Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Bachelor of Technology

in

Information Technology

Second Year Scheme & Syllabus

(As per AICTE guidelines, with effect from the Academic Year 2023-24)

Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated, and taken forward in a systematic manner. Therefore, autonomy for Vidyalankar Institute of Technology is not merely a transition from pre-cooked syllabi to self-designed curriculum. Autonomy curriculum of the Institute offers required academic flexibility with emphasis on industry requirements and market trends, employability and problem-solving approach which leads to improving competency level of learners with diverse strengths. In line with this, the curriculum framework designed is **Choice Based Credit and Grading System (CBCGS)**. Number of credits for each category of courses learnt by learners, internships and projects is finalized considering the scope of study and the ability that a learner should gain through the programme. The overall credits and approach of curriculum proposed is in line with AICTE model curriculum.

The curriculum comprises courses from various categories like basic sciences, humanities and social sciences, engineering sciences, general education and branch specific courses including professional electives and open electives. The curriculum has core courses of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. These courses are completed by third year of the engineering programme that enables learners to prepare for higher education during their final year. Professional elective courses, that begin from third year of programme, offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a salient feature of this curricula ensuring employability. Open Elective courses cover multi-disciplinary, special skill development, project management and similar knowledge that make learner capable to work in industrial environment.

For holistic development of learners, apart from technical courses, Humanities and Social Science courses develop the required soft-skills and attitude amongst learners. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking, Yoga and Meditation, Indian Traditional Knowledge System under General Education category. These general education courses aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses. In addition to this, the curriculum is augmented with Life Enrichment audit courses for knowledge inspiring experience.

Additionally, curriculum provides add-on Honours/Minor degree that involves field/ domain study. Learner can avail this degree by completing requirement of additional 18 credits.

Thus, the academic plan of VIT envisages a shift from summative to formative and competency-based learning system which will enhance learner's ability towards higher education, employability and entrepreneurship.

Chairman, Board of Studies
Department of Information Technology
Vidyalankar Institute of Technology

Chairman, Academic Council
Vidyalankar Institute of Technology

Second Year B. Tech. Information Technology **Semester: III**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS03	Technical and Business Writing	Theory+ Practical	2	75	-	-	075
BS05	Engineering Mathematics-III	Theory	3	20	30	50	100
IT01T	Data Structures & Analysis	Theory	2	15	20	40	075
IT01P	Data Structures & Analysis Lab	Practical	1	25	-	25	050
IT02T	Advanced Java	Theory	2	15	20	40	075
IT02P	Advanced Java Lab	Practical	1	25	-	25	050
IT03T	Computer Graphics	Theory	2	15	20	40	075
IT03P	Computer Graphics Lab	Practical	1	25	-	25	050
IT04T	Computer Organization & Microprocessor	Theory	2	15	20	40	075
IT04P	Computer Organization & Microprocessor Lab	Practical	1	25	-	25	050
BS17	Biology	Theory	2	15	20	40	075
GEXX*	Any GE course offered in the semester	As per course					

ISA=In Semester Assessment, MSE=Mid Semester Examination, ESE=End Semester Examination

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

***Refer to Appendix A for the list of General Education (GE) courses. A subset of courses shall be offered against GEXX*. However, the subset will depend on the GE courses made available by the institute for that semester.**

Second Year B. Tech. Information Technology **Semester: IV**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS06	Principles of Economics and Management	Theory & Tutorial	3	40	20	40	100
BS07	Engineering Mathematics-IV	Theory	3	20	30	50	100
IT05T	Operating Systems	Theory	2	15	20	40	075
IT05P	Operating Systems Lab	Practical	1	25	-	25	050
IT06T	Computer Networks	Theory	2	15	20	40	075
IT06P	Computer Networks Lab	Practical	1	25	-	25	050
IT07T	Database Management Systems	Theory	2	15	20	40	075
IT07P	Database Management Systems Lab	Practical	1	25	-	25	050
IT08	Skill based Lab – Python	Practical	2	25	-	50	075
IT45	Mini Project	Practical	2	25	-	50	075

ISA=In Semester Assessment, MSE=Mid Semester Examination, ESA=End Semester Examination

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed syllabus of Second Year Semester-III

Course Name: Technical and Business Writing

Course Code: HS03

Category: Humanities and Social Sciences (HSS)

Preamble:
The course, Technical and Business Writing, introduces students to the basics of effective writing, one of the core pillars of communication skills. Technical writing is a significant aspect of the engineering curriculum and engineers will encounter a plethora of technical writing tasks in their careers, wherein their writing needs to be professional. Technical and Business Writing will enable students to draft effective emails and letters, technical proposals and reports, maintain meeting documentation, while actively using contemporary digital writing tools.

