course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

Course Objectives:

- To learn basic concepts and structure of operating systems
- To learn about process and synchronization in operating system level
- To learn CPU scheduling algorithms
- To learn Memory and File system management

Learning Outcomes:

- Work with any type of operating system
- Handle threads, processes, process synchronization
- Implement CPU scheduling algorithms
- Understand the background role of memory management
- Design file system.

Unit	Topic	No. of lectures
I	Introduction to Operating-Systems: Definition of Operating System, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure Processes: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication Threads: Overview, Multicore Programming, Multithreading Models	15
II	Process Synchronization: General structure of a typical process, race condition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	15
III	Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation,	15

Paging, Structure of the Page Table

Virtual Memory: Background, Demand Paging, Copy-on-Write, Page
Replacement, Allocation of Frames, Thrashing

Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management

File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing

File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management

Textbook(s):

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley, 2021

Additional Reference(s):

1.Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill, 2017 2. Naresh Chauhan, Principles of Operating Systems, Oxford Press, 2014

2. Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCSP 301	Principles of Operating Systems – Practical	1	3
1	Process Communication: a. Write a program to give a solution to the producer—consumation of the producer—consumat		-
2	Threads: a. Write a program to work with a single thread. b. Write a program to work with multi threads. c. The Fibonacci sequence is the series of numbers 0, 1, 1, 2 can be expressed as: fib0 = 0, fib1 = 1, fibn = fibn-1 + fib Write a multithreaded program that generates the Fibonacci se	n-2.	Formally, it
3	Synchronization: a. Write a program to give a solution to the Bounded buffer program to give a solution to the readers—writers prob		
4	Write a program that implements FCFS scheduling algorithm.		

5	Write a program that implements (with no preemption) scheduling algorithm.
6	Write a program that implements RR scheduling algorithm.
7	Write a program that implements the banker's algorithm
8	Write a program that implements the FIFO page-replacement algorithm.
9	Write a program that implements the LRU page-replacement algorithm.
10	Write a program to design a File System.

Course Code	Course Title	Credits	Lectures / Week
VESUSC S302	Linear Algebra	2	3

Linear algebra, a branch of mathematics, provides concepts that are crucial to many areas of computer science, such as graphics, image processing, cryptography, machine learning, computer vision, optimization, graph algorithms, quantum computation, computational biology, information retrieval and web search. The course covers topics such as fields, vectors, matrices, eigenvalues and eigenvectors

Course Objectives:

- To offer the learner the relevant Linear Algebra concepts through Computer Science applications.
- To interpret existence and analyze the solution set of a system of linear equations.
- To formulate, solve, apply, and interpret properties of linear systems.
- To learn about the concept of linear independence of vectors over a field, and the dimension of a vector space.
- To interpret basic concepts of linear transformations, dimension, matrix representation of a linear transformation, and the change of coordinate matrix.

Learning Outcomes:

After successful completion of this course, students would be able to

• Appreciate the relevance and applications of Linear Algebra in the field of Computer Science.

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- Understand the concepts through program implementation.
- Instill a computational thinking while learning linear algebra.
- Express clear understanding of the concept of a solution to a system of equations.
- Find eigenvalues and corresponding eigenvectors for a square matrix.

Unit	Торіс	No. of lectures
Ι	Field: Introduction to complex numbers, complex numbers in Python, abstracting over fields, Playing with GF (2).	15
	Vectors: Vectors are functions, Vector addition, Scalar-vector multiplication, combining vector addition and scalar multiplication, Dictionary-based representations of vectors, Dot-product, Solving a triangular system of linear equations, Support Vector Machine – Introduction, Mechanism.	
	The Vector Space: Linear combination, Span, The geometry of sets of vectors, Vector spaces, Linear systems, homogeneous and otherwise	
II	Matrix: Matrices as vectors, Column space and row space, Matrix-vector and vector-matrix multiplication in terms of linear combinations, Matrix-vector multiplication in terms of dot-products, Null space, Computing sparse matrix-vector product, Linear functions, Matrix-matrix multiplication, Inner product and outer product, From function inverse to matrix inverse Basis: Coordinate systems, two greedy algorithms for finding a set of generators, Linear dependence, Basis, Unique representation, Change of basis, first look, Computational problems involving finding a basis Dimension: Dimension and rank, Direct sum, Dimension and linear functions, The annihilator Gaussian elimination: Echelon form, Gaussian elimination over GF(2), Solving a matrix-vector equation using Gaussian elimination.	15
III	Inner Product: The inner product for vectors over the reals, Orthogonality.	15
	Orthogonalization: Projection orthogonal to multiple vectors, projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, orthogonal complement.	
	Eigenvalues and Eigenvectors: Characteristic Polynomials of degree 2 and 3, Eigenvalues and eigenvectors, Properties of eigenvalues and eigenvectors, Cayley–Hamilton Theorem, Minimal Polynomial. Coordinate representation in terms of eigenvectors, The Internet worm, Markov Chains, Google Page Rank algorithm.	

Textbooks:

- 1. Coding the Matrix Linear Algebra through Applications to Computer Science, First Edition, Philip N. Klein, Newtonian Press 2013
- 2. Schaum's Outline of Linear Algebra, Sixth Edition by Seymour Lipschutz, Marc Lipson, McGraw Hill 2017

Additional References:

- 1. Linear Algebra and Probability for Computer Science Applications, First Edition, Ernest Davis, A K Peters/CRC Press, 2012.
- 2. Linear Algebra and Its Applications, Gilbert Strang, Cengage Learning, 4th Edition, 2007
- 3. Linear Algebra and Its Applications, David C Lay, Pearson Education India; 3rd Edition, 2002
- 4. Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.
- 5. Computer Networking With Internet Protocols and Technology, William Stallings, Pearson Education India, 2013.

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCSP 302	Linear Algebra – Practical	1	3
1	 Write a program which demonstrates the following: Addition of two complex numbers Displaying the conjugate of a complex number Plotting a set of complex numbers Creating a new plot by rotating the given number by a degrand also by scaling by a number a = 1/2, a = 1/3, a = 2 etc. 	ee 90, 180,	270 degrees
2	 Write a program to do the following: Enter a vector u as a n-list Enter another vector v as a n-list Find the vector au + bv for different values of a and b Find the dot product of u and v 		
3	Vector Applications: Classify given data using support vector machines (SVM)		
4	Basic Matrix Operations: • Matrix Addition, Subtraction, Multiplication • Check if matrix is invertible. • If yes then find Inverse		
5	Write a program to convert a matrix into its row echelon form. (Write a program to find rank of a matrix.	Order 2).	
6	Basic Matrix Application – I Representation of Image in Matrix Format and Image Transform	nations	
7	Basic Matrix Application – II Perform Image addition, multiplication and subtraction		
8	 Write a program to do the following: Enter a vector b and find the projection of b orthogonal to a Find the projection of b orthogonal to a set of given vectors 	-	or u.
9	Write a program to calculate eigenvalue and eigenvector (Order	2 and 3)	
10	Implement Google's Page rank algorithm.		

Course Code	Course Title	Credits	Lectures / Week
VESUSC S303	Data Structures	2	3

The course focuses to give an understanding of different types of data structures that can be used to store data in memory, how to create-manipulate them and to use them in the best possible manner as per the requirements of the application.

Course Objectives:

- To introduce data abstraction and data representation in memory
- To describe, design and use of elementary data structures such as stack, queue, linked list, tree and graph
- How and why different data structures are used for different types of problems.

Learning Outcomes:

- Create different types of data structures.
- Understand which data structure to be used based on the type of the problem.
- Apply combined knowledge of algorithms and data structures to write highly effective programs in various domains.