Pre-requisites:
NIL
Course Objectives:

- To enable learners to gain understanding of writing effective letters, proposals and reports.
- To facilitate learners in developing the skills of participating in meetings.
- To create awareness of strengthening research orientation by reading and paraphrasing technical papers.
- To introduce strategies for drafting documentation required for higher studies.

Course Outcomes:

Learner will be able to:
CO1: Draft effective letters and emails for various professional and business requirements.
CO2: Collect and compile data in the form of a technical report, and present findings in front of an audience.
CO3: Write technical reviews and instructions and differentiate between various hazard notations.
CO4: Draft persuasive proposals to achieve the desired outcomes.
CO5: Participate in meetings and draft meeting-related documentation like notice, agenda and minutes.
CO6: Write a Statement of Purpose and understand the requirements of a Letter of Recommendation.
Course Scheme:

Contact Hours		Credits Assigned
Theory	Practical	Theory + Practical
1	2	2

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	-	075
Practical	50	-	-	

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Business Correspondence	Principles of Correspondence (7 Cs) Parts of a letter and Formats Request for information/permission Enquiry, Reply to Enquiry Letters Complaints, Claims, Adjustment Letters Email writing and etiquette	4
2	Report Writing	Significance, Objectives of Report Writing Types of Reports Language and Style of Reports Formats of Reports Synopsis writing	3
3	Technical Writing	Introduction to Technical Writing Writing Definitions, Instructions, Safety Notations, Descriptions Technical Reviews of gadgets, software and technologies Principles of Scientific Vocabulary Technical Reports & Technical Presentation Paraphrasing Technical Paper (IEEE Format)	3
4	Proposal Writing	Parts of a Proposal and Formats Drafting persuasive proposals	2
5	Meetings and Documentation	Strategies for conducting effective meetings (in person/virtual) Note Taking Notice, Agenda, and Minutes of Meeting Business Meeting Etiquettes	2
6	Documentation for Higher Studies	Statement of Purpose Letter of Recommendation	1
Total			**15**

Suggested List of Practicals:

1. Ice Breakers/Elevator Pitch
2. Letter Writing & Email Writing
3. Synopsis Writing
4. Paraphrase a published IEEE Technical Paper
5. Technical Proposal – Discussion and drafting with relevance to domain (application-based)
6. Mock Meeting (Oral + Documentation)
7. Technical Blogs
8. Technical Reviews
9. Drafting Statement of Purpose & LOR
10. Mini Project Presentation

Suggested List of Assignments:

1. Draft an email and a reply to that on any one type of letter (Individual)
2. Draft a synopsis of the mini-project report (Group)
3. Paraphrase a published IEEE Technical Paper (Individual)
4. Draft a technical proposal (Group)
5. Participate in a mock meeting and prepare notice, agenda, and minutes (Group)
6. Draft a Statement of Purpose (for admission to Higher Studies) (Individual)

Guidelines to conduct mini project:

1. The Laboratory work is to be conducted by a group of three-five students.
2. To encourage project-based learning in the curriculum students may either select one of the mini project topics from the list given or a topic of their choice after a review process by the subject faculty.
3. Each group along with subject faculty shall identify a potential area of mini project selected, on which the study can be conducted. They can perform the survey-based analysis related to the topic selected.
4. Students should prepare presentation and present their findings on the selected topics.
5. Project assessment will be done at the end of the semester.

Suggested Online Courses:

1. Courses on Communication offered by Udemy, Coursera, EdX, NPTEL Swayam, TCS iON
2. Writing Skills for Engineering Leaders https://www.coursera.org/programs/vidyalankar-institute-of-technology-coursera-response-program-tysb7/browse?productId=6sk543Q6EeaRqAobOpNSMQ&productType=course&query=technical+and+business+writing&showMiniModal=true
3. Technical Writing https://www.coursera.org/programs/vidyalankar-institute-of-technology-coursera-response-program-tysb7/browse?productId=4ESRQQpFEea5dwol2CF9Kw&productType=course&query=technical+writing&showMiniModal=true

Reference Books:

1. Raman Meenakshi and Sangeeta Raman, “Communication Skills”, OUP, 2016.
2. Murphy Herta, “Effective Business Communication”, McGraw Hill, 2017.
3. Locker Kitty, “Business Communication-Building Critical Skills”, McGraw Hill, 2013.
4. Lehman Dufrene, Sinha, “BCOM”, Cengage Learning, 2020.
5. Stanton Nicky, “Mastering Communication”, Palgrave Master Series, 2009.
6. A. Kaul, “Effective Business Communication”, Prentice Hall of India, 2015.
7. Monipally, “Business Communication Strategies”, Tata McGraw Hill, 2001.
8. Monipally, “The Craft of Business Letter Writing”, Tata McGraw Hill, 1997.
9. Lesiker and Petit, “Report Writing for Business”, Mc Graw Hill, 1997.
10. R.C. Sharma and Krishna Mohan, “Business Correspondence and Report Writing”, Mc Graw Hill, 2017.