Unit	Topic	No. of lectures
I	Abstract Data structures& their ADT Type: Different Data Types, different types of data classifications, Introduction to ADT, Creating user-specific	
	Linked Structures: ADT for linked list, Advantages & Disadvantages, Singly Linked List-Traversing, Searching, Prepending and Removing Nodes, applications of linked list like polynomial equation Stacks: Stack ADT for Stack, Advantages & Disadvantages, Applications of stack like balanced delimiter, prefix to postfix notation	15
	Queues: Queue ADT, Advantages & Disadvantages, linked representations. Circu lar Queue operations, Dequeues, applications of queue like job scheduling queues	
II	Doubly Linked list: ADT of doubly linked list, Advantages & Disadvantages, Insertion and deletion of nodes at various positions	15
	Trees: ADT for Tree Structure. Advantages & disadvantages, Binary Tree-Properties, Implementation and Traversals, Binary Search Tree, Balanced BST, Threaded Binary Trees, AVL Trees, Applications of Tree like Huffman Coding, Priority Queues & Heaps: Priority Queue, Priority Queue ADT,	

	Advantages and Disadvantages, Applications, Heaps, types of heaps, Heapifying the element,	
III	Graph: Introduction, Graph ADT, Advantages and Disadvantages, Graph Representation using adjacency matrix and adjacency list, Graph operations like insertion and deletion of nodes, Graph Traversals using BFS & DFS, Applications of Graphs like shortest path algorithms, Hashing: Hash Table ADT, Advantages & Disadvantages, Concept of hashing, hash table, hash functions, collision, collision avoidance techniques, Applications of hashing	15

Textbooks:

- 1. Introduction to Algorithm, Thomas H Cormen, PHI
- 2. Data Structures And Algorithms Made Easy, Narasimha Karumanchi, 2021

Additional References:

1. Fundamentals of Computer Algorithms, Sartaj Sahni and Sanguthevar Rajasekaran Ellis Horowitz, Universities Press, 2018

2. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Wiley, 2016

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCS P303	Data Structures – Practical	1	3
1	Write a program to implement Abstract Data Types (ADT)		
2	Write a program to implement Singly Linked list with insertion, deletion, traversal operations		
3	Write a program to implement Doubly Linked list with insertion, deletion, traversal operations		
4	Write a program to implement Stack with insertion, deletion, traversal operations		
5	Write a program to implement Queue with insertion, deletion	n, traversa	l operations
6	Write a program to implement Priority Queue with insertion, deletion, traversal operations		

7	Write a program to implement Binary Tree with insertion, deletion, traversal operations
8	Write a program to implement Huffman Coding
9	Write a program to implement Graph with insertion, deletion, traversal operations
10	Write a program to implement Travelling Salesman Problem
11	Write a program to create basic Hash Table for insertion, deletion, traversal operations (assume that there are no collisions)
12	Write a program to create hash table to handle collisions using overflow chaining

Course Code	Course Title	Credits	Lectures / Week
VESUSC 304	Advanced Database Concepts	2	3

This course deals with the basic understanding of programming in database. It touches security, recovery, and transaction aspects of database. The course will increase the confidence among the learner while dealing with database.

Course Objectives:

• To develop understanding of concepts and techniques for data management and learn

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- about widely used systems for implementation and usage.
- To develop understanding of Transaction management and crash recovery.
- To develop concepts of programming concepts of database.

Learning Outcomes

- After successful completion of this course, students would be able to
- Master concepts of stored procedure, functions, cursors and triggers and its use.
- Learn about using PL/SQL for data management.
- Use efficiently Collections and records.
- Understand concepts and implementations of transaction management and crash recovery.

Unit	Торіс	No. of lectures
		rectares

I	Overview of PL/SQL: Advantages of PL/SQL, Main Features of PL/SQL, Architecture of PL/SQL Fundamentals of PL/SQL: Character Sets, Lexical Units, Declarations, References to Identifiers, Scope and Visibility of Identifiers, Assigning Values to Variables, Expressions, Error-Reporting Functions, Data Types. Control Statements: Conditional Selection Statements, LOOP Statements, Sequential Control Statements, GOTO, and NULL Statements. Sequences: creating sequences, referencing, altering, and dropping a sequence. Stored Procedures and Functions: Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures. Functions: Calling function and recursion function.	15
II	Collections and Records: Associative Arrays, Varrays (Variable-Size Arrays), Nested Tables, Collection Constructors, Assigning Values to Collection Variables, Multidimensional Collections, Collection Comparisons, Collection Methods, Collection Types Defined in Package Specifications, Record Variables, Assigning Values to Record Variables. Error Handling: Compile-Time Warnings, Overview of Exception Handling, Internally Defined Exceptions, Predefined Exceptions, User-Defined Exceptions, Redeclared Predefined Exceptions, Raising Exceptions Explicitly, Exception Propagation, Unhandled Exceptions. Cursors: Overview of Cursor, Types of cursors, Invalid cursor Exception. Static and Dynamic SQL: Static SQL: Description of Static SQL, Cursors Overview, Processing Query Result Sets, Cursor Variables, CURSOR Expressions, Transaction Processing and Control, Autonomous Transactions. Dynamic SQL: Native Dynamic SQL, DBMS_SQL Package, SQL Injection.	15
III	 Triggers: Overview of Triggers, implementing triggers – creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting, andmodifying triggers, and enforcing data integrity through triggers. Packages: Overview of a Package. Need of Packages, Package Specification, Package Body, Package Instantiation and Initialization. Transaction Management: ACID Properties, Serializability, 	15

Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem, Read-Write Locks, Deadlocks Handling, Two Phase Locking protocol.

Crash Recovery: ARIES algorithm. The log-based recovery, recovery related structures like transaction and dirty page table, Write-ahead log protocol, check points, recovery from a system crash, Redo and Undo phases

TextBooks:

- 1. Mastering PL/SQL Through Illustrations: From Learning Fundamentals to Developing Efficient PL/SQL Blocks, Dr. B. Chandra, BPB Publication, 2020
- 2. Oracle Pl/Sql Training Guide., Training guide, BPB Publications, 2016
- 3. Raghu Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill,3rd Edition, 2014
- 4. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 6th Edition

2019

Additional References:

- 1. Ivan Bayross, "SQL, PL/SQL -The Programming language of Oracle", B.P.B. Publications 2009
- 2. Ramez Elmasri & Shamkant B.Navathe, Fundamentals of Database Systems, Pearson Education, 2008

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCSP304	Advance <mark>d Database Concepts – Practical</mark>	1	3
1	Writing PL/SQL Blocks with basic programming by including following: a. Sequential Statements b. unconstrained loop	ng constru	cts
2	Sequences: a. Creating simple Sequences with WITH, INCREMENT BY, MAXVALUE, MINVALUE, CYCLE 1 NOCACHE, ORDER NOORECER. b. Creating and using Sequences for tab	NOCYCL	

3	Writing PL/SQL Blocks with basic programming constructs by including following: a. IfthenElse, IFELSIFELSE END IF b. Case statement	
4	Writing PL/SQL Blocks with basic programming constructs for following Iterative Structure: a. While-loop Statements b. For-loop Statements.	
5	Writing PL/SQL Blocks with basic programming constructs by including a GoTO to jump out of a loop and NULL as a statement inside IF.	
6	Writing Procedures in PL/SQL Block a. Create an empty procedure, replace a procedure and call procedure b. Create a stored procedure and call it c. Define procedure to insert data d. A forward declaration of procedure	
7	Writing Functions in PL/SQL Block. a. Define and call a function b. Define and use function in select clause, c. Call function in dbms_output.put_line d. Recursive function e. Count Employee from a function and return value back f. Call function and store the return value to a variable	
8	Creating and working with Insert/Update/Delete Trigger using Before/After clause.	
9	W <mark>rite an Implicit and explicit cursor to c</mark> omplete the task.	
10	Create packages and use it in SQL black to complete the task.	
11	Write a SQL block to handle exception by writing: a. Predefined Exceptions, b. User-Defined Exceptions, c. Redeclared Predefined Exceptions,	
12	Create nested tables and work with nested tables.	

Course Code	Course Title	Credits	Lectures / Week
VESUCS3 05	Java based Application Development	2	3

The objective of this course is to teach the learner how to use Object Oriented paradigm to develop code

and understand the concepts of Core Java and explore advanced topic of Java programming for solving problems.

Course Objectives:

- To provide insight into java based applications using OOP concepts.
- To provide understanding of developing GUI based desktop applications in java.
- To provide knowledge of web based applications through servlet and jsp.
- To provide understanding and implementation of basic JSON

Learning Outcomes:

- Design basic application in java using Graphical User Interface.
- The learner will be able to develop applications using swings
- The learner will be able to develop web based applications using servlet and jsp
- The learner will be able to connect databases with java through
- The learner will be able to perform programs using JSON objects

Unit	Topic	No. of lectures
I	Introduction: History, Features of Java, Java Development Kit, Java Application Programming Interface, Java Virtual Machine Java Program Structure, Java Tokens. OOPS: Introduction, Class, Object, Static Keywords, Constructors, this keyword, Inheritance, Inner class, Anonymous Inner class, super keyword, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces Packages: Introduction to predefined packages, User Defined Packages, Access specifiers	15

	Exception Handling: Introduction, Pre-Defined Exceptions, try-catch-finally, throws, throw, User Defined Exceptions Multithreading: Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, wait() notify() notify all() methods	
II	JDBC: Introduction, JDBC Architecture, JDBC Drivers, JDBC Connectivity Model, java.sql package, Using Statement, PreparedStatement, CallableStatement, ResultSet, Scrollable and Updatable ResultSet, Navigating and manipulating data, ResultSetMetaData, Managing	15
	Transactions in JDBC Introduction to JFC and Swing- Features of the Java Foundation Classes, Swing API Components, JComponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, Check Boxes, Menus, Toolbars, Implementing Action interface, Pane, JScrollPane, Desktop pane, Scrollbars, Lists and Combo Boxes, Text-Entry Components, Colors and File Choosers, Tables Event Handling: Delegation Event Model, Events, Event classes, Event	
III	listener interfaces, Using delegation event model, adapter classes. Servlets: Introduction, Servlet Life Cycle, Types of Servlet, Servlet Configuration with Deployment Descriptor, Working with ServletContext and ServletConfig Object, Attributes in Servlet, Response and Redirection using Request Dispacher and using sendRedirect Method Session Tracking: using Cookies, HTTPSession, Hidden Form Fields and URL Rewriting Java Server Pages (JSP): Introduction to JSP, Comparison with Servlet, JSP Architecture, JSP Life Cycle, JSP Scripting Elements, JSP Directives, JSP Action, JSP Implicit Objects	15
	JSON: Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java	

Textbooks:

- 1. 1. Herbert Schildt, Java The Complete Reference, Eleventh Edition, McGraw-Hill Education, 2020
- 2. 2. Bryan Basham, Kathy Sierra, Bert Bates, Head First Servlets and JSP, O'reilly (SPD), 2018
- 3. 3. Cay S. Horstmann, Gary Cornell, Core JavaTM 2: Volume II–Advanced Features Prentice Hall PTR, 2004
- 4. Ivan Bayross, Web Enabled Commercial Applications Development Using Java 2, BPB Publications
- 5. Java XML and JSON: Document Processing for Java SE by Jeff Friesen January 2019, Apress

Additional References:

1. E. Balagurusamy, Programming with Java- A Primer, Tata McGraw-Hill Education India, 2014

- 2. Programming in JAVA, 2nd Ed, Sachin Malhotra & Saurabh Choudhary, Oxford Press, 2018
- 3. Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology (SPD)
- 4. Eric Jendrock, Jennifer Ball, D Carson and others, The Java EE 5 Tutorial, Pearson Education
- 5. The Java Tutorials: http://docs.oracle.com/javase/tutorial/
- 6. Java Parsing Collection XML JSON: Map List XML JSON Transform by Yang Hu, 2019

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCS P305	Java based Ap <mark>plic</mark> ation Development – Practical	1	3
1	a. Write a program to create a class and implent concepts of Constructor Overloading, Method Overloading, Static methods b. Write a program to implement the concept of Inheritance and Method Overriding		
2	a. Write a program to implement the concepts of classes and methods b. Write a program to implement the concept of inte		t
3	Write a program to define user defined exceptions a the requirements	nd raise th	em as per
4	Write a program using various swing components do to accept a student's resume. (Design form)	esign Java	application
5	a. Write a JDBC program that displays the data of a given table b. Write a JDBC program to return the data of a specified record from a given table c. Write a JDBC program to insert / update / delete records into a given table		
6	 a. Construct a simple calculator using the JAVA Swings with minimum functionality. b. Construct a GUI using JAVA Swings to accept details of a record of a given table and submit it to the database using JDBC technology on the click of a button. 		

7	 a. Write a Servlet that accepts a User Name from a HTML form and stores it as a cookie. Write another Servlet that returns the value of this cookie and displays it. b. Write a Servlet that displays the names and values of the cookie stored on the client. c. Write a Servlet that accepts a User Name from a HTML form and stores it as a session variable. Write another Servlet that returns the value of this session variable and displays it. 	
8	a. Write a registration Servlet that accepts the data for a given table and stores it in the database.b. Write a Servlet that displays all the records of a table.	
9	a.Write a registration JSP that accept the data for a given table and stores it in the database.e	
10	a. Write a JSP that displays all the records of a table	

Course Code	Course Title	Credits	Lectures /Week
VESUCS 306	Web Technologies	2	3

The course provides an insight into emerging technologies to design and develop state of the art web applications using client-side scripting, server-side scripting, and database connectivity

Course Objectives:

- To understand the concepts of Hyper Text Markup Language and Cascading Style
- To learn JavaScript for creating dynamic websites.
- To learn various operations performed on data among web applications using XML · To learn Server-Side Programming using PHP

Learning Outcomes:

- After successful completion of this course, students would be able to
- Design valid, well-formed, scalable, and meaningful pages using emerging technologies.
 Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites
- Develop and implement client-side and server-side scripting language programs.
- Develop and implement Database Driven Websites.
- Design and apply XML to create a markup language for data and document centric applications.

Unit	Торіс	No. of lectures

Organ Image HTM	L5: Fundamental Elements of HTML, Formatting Text in HTML, tizing Text in HTML, Links and URLs in HTML, Tables in HTML, es on a Web Page, Image Formats, Image Maps, Colors, FORMs in L, Interactive Elements, Working with Multimedia - Audio and Video ormats, HTML elements for inserting Audio / Video on a web page Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an	15
HTM: prope	L Document, CSS properties to work with background of a Page, CSS rties to work with Fonts and Text Styles, CSS properties for oning an element.	
Funda Stater Defin Funct Brows Cooki XML XML XSLT xsl:im	Script: Using JavaScript in an HTML Document, Programming amentals of JavaScript – Variables, Operators, Control Flow ments, Popup Boxes, Functions – Defining and Invoking a Function, ing Function arguments, defining a return Statement, Calling ions with Timer, JavaScript Objects - String, RegExp, Math, Date, ser Objects - Window, Navigator, History, Location, Document, es, Document Object Model, Form Validation using JavaScript: Comparing XML with HTML, Advantages and Disadvantages of Structure of an XML Document, XML Entity References, DTD, EXSLT Elements and Attributes - xsl:template, xsl:apply-templates, aport, xsl:call-template, xsl:include, xsl:element, xsl:attribute, cribute-set, xsl:value-of	15
reques PHP: and E and H	A: AJAX Web Application Model, How AJAX Works, HttpRequest Object – Properties and Methods, handling asynchronous sts using AJAX Variables and Operators, Program Flow, Arrays, working with Files Directories, working with Databases, Working with Cookies, Sessions leaders duction to jQuery: Fundamentals, Selectors, methods to access L attributes, methods for traversing, manipulators, events, effects.	15

Textbooks:

- 1 HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Press, 2016
- 2. Web Programming and Interactive Technologies, scriptDemics, StarEdu Solutions India, 2018
- 3. PHP: A Beginners Guide, Vikram Vaswani, TMH

Additional References:

1. HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY, 2011 2. Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O'Reilly, 2018 3. PHP, MySQL, JavaScript & HTML5 All-in-one for Dummies, Steve Suehring, Janet Valade Wiley, 2018

Course Code	Course Title	Credits	Lectures /Week
VESUCSP30	Web Technologies – Practical	1	3
1	Design a webpage that makes use of a. Document Structure Tags b. Various Text Formatting Tags c. List Tags d. Image and Image Maps		
2	Design a webpage that makes use of a. Table tags b. Form Tags (forms with various form elements) c. Navigation across multiple pages d. Embedded Multimedia elements		
3	Design a webpage that make use of Cascading Style Sheets with a. CSS properties to change the background of a Page b. CSS properties to change Fonts and Text Styles c. CSS properties for positioning an element	s with	
4	Write JavaScript code for a. Performing various mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number b. Validating the various Form Elements		
5	Write JavaScript code for a. Demonstrating different JavaScript Objects such as String, RegExp, Math, Date b. Demonstrating different JavaScript Objects such as Window, Navigator, History, Location, Document, c. Storing and Retrieving Cookies		-
6	Create a XML file with Internal / External DTD and display it u a. CSS b. XSL	e with Internal / External DTD and display it using	
7	Design a webpage to handle asynchronous requests using AJAX on a. Mouseover b. button click Write PHP scripts for a. Retrieving data from HTML forms b. Performing certain mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number c. Working with Arrays d. Working with Files (Reading / Writing)		
8			
9	Write PHP scripts for a. Working with Databases (Storing Records / Reprieving Records and Display them) b. Storing and Retrieving Cookies c. Storing and Retrieving Sessions		
10	Design a webpage with some jQuery animation effects.		

Course Code	Course Title	Credits	Lectures / Week
VESUSC S3071	Creative Content Writing	2	3

With the advent of the internet, content writing has become a very lucrative and promising career. The course is designed to equip students to comprehend, refine, and enhance their writing abilities so that they may become proficient web content developers. The course aims to prepare students to enter the industry with enhanced skill and substantial competence.