Course Name: Engineering Mathematics-III

Course Code: BS05

Category: Basic Science

Preamble:

This course introduces students to various discrete structures concept that is helpful for many fundamentals topic understanding in Information Technology Domain.

Pre-requisites:

Nil

Course Objectives:

- To introduce the concepts of Set Theory and logic
- To enable the learner to understand the concepts of Relations, Functions & Graph Theory
- To enable the learner to understand the concepts of Trees and Coding Theory

Course Outcome:

Learner will be able to:

CO1: Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.

CO2: Ability to reason logically.

CO3: Ability to understand relations, Diagraph and lattice.

CO4: Ability to understand use of functions, graphs and their use in programming applications.

CO5: Understand use of groups and codes in Encoding-Decoding.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment Guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be

approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No	Module name	Content	No of Hours
1	Set Theory and Logic	Introduction and significance of Discrete Mathematics, Sets–Naïve Set Theory (Cantorian SetTheory), Axiomatic Set Theory, Set Operations, Cardinality of set, Principle of inclusion and exclusion. Types of Sets – Bounded and Unbounded Sets, Diagonalization Argument, Countable and Uncountable Sets, Finite and Infinite Sets, Countably Infinite and Uncountably Infinite Sets, Power set.	8
2	Logic	Propositional Logic- logic, Propositional Equivalences, Normal Forms Predicates and Quantifiers, Application of Propositional Logic- Translating English Sentences, Proof by Mathematical Induction and Strong Mathematical Induction.	6
3	Relations and Functions	Relations and their Properties, n-ary relations and their applications, Representing relations, Closures of relations, Equivalence relations, Partial orderings, Partitions, Hasse diagram, Lattices, Chains and Anti-Chains, Transitive closure and Warshall's algorithm. Functions- Surjective, Injective and Bijective functions, Identity function, Partial function, Invertible function, Constant function, Inverse functions and Compositions of functions, The Pigeonhole Principle	8
4	Graph Theory	Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, the handshaking lemma, Single source shortest path- Dijkstra's Algorithm, Planar Graphs, Graph Colouring.	8
5	Trees	Introduction, properties of trees, Binary search tree, treetraversal, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal's and Prim's algorithms, The Max flow-Min Cut Theorem (Transport network).	7
6	Algebraic Structures and Coding Theory	The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, and Congruence relations, Rings, Integral Domains and Fields, Coding theory, Polynomial Rings andpolynomial Codes, Galois Theory –Field Theory and Group Theory.	8
Total			**45**

Text Books:

1. C. L. Liu, "Elements of Discrete Mathematics", TMH, ISBN 10:0-07-066913-9.
2. N. Biggs, "Discrete Mathematics", 3rd Ed, Oxford University Press, ISBN 0 –19-850717–8.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill

Reference Books:

1. Bernard Kolman, Robert C. Busby and Sharon Ross, "Discrete Mathematical Structures",Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.
2. Narsingh Deo, "Graph with application to Engineering and Computer Science", Prentice Hall ofIndia, 1990, 0 – 87692 – 145 – 4.
3. Eric Gossett, "Discrete Mathematical Structures with Proofs", Wiley India Ltd, ISBN:978-81-265- 2758-8.
4. Sriram P.and Steven S., "Computational Discrete Mathematics", Cambridge University Press, ISBN 13: 978-0-521-73311-3.

Course Name: Data Structures & Analysis

Course Code: IT01T

Category: Core

Preamble:

This course introduces students to different data structures that they have to understand, implement and use for real life problems. Starting from linear data structures like Stacks, Queues, link-lists till non-linear data structures like graph, trees will be dealt in depth for implementing operations like searching, sorting along with analysis of the algorithms.

Pre-requisites:

Structured Programming (ES04T)

Course Objectives:

- The fundamental knowledge of data structures.
- The programming knowledge which can be applied to sophisticated data structures.
- The fundamental knowledge of stacks queue, linked list etc.
- The fundamental knowledge of Trees, Graphs etc.
- The fundamental knowledge of different sorting, searching, hashing and recursion techniques
- The real time applications for stacks, queue, linked list, trees, graphs etc.