Course Objectives:

- To introduce students to the concepts of content writing.
- To connect them with various writing and editing styles and techniques.
- To help them develop their creative abilities.
- To improve the learners' employability

Learning Outcomes:

- After successful completion of this course, students would be able to
- Understand the fundamentals of content creation for Blog, Website etc.
- Acquire the ability to write and edit in a variety of styles and procedures
- To develop the creative abilities.
- To acquire essential language skills for editors.

Unit	Topic	No. of lectures
I	Basics of Content writing: Introduction to Content Writing, Various forms of contents writing, Process of content writing, Types of Contents, Role of Content Writer	15
	Process of Content Writing: Research and planning, Understanding audience and purpose, style of writing, writing & storytelling techniques, content editing & proof-reading, Plagiarism, Publishing, content marketing and promotion, SEO for content, Knowing latest trends & technologies	
II	Language Skills - Learning Tone in Writing and Its Types, Comprehending style in writing and its Types,Common Grammatical Errors, Spelling Styles, Using punctuation marks, Building Vocabulary Working with Images & knowing other media forms like motion & sound	15

	Infographics: What Are Infographics?, TheScience of Visualization, Creating Infographics- Purpose, The Art of Observation, Processing Your Ideas, Designing your Infographics, Publishing your Infographics. Writing Articles, Newsletters, Reports, Proposals, Brochures, Resume, Book Review,	
III	Writing for Blogs, Emails, Landing Pages, Social Media Posts on Instagram/LinkedIn, E-Learning Courses, Popular Content writing tools Ethical and Legal aspects of content writing: Legal English & Legal Writing, IPR Laws, Copywriting, Plagiarism laws	15

TextBooks:

- 1. Content Writing Handbook, Author: Kounal Gupta, 2020, Henry Harvin.
- 2. Feldar, Lynda. Writing for the Web: Creating Compelling Web Content Using Words, Pictures, and Sound. New Riders, CA, USA, 2011

Additional References:

- 1. Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content Paperback Ann Handley Pan Macmillan India 2016
- 2. The Power of Infographics: Using Pictures to Communicate and Connect With Your Audiences Paperback 15 June 2012 Mark Smiciklas
- 3. Law Relating to Intellectual Property Rights Book by V. K. Ahuja, 2017

Web Resources:

- 1. https://www.locationrebel.com/b2b-writing/
- 2. https://www.mindler.com/blog/how-to-become-a-content-writer-in-india/
- 3. https://study.com/articles/What is a Content Writer.html
- 4.https://www.mondaq.com/in<mark>dia/contracts-and-commercial-law/44</mark>5620/legal-contractsagreeme nts-drafting-and-legal-vetting
 - 5. https://www.crazyegg.com/blog/copywriting/

Course Code	Course Title	Credits	Lectures / Week
VESUSC S3072	Green Technologies	2	3

This course focuses on familiarizing learners with the need and relevance of Green Computing, Technology, and its practices for creating a sustainable work and production environment for the IT-enabled sector. The course emphasizes the use of principles and practices of green services and regulatory standards for addressing the carbon issues and related concerns.

Course Objectives

- Know about Green IT Fundamentals: Business, IT, and the Environment
- Green IT Strategies and Significance of Green IT Strategies
- Green Enterprise Architecture and Green Information Systems
- Sociocultural Aspects of Green IT and Green Compliance

Learning Outcomes

- Explain drivers and dimensions of change for Green Technology
- Appreciate Virtualization; smart meters and optimization in achieving green IT
- Gain knowledge about green assets, green processes, and green enterprise architecture
- ISO 14001 and related standards for Audit for Green Compliance

Unit	Торіс	No. of lectures
I	Green IT Fundamentals: Information Technology and Environment, Business, Environment, and Green Enterprise Characteristics, Green Vision and Strategic Points, Green Value, Green IT Opportunity, Challenges of a Carbon Economy, Environmental Intelligence, Envisioning the Green Future Green IT Strategies: Green strategic alignment, Green IT Drivers-Cost, Regulatory and Legal, Sociocultural and Political, Business ecosystem, New market opportunities, Green IT Business Dimensions, KPIs in Green Strategies Environmentally Responsible Business: Developing ERBS, Policies, Practices, and Metrics, Mobility and Environment, Green It Metrics and Measurements, Green IT Readiness and CMM, Context Sensitivity and Automation in Green IT Measures Green Assets: Introduction, Green Assets, Green IT Hardware, Green DataCenters and ICT Equipment, Server and Data Strategy	15

II	Green Assets and emerging Trends: Data Servers Optimization and Virtualization, Physical Data Server Organization and Cooling, Cloud Computing and Data Centers, Networking and Communications Infrastructure, End-User Devices, Smart Meters in Real-Time, Managing Devices for Central Green Services, Devices and Organizational Boundaries for Measurements, Mobile Devices, and Sustainability	15
	Green Business Process Management: Introduction, Green Reengineering, Green Process, Green BPM and standards, Green Business Analysis, Green Requirements Modelling, Green IT Governance, Green Business Process and Applications, QoS, Achieving green BPM, Green Mobile Business Process, Digital Library Green Enterprise Architecture: Green IT and organizational Systems,	

	Aspects of Green Solutions Architecture, Contents and Integration with Service-Oriented Architecture, Green Supply Chain Management, Green Portals in Green Enterprise Architecture, Environmental Intelligence	
IIII	Green Information Systems(GIS): Design and Development Models:Describing GIS, GIS Requirements Sociocultural Aspects of Green IT: Green IT's Social Impact, Learning Organization, Green Social Stakeholders, Role-Based View of Green IT, Green User Practices, Attitude and Subjectivity in Green IT, Green IT Ethics and Code of Conduct, Privacy and Security of Green Information, Green Washing, Communications in Green Transformation Projects, Green HR and Changing Organizational Structures, Green-Collar Workers: Roles and Skill Sets, Green Virtual Communities Green Compliance: Protocols, Standards, and Audits: Protocols and Standards, ISO 14000-2004 Standard, Various initiatives by stakeholders, Green Audits and types, Audit and use of Carbon emission management software Emerging Carbon Issues: Technologies and Future: Future Carbon Landscape, Green ICT and Technology Trends, Cloud Computing, Nanotechnology, Quantum computing, Renewable energies, eco-design, Collaborative environmental intelligence	15

TextBooks:

- 1. Green IT Strategies and Applications Using Environmental Intelligence, Bhuvan Unhelkar, CRC Press, 2016
- 2. Green Information and Communication Systems for a Sustainable Future, Rajshree Srivastava, Sandeep Kautish, Rajeev Tiwari. CRC Press, 2020

Additional References:

- 1. Emerging Green Technologies, Matthew N. O. Sadiku, Taylor and Francis (CRC Press), 2022
- 2. Sustainability Awareness and Green Information Technologies, Tomayess Issa, Springer, 2021
- 3. Environmental Sustainability Role of Green Technologies, P. Thangavel, and G. Sridevi, Springer, 2016

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Semester IV

Course Code	Course Title	Credits	Lectures / Week
VESUSC S401	Theory of Computation	2	3

About the Course:

The course provides a comprehensive insight into theory of computation by understanding grammar, languages and other elements of modern language design. It also helps to develop capabilities to design and develop formulations for computing models and identify its applications in diverse areas.

Course Objectives:

- To give an overview of the theoretical foundations of computer science from the perspective
- of formal languages
- To illustrate finite state machines to solve problems in computing
- To explain the hierarchy of problems arising in the computer sciences.
- To familiarize Regular grammars, context frees grammar.

Learning Outcomes:

- Understand Grammar and Languages
- Learn about Automata theory and its application in Language Design
- Learn about Turing Machines and Pushdown Automata
- Understand Linear Bound Automata and its applications

Unit	Торіс	No. of lectures
I	Automata Theory: Defining Automaton, Finite Automaton, Transitions and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NDFA equivalence, Mealy and Moore Machines, Minimizing Automata.	
	Formal Languages : Defining Grammar, Derivations, Languages generated by Grammar, Chomsky Classification of Grammar and Languages, Recursive Enumerable Sets, Operations on Languages, Languages and Automata	
II	Regular Sets and Regular Grammar: Regular Grammar, Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma and its Applications, Closure Properties, Regular Sets and Regular Grammar	15
	Context Free Languages: Context-free Languages, Derivation Tree, Ambiguity of Grammar, CFG simplification, Normal Forms, Pumping Lemma for CFG	
	Pushdown Automata: Definitions, Acceptance by PDA, PDA and CFG	

Unit 3	Linear Bound Automata: The Linear Bound Automata Model, Linear Bound Automata and Languages.	15
	Turing Machines: Turing Machine Definition, Representations, Acceptability by Turing Machines, Designing and Description of Turing Machines, Turing Machine Construction, Variants of Turing Machine.	
	Undecidability: The Church-Turing thesis, Universal Turing Machine, Halting Problem, Introduction to Unsolvable Problems	

TextBooks:

- 1. Theory of Computer Science, K. L. P Mishra, Chandrasekharan, PHI, 3rd Edition 2019
- 2. Introduction to Computer Theory, Daniel Cohen, Wiley, 2nd Edition, 2007
- 3. Introductory Theory of Computer Science, E.V. Krishnamurthy, Affiliated East-West Press, 2009

Additional References:

- 1. Theory of Computation, Kavi Mahesh, Wiley India, 2018
- 2. Elements of The Theory of Computation, Lewis, Papadimitriou, PHI, 2015
- 3. Introduction to Languages and the Theory of Computation, John E Martin, McGraw-Hill Education, 2010
- 4. Introduction to Theory of Computation, Michel Sipser, Thomson
- 5. Introduction to Automata Theory, Languages and Computation, John E Hopcroft, Pearson Education, 2014

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCS P401	Theory of Com <mark>put</mark> ation – <mark>Tutorials</mark>	1	3
1	Problems on DFA and NDFA equivalence		
2	Problems on Mealy & Moore Machines		
3	Problems on generating languages for given simple grammar		
4	Problems on drawing transition state diagrams for Regular Expressions		
5	Problems on Regular Sets and Regular Grammar		
6	Problems using Arden's Theorem		
7	Problems to simplify CFG		
8	Problems to convert CFG into normal forms.		
9	Problems on working with Turing Machines		
10	Problems on Linear Bound Automata/Universal Turing Machine		

Course Code	Course Title	Credits	Lectures / Week
VESUCS 402	Computer Networks	2	3

This course introduces computer networks, with a special focus on the Internet architecture and protocols. The course includes topics such as network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, web, email and other application layer protocols.

Course Objectives:

- To Understand Basic Concepts of Networking.
- To Understand Working of Network Layer Architecture.
- To Learn Practical Implementation of Basic Routing Algorithms.
- To Learn Different Networking Protocols.

Learning Outcomes:

- Learn basic networking concepts and layered architecture.
- Understand the concepts of networking, which are important for them to be known as a networking professionals'.

Unit	Торіс	No. of lectures
I	Introduction: Networking standards and Administrations, networks, network types – LAN, MAN, WAN. Network Models: The OSI model, TCP/IP protocol suite, Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital transmissions: Digital-to-digital conversion, analog-to-digital conversion, transmission modes Analog transmissions: digital-to-analog conversion, analog-to-analog conversion. Bandwidth Utilization – Multiplexing and Spectrum spreading: Multiplexing, Spread Spectrum Transmission media: Guided Media, Unguided Media Switching: Introduction, Circuit Switched Network, Packet Switching.	15

II	Introduction to Data Link Layer: Link layer addressing, Data Link LayerDesign Issues.	15
	Error detection and correction: -Block coding, cyclic codes, checksum,forward error correction, error correcting codes, error detecting codes.	
	Data Link Control : DLC services, data link layer protocols, HDLC, Point-to-point protocol.	
	Media Access Control: Random access, controlled access, channelization,	
	Wired LANs – Ethernet: Ethernet Protocol, standard Ethernet, fast Ethernet, gigabit Ethernet, 10 gigabit Ethernet	
	Wired Network: Telephone Network, Cable Network, SONET, ATM	
	Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks.	
	Introduction to Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets,	
	Network Layer Protocols: Internet Protocol, ICMPv4, Mobile IP	
III	Unicast Routing: Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.	15
	Introduction to the Transport Layer: Transport Layer Protocol, User Datagram Protocol, Transmission Control Protocol, SCTP.	
	Introduction to Application Layer: Client Server Programming, Iterative Programming.	
	Standard Client-Server Protocols: WWW, HTTP, FTP, Electronic Mail, TELNET, Secure Cell, DNS, SNMP	
	Quality of Service: Data Flow to improve QoS, Flow control to improve QoS, Integrated service (Intserv), Differentiated Service(Diffserv).	
Textbooks:		

- 1.Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, TMH, 2018.
- Computer Network, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson Education, 2018.

Additional References:

- 1. Computer Network, Bhushan Trivedi, Oxford University Press, 2016
- 2. Data and Computer Communication, William Stallings, PHI, 2017

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCS 402	Computer Networks – Practical	1	3
1	Using, linux-terminal or Windows-cmd, execute following and note the output: ping, traceroute, netstat, arp, ipconfig, NSLookUp,pathping, SystemInfo		
2	Using Packet Tracer, create a basic network of two computers appropriate network wire. Use Static IP address allocation a connectivity	_	
3	Using Packet Tracer, create a basic network of One server and two computers using appropriate network wire. Use Dynamic IP address allocation and show connectivity		
4	Using Packet Tracer, create a basic network of One server and two computers and two mobile / movable devices using appropriate network wire. Show connectivity		
5	Using Packet Tracer, create a network with three routers with RIPv1 and each router associated network will have minimum three PC. Show Connectivity		
6	Using Packet Tracer, create a network with three routers with RIPv2 and each router associated network will have minimum three PC. Show Connectivity		
7	Using Packet Tracer, create a network with three routers with OSPF and each router associated network will have minimum three PC. Show Connectivity		
8	Using Packet Tracer, create a network with three routers with BGP and each router associated network will have minimum three PC. Show Connectivity		
9	Using Packet Tracer, create a wireless network of multiple PCs using appropriate access point.		
10	Using Wireshark, network analyzer, set the filter for ICMP, TCP, HTTP, UDP, FTP and perform respective protocol transactions to show/prove that the network analyzer is working		

Course Code	Course Title	Credits	Lectures / Week
VESCSUS 403	Software Engineering and Quality Assurance	2	3

About the Course: This course covers a collection of methods which embody an "engineering" approach to the development of software. It discusses the nature of software and software projects, software development models, software process maturity, project planning, management, and estimations. It also underlines the topics on software testing and quality assurance.

Course Objectives:

- To learn and understand the Concepts of Software Engineering
- To learn and understand Software Development Life Cycle
- To apply the project management and analysis principles to software project development.
- To apply the design & testing principles to software project development.
- To understand the automation testing using Selenium.

Learning Outcomes:

- a. Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
- b. Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.
- c. Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice
- d. Able to use modern engineering tools necessary for software project management, time management and software reuse.
- e. Study manual and automation testing

Unit	Topic	No. of lectures
Unit 1	Introduction: The Nature of Software, Software Engineering, Professional Software Development, Layered Technology, Process framework, Waterfall Model, Incremental, RAD Models Evolutionary Process Models: Prototyping, Spiral and Concurrent Development Model Specialized Models: Component based, Aspect Oriented	

development, The Unified Process Phases, Agile Development-Agility, Agile Process, Extreme Programming

Requirement Analysis and System Modeling: Requirements Engineering, SRS Validation, Components of SRS, Characteristics of SRS, Object-oriented design using the UML -Use case diagram, Activity Diagram, Class diagram, Object diagram, Sequence diagram/ Collaboration diagram, State chart, Activity diagram,

Component diagram, Deployment diagram

System Design: System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented

Versus Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design

Unit II

Software Measurement and Metrics: Concept and Developing Metrics, Different types of Metrics, Process Metrics and Project Metrics, Software Measurement, Object Oriented Metrics, Software Project Estimation, Decomposition Techniques, LOC based, FP based and Use case-based estimations, Empirical estimation Models, COCOMO II, Complexity metrics

Software Project Management: Estimation in Project Planning Process, Estimation for Agile Development, The Make/Buy Decision,

Project Scheduling - Basic Principles, Relationship Between People and Effort, Gantt Chart, Time-Line Charts

Risk Management - Risk strategies, Software risks, Risk Identification, projection, RMMM Quality Concepts

Unit III

Software Testing: Introduction to Testing, Testing Principles, Testing Objectives, Testing Fundamentals, Strategic Approach to Software Testing, Nature of errors, an example for Testing, Oracles, Levels of Testing, Unit Testing, Integration Testing, Validation Testing, White Box Testing and its types, Black Box Testing, and its types, System Testing, Test Plan, Test-Case Design, Definition of V &V, Different types of V & V Mechanisms, Concepts of Software Reviews, Inspection

Singe 1962

Software Quality Assurance: Definition of Quality, QA, QC, QM and SQA, Software Development Life Cycle, SQA activities, Software reviews, SQA plan, Software Quality Factors, Quality Concepts, Quality Movement, Background Issues, SQA activities, Software Reviews, Formal Technical Reviews, Formal approaches to SQA, Statistical Quality Assurance, Software

Reliability, The ISO 9000 Quality Standards, SQA Plan, Six sigma, Informal Revi, SQA activities, Software reviews, SQA plan

Defect Management: Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related to Defects, Using Defects for Process Improvement.