Course Outcomes:

Learner will be able to:
CO1: Select appropriate data structures as applied to specified problem definition.
CO2: Implement operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO3: Implement Linear and Non-Linear data structures.
CO4: Implement appropriate sorting/searching techniques for given problem.
CO5: Design advance data structures using Non-Linear data structures.
CO6: Determine and analyse the complexity of given algorithms.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Introduction to Data Structures	Introduction to Data structures, Need of Data structures, Types of Data structures : Linear and non linear data structures. Arrays, Stacks, Queue, Linked list and Tree, Graph, Recursion, ADT (Abstract Data type). Introduction to Analysis, Algorithms, characteristics of an algorithms, Time and Space complexities, Order of growth function, Asymptotic notations	5
2	Stack and Queue	Introduction to Stack, Stack as ADT, Operations on stack, Application of stack: – reversing string, Polish notations. Introduction to Queue, Queue as ADT, Operations on Queue, Linear representation of queue, Circular Queue, Priority Queue, De-queue, Application of Queues	12
3	Linked List	Introduction to Linked List, Basic concept of Linked List, Memory allocation & de allocation of Linked list, Singly Linked list, Doubly Linked list, Circular linked list, Operations on linked list, Linked representation of stack, Linked representation of Queue, Application of linked list.	7
4	Sorting and Searching	Introduction to Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix sort, Bucket Sort. Analysis of Sorting Techniques. Comparison of sorting Techniques. Introduction to Searching: Linear search, Binary search, Hashing Techniques, Different Hash functions, Collision & Collision resolution techniques, Analysis of searching Techniques.	9
5	Trees	Introduction to Trees, Definitions & Tree terminologies, Binary tree representation, Operations on binary tree, Traversal of binary trees, Binary search tree, Threaded Binary tree, Expression tree, Application of Trees.	6

6	Graph	Introduction to Graph, Graph Representation, Type of graphs, Graph traversal: Depth first search (DFS) & Breadth First search(BFS), Minimum Spanning Tree : Prim's & Kruskal's Shortest Path Algorithm – Dijkstra's Algorithm. Applications of graph.	6
Total			**30**

Text Books:

1. S. K Srivastava, Deepali Srivastava; Data Structures through C in Depth; BPB Publications; 2011.
2. Yedidya Langsam, Moshej Augenstein, Aaron M. Tenenbaum; Data Structure Using C & C++; Prentice Hall of India; 1996.
3. Reema Thareja; Data Structures using C; Oxford.

Reference Books:

1. C & Data Structures -Prof. P.S Deshpande, Prof. O.G Kakde, Dreamtech Publications.
2. Data Structure Using C- E. Balaguruswamy, McGraw Hill Publications.

Course Name: Data Structures & Analysis Lab

Course Code: IT01P

Category: Core

Preamble:

This course demonstrates familiarity with major algorithms and data structures and analyzes performance of algorithms. It is used to choose the appropriate data structure and algorithm design method for a specified application and determine which algorithm or data structure to use in different scenarios.

Pre-requisites:

Structured Programing lab (ES04P)

Course Objectives:

- To use data structures as the introductory foundation for computer automation to engineering problems.
- To use the basic principles of programming as applied to complex data structures.
- To learn the principles of stack, queue, linked lists and its various operations.
- To learn fundamentals of binary tree, graph, binary search tree, tree & graph traversal techniques.
- To learn about searching and sorting.
- To learn the applications of linked lists, stacks, queues, trees and graphs.

Course Outcomes:

Learner will be able to:
CO1: Understand and use the basic concepts and principles of various linked lists, stacks and queues.
CO2: Understand the concepts and apply the methods in basic trees.
CO3: Use and identify the methods in trees.
CO4: Understand the concepts and apply the methods in graphs.
CO5: Understand the concepts and apply the techniques of searching and sorting
CO6: Illustrate and examine the methods of linked lists, stacks, queues, trees and graphs to various real time problems

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of practical

Learners are expected to perform practical based on the following suggested topics.

Sr. No.	Suggested Topic(s)
1	Array Implementation of Stack and Queue
2	Array implementation of circular queue
3	Array implementation of priority queue
4	Implementation of singly linked list
5	Implementation of doubly linked list
6	Implementation of circular linked list
7	Implementation of doubly circular linked list
8	Linked list implementation of stack and queue
9	Implementation of binary tree
10	Implementation of tree traversal techniques
11	Implementation of binary search tree
12	Implementation of threaded binary tree
13	Implementation of graph traversal
14	Implementation of minimum spanning tree using prim's and krukshal's algorithm
15	Implementation of shortest path using Dijkstra's algorithm
16	Implementation of infix to postfix conversion and evaluation of postfix expression
17	Implementation of sorting & searching techniques

Text Books:

1. S. K Srivastava, Deepali Srivastava; Data Structures through C in Depth; BPB Publications, 2011.
2. Yedidya Langsam, Moshej Augenstein, Aaron M. Tenenbaum; Data Structure Using C & C++; Prentice Hall of India; 1996.
3. Reema Thareja; Data Structures using C; Oxford.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni; Fundamentals of Data Structures; Galgotia Publications; 2010.
2. Jean Paul Tremblay, Paul G. Sorenson; An introduction to data structures with applications; Tata Mc Graw Hill; 1984.
3. Rajesh K. Shukla; Data Structures using C and C++; Wiley India; 2009.

Course Name: Advanced Java

Course Code: IT02T

Category: Core

Preamble:

This course introduces advanced concepts of Java programming. It covers database connectivity, networking, servlets, Java Server Pages and Enterprise Java Beans. It demonstrates web application development and database connectivity using Java programming.

Pre-requisites:

Object oriented programming (ES05T)

Course Objectives:

- To introduce the advanced concepts of Java
- To enable the students, develop front end applications using Java Swing
- To provide students with an understanding of database connectivity through JDBC
- To enable the students, create simple client server application using Java networking
- To introduce server-side programming using Java Servlets and JSP
- To introduce full application development using Java Enterprise Beans

Course Outcomes:

Learner will be able to:
CO1: Design graphical interface using Swing components
CO2: Implement database connectivity using JDBC.
CO3: Implement socket programming and remote method invocation
CO4: Design and implement server side programming using servlets
CO5: learn Server- side programing and create dynamic web pages using JAVA server pages
CO6: Understand the multi-tier architecture of web based enterprise applications using enterprise java beans (EJB)

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Swings	Event Handling, JFrames, Lists, Tables, Trees, Text Components, Progress Indicators, Menu, Buttons, Combo box, Component Organizers	5
2	Java database connectivity	Design of JDBC, JDBC configuration, Executing SQL statement, Query Execution, Scrollable and updatable result sets, row sets, metadata, Transaction	5
3	Networking	Networking basics, TCP IP client sockets, URL, TCP IP sever sockets, Datagrams, Remote Method Invocation(RMI)	5
4	Introduction to Java Servlets	**Introduction to servlets**: Need for dynamic content, java servlet technology, why servlets? **Servlet API and Lifecycle**: servlet API, servletConfig interface, ServletRequest and ServletResponse Interfaces, GenericServlet Class. ServletInputStream And ServletOutputStreamClasses, RequestDispatcher Interface,HttpServlet Class, HttpServletRequest and HttpServletResponse Interfaces, HttpSession Interface, Servlet Lifecycle. **Working with servlets:** organization of a web application, creating a web application(using netbeans), creating a servlet, compiling and building the web application	5
5	Java server Pages	Introduction, disadvantages, JSP v/s Servlets, Lifecycle of JSP, Comments, JSP documents, JSP elements, Action elements, implicit objects, scope, characterquoting conventions, unified expression language.	5
6	Enterprise JAVA Bean (EJB)	Enterprise bean architecture, Benefits of enterprise bean, types of beans, Accessing beans, packaging beans, creating web applications, creating enterprise bean, creating web client, creating JSP file, building and running web application.	5
Total			**30**

Text Books:

1. Java EE 6 for Beginners, Sharanam Shah, Vaishali Shah, SPD
2. Core Java Vol. II – Advanced Features, Cay S. Horstmans, Gary Coronell, Eight Edition, Pearson

Reference Books:

1. Java Complete Reference, Herbert Schildt, Seventh Edition,TMH.

Course Name: Advanced Java Lab

Course Code: IT02P

Category: Core

Preamble:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: Develop web and stand-alone applications using advanced concepts of Java.

Pre-requisites:

Object oriented programming Lab (ES05P)

Course Objectives:

- To develop front end applications using Java Swing and AWT
- To access database through JDBC
- To create the simple client server application using network protocols.
- To implement server-side programming using Java Servlets and JSP
- Full application development using Java Enterprise Beans

Course Outcomes:

Learner will be able to:
CO1: Develop programs using GUI Framework (AWT and Swing).
CO2: Handle events of AWT and Swings components.
CO3: Develop programs to handle events in Java Programming.
CO4: Develop Java programs using networking concepts.
CO5: Develop programs using database.
CO6: Develop programs using Servlets.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practical:

Sr No.	Title of Practical
1	Program to demonstrate use of components like Label, Button, Textbox, Checkbox and Radio Button
2	Design a registration form
3	Demonstrate different layouts
4	Program to create simple calculator using Grid Layout
5	Design a Paint application using MenuBar
6	Write a program to show use of URLConnection class
7	Write a program to implement chat using ServerSocket and Socket class
8	Write a program to implement chat using datagram
9	Write a program to create Session using cookies
10	Write a program to create JDBC connection. Perform CRUD operations

Reference Books:

1. Java Complete Reference, Herbert Schildt, Seventh Edition,TMH.

Course Name: Computer Graphics

Course Code: IT03T

Category: Core

Preamble:

This course introduces students to Computer Graphics that helps to apply various methods and techniques for implementing line- circle drawing, animation, shading, illumination and lighting.