Quality Improvement: Introduction, Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts

Quality Costs: Defining Quality Costs, Types of Quality Costs, Quality Cost Measurement, Utilizing Quality Costs for Decision-Making.

Textbooks:

- 1. Software Engineering, A Practitioner's Approach, Roger S, Pressman, 2019
- 2. Software Engineering: principles and Practices, Deepak Jain, OXFORD University Press, 2008
- 3. Software Testing: Concepts and Practices: K. Mustafa
- **4.** Software Engineering for Students, A Programming Approach, Douglas Bell, 4th Edition,, Pearson Education, 2005
- 5. Quality Management, Donna C. S. Summers, 5th Edition, Prentice-Hall, 2010.
- 6. Total Quality Management, Dale H. Besterfield, 3rd Edition, Prentice Hall, 2003.

Additional References:

- 1. Software Engineering, Ian Sommerville, Pearson Education, 2017
- 2.A Concise Introduction to Software Engineering, Pankaj Jalote, Springer

List of sample projects

- a. Student Result Management System
- b. Library management system
- c. Inventory control system
- d. Accounting system
- e. Fast food billing system
- f. Bank loan system
- g. Blood bank system
- h. Railway reservation system
- i. Automatic teller machine
- j. Video library management system
- k. Hotel management system
- 1. Hostel management system
- m. Share online trading
- n. Resource management system
- p. Court case management system

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCS P 404	Software Engineering and Quality Assurance -Practical	1	3
1	Perform requirement analysis and develop Software Requirem Sheet (SRS) for suggested system.	nent Specif	ication
2	Draw the user's view analysis for the suggested system: Use case diagram/Activity diagram		
3	Draw the structural view diagram for the system: Class diagra	m, object o	liagram.
4	Draw the behavioral view diagram: State-chart diagram		
5	Draw the behavioral view diagram for the suggested system: Sequence diagram/Collaboration diagram		
6	Install Selenium IDE; Write a test suite containing minimum different formats.	test cases	for
7	Install Selenium server (Selenium RC) and demonstrate it usin Java/Python and open any webpage on any of the two browsers(Mozilla/Chrome/Opera etc)	ng a script	in
8	Write and test a program to provide total number of objects pravailable on the page. (Hint: number of links/number of dropd of checkboxes checked and unchecked etc.)		per
9	Write and test a program to login a specific web page(faceboo sign up).	k page/ go	ogle
10	Write and test a program to update 10 student records into tab. file.	le into Exc	el

Course Code	Course Title	Credits	Lectures / Week
VESUCS 404	IoT Technologies	2	3

The course aims to provide basic understanding of SoC architectures; IoT, different types of IoT platforms and different types of applications that can be built.

Course Objectives:

- Introduce concepts of SoC and IoT
- Introduce various types of IoT platforms
- Interfacing various types of devices using different protocols with IoT
- Understand practical applications of IoT in real life world

Learning Outcomes:

- understand SoC and IoT
- use different types of IoT Platforms and interfaces
- understand and implement an idea of various types of applications built using IoT

Unit	Topic	No. of lectures
I	Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT,IoT Architectures, Physical & Logical Design of IoT, Enabling Technologiesin IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M. System on Chip: What is System on chip? Structure of System on Chip. SoC Elements: FPGA, GPU, APU, Compute Units. Different types of IoT/SoC Platforms: Introduction to Raspberry Pi,Arduino & NodeMCU, Introduction to SoC-ARM Architecture, atmega328 architecture	15
II	Interfacing with IoT Platforms: Basic hardware components like LED,Button, Camera, 8X8 LED Grid, Motor etc and interfacing them forinput/output with IoT devices using PWM, UART, GPIO, I2C, SPI Using Sensor & Actuators: Overview of Sensors working, Analog andDigital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor, Level Sensors, Ultrasonic sensors, Interfacing of Actuators, Interfacing of Relay Switch and Servo Motor IoT and Protocols IoT Security: HTTP, UPnP, CoAP, MQTT, XMPP, Privacy and Security Issues in IoT.	15

III	IoT & Web: Web server for IoT, Sending/Receiving data between web server & IoT device, Cloud for IoT, Node RED, M2M vs IoT Communication Protocols, Basics of WSNs, WSN architecture and types,	15
	IoT Applications: Modern IoT case studies / applications used in the areasof transportation, agriculture, health care etc	
	Edge Computing: Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.	

- 1.Introduction to IoT Paperback by Sudip Misra, Anandarup Mukherjee, Arijit Roy Cambridge Press, 2022
- 2. Jain, Prof. Satish, Singh, Shashi, "Internet of Things and its Applications", 1st Edition, BPB,2020.
- 3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, Internet of Things, Wiley, India, 2019
- 4. IoT and Edge Computing for Architects Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020

- 1.Internet of Things by Vinayak Shinde, SYBGEN Learning India Pvt. Ltd, 2020
- 2. Internet of things, Dr. Kamlesh Lakhwani, Dr. Hemant kumar Gianey, Josef Kofi Wireko, Kamalkant Hiran, BPB Publication, 2020
- Arduino, Raspberry Pi, NodeMCU Simple projects in easy way by Anbazhagan k and Ambika Parameswari k, 2019.
- IoT based Projects: Realization with Raspberry Pi, NodeMCU Paperback February 2020, by Rajesh Singh Anita Gehlot, 2020
- Mastering the Raspberry Pi, Warren Gay, Apress, 2014

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCSP 404	IoT Technologies - Practical	1	3
1	Preparing Raspberry Pi: Hardware preparation and Installation		
2.	Demonstrate Arduino Uno and its pins interfacing with IDE.		
3.	GPIO: Light the LED with Python with/without a button using either Uno/Raspberry Pi.		
4	SPI: Camera Connection and capturing Images/Videos using SPI		
5	GPIO: LED Grid Module: Program the 8X8 Grid with Different	Formulas	

6	Stepper Motor Control: PWM to manage stepper motor speed using Uno/Raspberry Pi.	
7	Node RED: Connect LED to Internet of Things	
8	Use different types of sensors (LDR, Temperature) with Raspberry Pi/Uno.	
9	Trigger a set of led GPIO on any IoT platform via any related web server	
10	Interface with any sensor and send its value over the internet to the server using any suitable protocol	

Course Code	Course Title	Credits	Lectures / Week
VESUCS40 5	Android Application Development	2	3

This course is aimed at creating a skilled IT workforce that is focused on developing Apps for mobile and smart Android-based computing platforms. It familiarizes the development of android applications using Kotlin for problems that address real-life needs ranging from intuitive UI to rich multimedia experience.

Course Objectives:

Kotlin Programming Language for application development

Creating robust mobile applications on simulators and physical devices

Creating intuitive, reliable mobile apps using the android services and components

Handling data local and remote data storage

Create a seamless user interface that works with different mobile screens

Learning Outcomes:

After successful completion of this course, students would be able to

Build useful mobile applications using Kotlin language on Android

Install and configure Android Studio for application development

Master basic to intermediate concepts of Kotlin required for mobile application development

Use built-in widgets and components, work with the database to store data

Master key Android programming concepts and deploy the application on Google Play

Unit	Торіс	No. of
		lectures

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Ι	Introduction to Kotlin : Basics of Kotlin, type conversions, comments, Kotlin operators, variables in Kotlin, packages, visibility modifiers, control flow statements, Concept of OOPS in Kotlin, classes in Kotlin, delegation and extension functions, the companion object,	15
	Advanced Concepts in Kotlin: declaring and calling functions, parameters, and arguments in Kotlin, default argument, variable number of arguments, unit-returning function, explicit return type, lambda expression, coroutines, Collections in Kotlin, Mutable and Immutable Collections, Ranges, type Checks, casting concept, this expression, Null safety, exception handling, annotations	
	App Development with Android Studio: Android Architecture, Android Application Framework, Android Virtual Device, Creating and running First Android Application, working with Physical Android Device, Adding Kotlin Files in Android Studio	
	Basics Of Android- Application Components: Activities, Intent, and Broadcast Receiver, Services, Fragment, Activity Life Cycle, Content Provider, Widgets, and Notifications	
II	Designing Android UI : User Interface (UI), Layout and Its Types, Layout Attribute, working with Views, Android UI Controls, Styles and Themes, Event Handler, setting up themes in Manifest and from the application, dialog in activity, using intents, fragments	15
	Handle Images, Listview And Menu: ImageView, ImageSwitcher, ListView, Menu, and its types, Designing menu in XML, Option menu,	
	- (Trans - Trans - // c	
	Context menu, popup menu, Screen Navigation, Recycler View, Interaction of Views	
	Data binding in Android-AdapterView, Spinner, Gallery view, AutotextCompleteView, screen orientation, Design the view dynamically	
	Implementing Data Persistence: Data Storage-Shared Preference, Internal And External Storage Storing Data Using SQLite Databases, Content Provider, Firebase Real-Time Data	
Ш	Graphics, Animations, and Integrating Media in Android: Drawable Class, Animation in Android, MediaPlayer API and in Android, Mediaplayer and AudioManger Class,	15
	Interacting With Camera and input gestures: Android Camera, Input gestures-multiple touch, swipe, drag, scroll, zoom, Recording	
	Gathering Location Data:	
	Managing Background Tasks: Broadcast Receivers, Services, Threads and Process, AsyncTask, JobScheduler, Manage device Awake State	
	Deploying Android applications on Google Play- Publishing/Deploy the application, Versioning, signing Application	