Pre-requisites:

Engineering Graphics (ES01T)

Course Objectives:

- To equipped students with the fundamental knowledge and basic technical competence in the field of computer graphics
- To emphasize on implementation aspect of computer graphics algorithms
- To prepare the students for advanced areas and professional avenues in the field of computer graphics

Course Outcomes:

Learner will be able to:
CO1: Understand the basic concepts of Computer Graphics.
CO2: Demonstrate various algorithms for scan conversion and filling of basic objects and their comparative analysis.
CO3: Apply 2D geometric transformations.
CO4: Apply viewing and clipping on graphical objects.
CO5: Explore 3D geometric transformation, curve representation and projection methods.
CO6: Understand visible surface detection techniques and illumination models.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction and Overview of Graphics System:	•Definition and Representative uses of computer graphics, classification of application areas, Overview of coordinate systems ,definition of scan conversion, rasterization and rendering. •Raster scan & random scan displays, Flat Panel displays like LCD and LED , architecture of raster graphics system with display processor, architecture of random scan systems.	2
2	Scan conversion algorithms	•Scan conversions of point, line, circle and ellipse : DDA algorithm and Bresenham algorithm for line drawing, midpoint algorithm for circle, midpoint algorithm for ellipse drawing (Mathematical derivation for above algorithms is expected) •Filled Area Primitive: Scan line Polygon Fill algorithm, Inside outside tests, Boundary Fill and Flood fill algorithm.	8
3	Two Dimensional Geometric Transformations	•Basic transformations : Translation , Scaling , Rotation •Matrix representation and Homogeneous Coordinates •Composite transformation •Other transformations : Reflection and Shear •Raster method for transformation.	5
4	Two Dimensional viewing and clipping	Two Dimensional Viewing and Clipping •Viewing transformation pipeline and Window to Viewport coordinate transformation •Clipping operations – Point clipping , Line clipping algorithms : Cohen – Sutherland , Midpoint subdivision , Liang – Barsky , Polygon Clipping Algorithms : Sutherland – Hodgeman, Weiler – Atherton.	5
5	Three Dimensional Geometric Transformations and 3D Viewing	3D Transformations : Translation, Rotation , Scaling and Reflection. Composite transformations :Rotation about an arbitrary axis 3D transformation pipeline Projections – Parallel , Perspective.(Matrix Representation) 3D clipping.	6

6	Visible Surface Detection & Illumination Models	Classification of Visible Surface Detection algorithm: Back Surface detection method, Depth Buffer method, Depth Sorting method, Scan line method, Area Subdivision method Basic Illumination Models : Diffused reflection, Phong Specular reflection Model, Polygon Rendering :Constant shading , Gouraud Shading , Phong Shading.	4
Total			**30**

Textbooks:

1. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987
2. Donald D. Hearn and Baker, "Computer Graphics with OpenGL", 4th Edition, ISBN-13: 9780136053583.
3. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2001

Reference Books:

1. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003.
2. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw Hill Publication, 2002.

Course Name: Computer Graphics Lab

Course Code: IT03P

Category: Core

Preamble:

This course introduces students to Computer Graphics that helps to apply various methods and techniques for implementing line- circle drawing, animation, shading, illumination and lighting.

Pre-requisites:

Structured programming Lab (ES04P)

Course Objectives:

- Understanding need of developing graphics application
- Learn algorithmic development of graphics primitives
- Learn representation and transformation of graphical objects

Course Outcomes:

Learner will be able to:
CO1: To implement basic graphical primitives
CO2. To implement are filling algorithms
CO3: To implement two dimensional geometric transformations
CO4: To implement line and polygon clipping
CO5: To implement projection methods
CO6: To implement simple animation

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology

for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Experiments:

Sr No	Experiments
1	Study of graphics functions in C language
2	To implement DDA Line Drawing algorithm and Bresenham Line Drawing algorithm
3	To implement midpoint Circle algorithm and midpoint Ellipse algorithm
4	To implement Area Filling Algorithm: Boundary Fill, Flood Fill.
5	To implement Scan line Polygon Fill Algorithm
6	To implement Geometric Transformations like Translation , Scaling , Rotation , Reflection , Shear
7	To implement Cohen Sutherland and Liang Barsky Line Clipping
8	To implement Sutherland Hodgman Polygon Clipping
9	To perform projection of a 3D object on Projection Plane : Parallel and Perspective
10	Write a program to control a ball using arrow keys.
11	Write a program to implement bouncing ball using sine wave form.
12	Write a program to implement analog clock

Textbooks:

1. James D. Foley, Andries van Dam, Steven K Feiner, John F. Hughes, "Computer Graphics Principles and Practice in C, Pearson, 2nd Edition.
2. "Computer Graphics" C version, Hearn AND Baker, Pearson,2nd Edition

Reference Books:

1. "Procedural Elements for Computer Graphics ",D. Rogers, Tata McGraw-Hill, 2nd edition
2. "Computer Graphics using OpenGL", F.S.Hill , Jr.Pearson,3rd edition

Course Name: Computer Organization and Microprocessor

Course Code: IT04T

Category: Core

Preamble:

The syllabus is designed for the students to learn and understand the basic principles of number systems, binary arithmetic, Boolean algebra and digital logic gates and circuits. It illustrates different methods for simplification of Boolean logic functions. Then the principles of combinational logic circuits, their design and implementation are demonstrated. The fundamental concepts of synchronous sequential logic circuits, starting from different flip flops and their design techniques are exemplified.

Pre-requisites:

Fundamentals of Logic Circuits (ES06T)

Course Objectives:

- Understand the basics of organizational and architectural issues of computer.
- Describe Processor performance improvement using instruction level parallelism
- Understand various data transfer techniques in digital Computer

Course Outcomes:

Learner will be able to:
CO1: To understand the basic structure of the computer system.
CO2: To describe instruction level parallelism and hazards in typical processor pipelines.
CO3: Demonstrate control unit operations and conceptualize instruction level parallelism.
CO4: Categorize memory organization and explain the function of each element of a memory hierarchy.
CO5: Estimate the performance of disk devices and the consumption of CPU time due to interrupt driven and DMA data transfer.
CO6: Develop simple assembly language programs for arithmetic, code conversion and sorting operations, with an understanding of architecture and interrupt processing of Intel x86 CPUs

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	overview of computerand computer arithmetic	Introduction of Computer Organization and Architecture. Basic organization of computer and block level description of the functional units. Evolution of Computers, Von Neumann model. basics of floating-point representation IEEE 754 floating point (Single & double precision) number representation. Booth's algorithm. Division of integers: Restoring and non-restoring division	6
2	Processor Organization and Architecture	Von Neumann model, Harvard Architecture, Register Organization, Instruction formats, addressing modes, instruction cycle. Instruction interpretation and sequencing, ALU and Shifters, Basic pipelined Datapath and control, Data dependences, data hazards, Branch hazards, delayed branches, branch prediction, Performance measures – CPI, speedup, efficiency, throughput and Amdahl's law. Introduction to parallel processing concepts, Flynn's classifications	6
3	Control Unit Design	Hardwired control unit design methods: State table, delay element, sequence counter with examples like control unit for multiplication and division, Microprogrammed control Unit: Microinstruction sequencing and execution, Micro	6
4	Memory organization	Characteristics and hierarchy of memory, Cache memory principles and operation. Main memory, DRAM and SRAM, Cache design, mapping functions and replacement algorithms, Types of ROMs, memory module organization	6
5	IO Organization	Input/output systems, I/O module-need & functions and Types ofdata transfer techniques: Programmed I/O, Interrupt driven I/O and DMA	2
6	Microprocessor	Architecture of 8086 Family, Instruction Set, Addressing Modes, Assembler Directives, and assembly language programming	6
Total			**30**

Textbooks:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, Fifth Edition, TataMcGraw-Hill.
2. William Stallings, Computer Organization and Architecture: Designing for Performance, EighthEdition,, Pearson
3. John Uffenbeck, 8086/8088 family: Design Programming and Interfacing, (Pearson Education

Reference Books:

1. Govindarajulu,, Computer Architecture and Organization: Design Principles and Applications, Computer Architecture and Organization: Design Principles and Applications, Tata McGraw-Hill
2. Dr. M. Usha, T. S. Srikanth, Computer System Architecture and Organization, First Edition,Wiley-India.
3. John P. Hayes, Computer Architecture and Organization, Third Edition., McGraw-Hill
4. K Bhurchandi, Advanced Microprocessors & Peripherals, Tata McGraw-Hill Education

Course Name: Computer Organization and Microprocessor Lab

Course Code: IT04P

Category: Core

Preamble:

The syllabus is designed for the students to learn and understand the basic principles of number systems, binary arithmetic, Boolean algebra and digital logic gates and circuits. Then the principles of combinational logic circuits, their design and implementation are demonstrated. The fundamental concepts of synchronous sequential logic circuits, starting from different flip flops and their design techniques are exemplified.