- 1. How to Build Android Apps with Kotlin: A hands-on guide to developing, testing, and publishing your first apps with Android, Alex Forrester, Packt Publishing, 2021
- 2. Android Programming: Crafting UI/UX using Kotlin, SYBGEN Learning, 2020

- 1. Head First Android Development: A Learner's Guide to Building Android Apps with Kotlin Dawn Griffiths, 3rd Edition, O'Reilly Media, 2021
- 2. Android Studio 4.2 Development Essentials Kotlin Edition: Developing Android Apps Using Android Studio 4.2, Kotlin and Android Jetpack, Neil Smyth, Payload Media, 2021 3. Android Programming with Kotlin for Beginners, John Horton, Packt Publishing, 2019 4. Android Development with Kotlin: Enhance your skills for Android development using Kotlin, Marcin Moskala, Packt Publishing

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCSP 405	Android Appl <mark>icat</mark> ion Dev <mark>elopment – Practical</mark>	1	3
1	 Write a program using Kotlin to implement control structu Write a program to implement object-oriented concepts in Ko 		ps. ii.
2	 i. Create an Android application to design screens using of UI including Button, Edittext, Textview, Radio Button ii. Write an android application demonstrating response to everal Checkbox b. Radio button c. Button d. Spinner 	etc.	
3	 i. Create an application to create Image Flipper and Image Gallery. On clicking on the image displays the information about the image. ii. Create an application to use Gridview for shopping cart application. 		
4	i. Create an Android application to demonstrate implicit and explicit intents ii. Create an application to demonstrate shared preferences		
5	 i. Create an Android application to demonstrate the use of Broadcast listeners. ii. Create an Android application to create and use services. 		
6	i. Create an Android application to demonstrate XML based animation ii. Create an Android application to display canvas and allow the user to draw on it.		
7	 i. Create a media player application in android that plays play, pause, and loop features. ii. Create an Android application to use a camera and cap display them on the screen. 	_	
8	Create an android application to implement Asynctask and three Create an Android application to demonstrate the different types a. Pop-up Menu b. Context Menu c. Option Menu	•	epts. ii.

9	Create an Android application to record the current location. Based on the current location allow the user to use some useful services/applications
10	Create a suitable Android application to store and retrieve data in the SQLite database.
11	Create a suitable Android application to work with Firebase for storing and manipulating data.

Course Code	Course Title	Credits	Lectures / Week
VESUCS 406	Advanced Appl <mark>ication Development</mark>	2	3

The course aims at developing scalable, robust, and maintainable web applications using MEAN stack and developing advanced mobile applications using Flutter

Course Objectives:

- To understand all the necessary and important technologies such as MongoDB, Express.js, AngularJS, and Node.js.
- To understand modern app development using Flutter

Learning Outcomes:

After successful completion of this course, students would be able to

- Store the data in NoSQL, a document-oriented MongoDB database that brings performance and scalability.
- Use Node.js and Express Framework for building fast, scalable network applications.
 Use AngularJS framework that offers declarative, two-way data binding for web applications.
 Integrate the front-end and back-end components of the MEAN stack.
- Develop robust mobile applications using Flutter.



Unit	Topics	No of Lectures
I	Node.js (N): Introduction to Node.js. Installing Node.js. The package.json File. The Node.js Event Loop. The I/O Cycle. The Anatomy of a Node.js Module. Creating Node Modules. Exploring the Node.js HTTP Module. Creating an HTTP Web Server with Node.js. Responding to HTTP Requests. Routing in Node.js. Creating a Sample Node.js Application.	
	MongoDB(M): Introduction to MongoDB. Installing MongoDB. Using MongoDB Compass. Using Mongo Shell Interface. Connecting to MongoDB. Creating Schemas and Models. Querying Documents Using find(). Inserting Documents Using create(). Updating Documents Using findOneAndUpdate(). Deleting Documents Using findOneAndDelete() & deleteMany()	
II	Server-Side Development with Express (E): Introduction to the Express Framework. Installing and Testing Express. Creating a Node.js Express App. Restructuring an Express App. Creating Templates. Using Express Middleware Functions. Creating the List Page. Creating the Details Page. Creating the Edit Page. Creating the Add Page. Deleting Data. REST API Basics. Testing REST APIs. Refactoring APIs.	
	Understanding Angular.JS(A): Getting Started with Angular. Creating an Angular Application. Angular Project File Structure. Anatomy of an Angular Component. One-way Data Binding. Two-way Data Binding. Using Nglf Directive. Using NgForOf Directive. Angular Modules. Creating NgModules Using Angular Router. Configuring Templates. Creating Navigations. Working with Template-driven Forms. Working with Reactive Forms. Validating Form Data. Services Dependency Injection (DI). Reading Data from Database. Inserting Data into Database. Updating Data in the Database. Delete Data from Database.	
III	Understanding Flutter: Importance of Flutter, Flutter Framework, Android Studio, Flutter SDK, Installing and Configuring Flutter SDK. Dart Programming: main() function, Dart Variables, Dart Data Types, Dart Conditional Operators, Control Flow & Loops. Dart Functions - Functions, Function Structure, creating a Function, Function Returning Expression. Object-Oriented Programming (OOP) - Creating a Class, Adding Methods to Classes, Class — Getters and Setters, Class Inheritance, Abstract Class.	
	Flutter Widgets Fundamentals : Scaffold Widget, Image Widget, Container Widget, Column and Row Widgets, Icon Widget, Layouts in Flutter, Card Widget, Hot Reload and Hot Restart, Stateful and Stateless Widgets	
	Navigation and Routing: Button Widget, App Structure and Navigation, Navigate to a New Screen and Back, Navigate with Named Routes, Send and Return Data among Screens, Animate a Widget across Screens, WebView Widget in Flutter	

- 1. Node.js, MongoDB and Angularjs Web Development: The definitive guide to using the MEAN stack to build web applications by Brad Dayley, Brendan Dayley, Caleb Dayley, Pearson, 2018. 2. Beginning Flutter: A Hands On Guide to App Development by Marco L. Napoli, Wrox, 2019 Additional References:
 - 1. Full Stack Javascript Development with Mean MongoDB, Express, AngularJS, and Node.JS by Adam Bretz, Colin J Ihrig, Shroff/SitePoint, 2015
 - 2. Practical Flutter by Zammetti Frank, Apress, 2019

Course Code	Course Title	Credits	Practical/ Tutorials Per Week
VESUCSP 406	Advanced Application Development – Practical	1	3
1	Write a program to implement MongoDB data models		
2	Write a program to implement CRUD operations on MongoDB		
3	Write a program to perform validation of a form using AngularJ	S	
4	Write a program to create and implement modules and controlle	rs in Angul	larJS
5	Write a progra <mark>m t</mark> o imp <mark>lement Error Handling</mark> in An <mark>gul</mark> arJS		
6	Create an appli <mark>cat</mark> ion for Customer / Students records using An	gularJS	

7	Write a program to create a simple web application using Express, Node JS and Angular JS	
8	Create a simple HTML "Hello World" Project using AngularJS Framework and apply ng-controller, ng-model and expressions	
9	Create an app using Flutter for User Authentication	
10	Create an app using Flutter to implement an Image Gallery	
11	Create an app using Flutter to demonstrate the use of different layouts	
12	Create an app using Flutter to demonstrate navigation in an App	

Course Code	Course Title	Credits	Lectures /Week
VESUCS4071	Research Methodology	2	3

The course aims to understand the basics of research, how research problems are defined, research methods are adopted and/or developed, research is undertaken, and how research results are communicated to the peers.

Course Objectives:

- The research methodology course is proposed to assist students in planning and carrying out research projects.
- The students are exposed to the principles, procedures and techniques of implementing research project.
- The course starts with an introduction to research and carries through the various methodologies involved.
- It continues with finding out the literature using technology, basic statistics required for research and finally report writing.

Learning Outcomes:

After successful completion of this course, students would be able to

- Define research, formulate problem and describe the research process and research methods.
- Understand and apply basic research methods including research design, data analysis and interpretation.
- Understand ethical issues in research, write research report, research paper and publish the paper.

Unit	Topics	No of Lectures
I	Introduction to Research Methodology: Meaning of Research, Objectives of Research, Motivations in Research, types of Research, Research Approaches, Significance of Research, Research Methods v/s Methodology, Research and Scientific Methods, Research Process, Criteria of Good Research. Defining the Research Problem: Concept and need, Identification of Research problem, defining and delimiting Research problem. Formulating a Research Problem: Reviewing Literature, formulating a Research Problem, Research Question, Identifying Variables, Constructing Hypothesis The Research Design: Meaning, Need for Research Design, Important Concepts, Different Research Designs.	
II	Tools for Data Collection : Collections of Primary Data, Collection of Data through questionnaire and Schedules, Observations, Interview Methods, Collection of Secondary Data, Selection of appropriate method for data collection, Techniques of developing research tools	

Sampling Design: Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs, how to Select a Random Sample. Probability and Non-Probability sampling types and criteria for selection, Developing sampling Frames.

Overview of Hypothesis Testing: What is a Hypothesis? Characteristics of good Hypothesis. Basic Concepts, Procedure for Hypothesis Testing, Flow Diagram for Hypothesis Testing, Tests of Hypotheses, Type – I and Type – II errors, Null Hypothesis- Alternative Hypothesis.

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Technical Writing: Writing a Research Proposal, what is a Scientific Paper? Ethics in Scientific Publishing, What is Plagiarism? How not to plagiarize

Preparing the Text: How to Prepare the Title, how to List the Authors and Addresses, how to Prepare the Abstract, how to Write the Introduction, how to Write the Materials and Methods Section, how to Write the Results, how to Write the Discussion, how to State the Acknowledgments, how to Cite the References, referencing tools like Mendeley and Zotero

Preparing the Tables and Figures: How to Design Effective Tables, how to Prepare Effective Graphs. How to prepare photographs

Publishing the Paper: Rights and Permissions, How to Submit the Manuscript, How and When to Use Abbreviations, How to Write a thesis, Outcome of Research, Ethical issues in research

Textbooks:

- * Kothari C.R., Research Methodology, New Age International Publication, 2019
- Research Methodology-A Step-by-Step Guide for Beginners, (4th ed.), Ranjit Kumar, Singapore, Pearson Education, 2018
- Research Methodology, Vaishali Khairnar, Staredu Solutions India Pvt Ltd, 2020

- Research Methodology: Methods and Techniques, Dr. R. K. Jain, Fifth Edition, VEI, 2021
- · Research Methodology, R. Panneerselvam, Second Edition, PHI, 2014
- Dr. Rachna Jain, Research Methodology, Maximax Publishing House
- How to Write and Publish a Scientific Paper, Cambridge University Press, Barbara Gastel and Robert A. Day, 2017

Course	Course Title	Credi	Lectures
Code		ts	/Week
VESUCS 4072	Management & Entrepreneurship	2	3

The aim of the course is to develop conceptual understanding of management and administration, and comprehend the environment of making of an entrepreneur. The course focuses on giving students the business management and innovation skills required to succeed in a startup

Course Objectives:

- To understand the idea of management, process and its levels.
- To understand the perception of entrepreneurship, process and its types.
- To understand the concept SSI and steps to start SSI.
- To understand the selection of project, project report, project appraisal, and its feasibility

Learning Outcomes:

After successful completion of this course, students would be able to

- Understand the meaning of management, functions, administration and its process.
- Understand the foundation of entrepreneurship and its theory, types and its process.
- Identify the steps involved in an entrepreneurial venture (SSI).
- Understand an entrepreneur is converting his business ideas into running concern by selecting the project.

Unit	Topics	No of Lectures
I	Introduction: Meaning, Meaning, Characteristics of Management, Nature of Management, Management Functions, Functional Areas of Management, Management and Administration, Role of Management,	15
	Levels of Management, Evolution of Management Planning: Meaning, Nature, importance, types of planning, types of plans, planning process, decision-making. Organizing and staffing: Meaning and Definitions of Organizing, Steps in Organizing, Nature of Organization, Organization Structure, Purpose of Organization, Principles of Organization, Departmentation, Types of Organization, Span of Control, Authority, Power and Responsibility, Delegation of Authority, Centralization and Decentralization, Delegation vs Decentralization, Management by Objectives [MBO], Meaning of Staffing, Nature and Importance of Staffing, Recruitment, Selection.	

II	Directing and Controlling: Meaning and Nature of Direction, Principles of Directing, Leadership and Leadership Styles, Motivation, Communication, Noise and Feedback in Communication, Importance of Communication, Channels of Communication, Types of Communication, Forms of Communication, Coordination, Coordination and Cooperation, Importance of Coordination, Techniques of Coordination, Managerial Control, Steps in a Control Process, Essentials of a Sound Control System, Control Methods. Entrepreneurship: Evolution of Concept of Entrepreneur, Concept of Entrepreneur, Characteristics of Entrepreneur, Distinction between Entrepreneur and Manager, Technical Entrepreneur, Charms of Being an Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneurs, Ultrapreneurs, Concept of Entrepreneurship, Evolution of Entrepreneurship, Role of Entrepreneurship in Economic Development, Stages in the Entrepreneurial Process, Barriers to Entrepreneurship	15
III	Small Scale Industry: Meaning and Definition of Small-Scale Industry, Characteristics of SSI, Objectives, Scope, Role of SSI in EconomicDevelopment, Advantages of Small-Scale Industries, steps to Start an SSI, Government Policy towards SSI Preparation of Project: Meaning, Project Classification, Project Identification, Project Report and its significance, Contents of a Project Report, Formulation of Project Report, Planning Commission Guidelines, Network Analysis, Common Mistakes by Entrepreneurs in Project Formulation, Project Appraisal, Identification of Opportunity, Project Feasibility study.	15

- 1. Havinal Veerabhadrappa, Management and Entrepreneurship, New Age International Publishers
- 2. Kanishka Bedi, Management and Entrepreneurship, Oxford University Press
- 3. Dr. R. K. Singal, Entrepreneurship Development and Management

- P. N. Singh, J. C. Saboo, Entrepreneurship Management, 6th Edition, Dr. P. N. Singh Centre for Hrd Publications.
- Donald L. Sexton & Raymond W. Smilor, The Art and Science of Entrepreneurship, Ballinger, 2022
- · Clifford M.Baumback & Joseph R.Mancuso, Entrepreneurship And Venture Management, Prentice Hall

Modality of assessment

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 25% marks in the first part & by conducting the Semester End Examinations with 75% marks in the second part. Practical Examination will consist of End Sem examination.

Students will have to score 40% of marks separately in each of the Internal Theory, External Theory as well as External Practical Examination to pass the course.

I. Internal Evaluation for Theory Courses – 25 Marks

(i) Mid-Term Class Test – 15 Marks

It should be conducted using any learning management system such as Moodle (Modular object-oriented dynamic learning environment)

The test should have 15 MCQ's which should be solved in a time duration of 30 minutes.

(ii) Assignment / Presentations – 10 Marks

Assignment - Any subject-related work in soft copy format comprising of case study, solutions to multiple problems, study and review of published research paper from a reputed journal, technical paper written as white paper

Presentation - Any subject-related work(can be done in a group) comprising of mini-project, explaining topics beyond syllabus, converting any subject-related topic into innovative way

Proof of the assignment/presentation should be maintained.

II. External Examination for Theory Courses – 75 Marks

Duration: 2.5 Hours

Theory question paper pattern:

All questions are compulsory.			
Question	Based on	Options	Marks
Q.1	Unit I	Any 4 out of 6	20
Q.2	U <mark>nit II</mark>	Any 4 out of 6	20
Q.3	U <mark>nit</mark> III	Any 4 ou <mark>t o</mark> f 6	20
Q.4	Unit <mark>I,II</mark> and III	Any 5 ou <mark>t o</mark> f 6	15

All questions shall be compulsory with internal choice within the questions. Each Question may be subdivided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

Each core subject carries 50 Marks 40 marks + 05 marks (journal) + 05 marks (viva)

Duration: 2 Hours for each practical course.

Minimum 80% practical from each core subjects are required to be completed. Certified Journal is compulsory for appearing at the time of Practical Exam failing which the student will not be allowed to appear for the practical examination. The final submission and evaluation of a journal in electronic form using a Learning Management System / Platform can be promoted by college.

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