Pre-requisites:

Fundamentals of Logic Circuits Lab (ES06P)

Course Objectives:

- Learn assembling and disassembling of PC
- Design, simulate and implement different digital circuits
- Get hands on experience with Assembly Language Programming

Course Outcomes:

Learner will be able to:
CO1: Demonstrate various components and peripheral of computer system.
CO2: Analyze and design combinational circuits.
CO3: Build a program on a microprocessor using arithmetic & logical instruction set of 8086.
Co4: Develop the assembly level programming using 8086 loop instruction set.
CO5: Write programs based on string for 8086 microprocessor.
CO6: Develop assembly level programs using recursion for 8086 microprocessor.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	**ISA**	**MSE**	**ESE**	**Total**
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Experiments:

Sr No	Experiments
1	Study of PC Motherboard Technology. Assembling & disassembling of PC.
2	A) Verify truth table of logic gates, B)Design half adder using gates and multiplexers
3	Study of Turbo Assembler, Linker and Debugger tools – Introduction to AssemblerDirectives.
4	8086 Assembly Language Program for Simulation of Simple Calculator – (a) Addition (b) Subtraction (c) Multiplication (d) Division and multi byte addition.
5	8086 Assembly Language Program for Conversions– (a) Packed to Unpacked BCD (b)Unpacked to Packed BCD (c) Packed BCD to ASCII
6	8086 Assembly Language Program to – Find from block of Numbers (a) Block Copy (b) Block Copy with and without StringInstructions (c) Block Exchange.
7	8086 Assembly Language Program to – (a) Count Odd and Even Numbers from the given block of Numbers (b) CountingFrequency of Occurrence of a Number.
8	8086 Assembly Language Program to – Arrange the Numbers in (a) Ascending Order (b) Descending Order.
9	8086 Assembly Language Program to – Find whether a string is Palindrome or not.
10	8086 Assembly Language Program to – Compute the factorial of a positive integer ‘n’ using recursive procedure.

Textbooks:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, Fifth Edition, Tata McGraw-Hill.
2. William Stallings, Computer Organization and Architecture: Designing for Performance, Eighth Edition,, Pearson
3. John Uffenbeck, 8086/8088 family: Design Programming and Interfacing, (Pearson Education)

Reference Books:

1. B. Govindarajulu,, Computer Architecture and Organization: Design Principles and Applications, Computer Architecture and Organization: Design Principles and Applications, Tata McGraw-Hill
2. Dr. M. Usha, T. S. Srikanth, Computer System Architecture and Organization, First Edition, Wiley-India.
3. John P. Hayes, Computer Architecture and Organization, Third Edition., McGraw-Hill
4. K Bhurchandi, Advanced Microprocessors & Peripherals, Tata McGraw-Hill Education

Course Name: Biology

Course Code: BS17

Category: Basic Science

Preamble:

This course introduces students to virology and its related terms and concept. It also introduces basic concepts of the nervous system, biological immune system and computational neuroscience. This course will help the learners understand the mathematical models that are inspired from the corresponding biological models/processes and are extensively used in machine learning, deep learning, artificial immune system, computer security, artificial intelligence, etc.

Pre-requisites:

Nil

Course Objectives:

- Enable the learner to understand the concepts of virology
- Enable the learner to understand the structure and functioning of the nervous system
- Enable the learner to understand basics of natural immune systems
- Enable the learner to understand basics of computational neuroscience
- Enable the learner to understand the derivation of mathematical models from their biological counterparts

Course Outcomes:

Learner will be able to:
CO1: To develop an understanding of the virology
CO2: To understand the structure and functioning of biological nervous system
CO3: To understand Principles of natural immune system
CO4: To understand working principles of biological neural system

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Virology	Virus structure and morphology. Viruses of veterinary importance. Important virus families, their replication strategies,	5
2	Nervous System	Neuron structure, anatomy in vertebrates: central & peripheral Nervous systems, Functions of the Nervous system: Neurons & Synapses, Neural circuits and systems, Reflexes & other stimulus response circuits, Intrinsic pattern generation	5
3	Immunology	Introduction and history; Components of Immune system: Innate & Adaptive. Primary and secondary organs of the immune system, Cells of the immune system	5
4	Computational Neuroscience-I Single Neuron Modeling	Ion flux in membranes, Nernst Planck Equation, Ion-Channels, Excitable membranes, Spiking, Hodgkin Huxley models, Integrate and Fire Neurons	5
5	Computational Neuroscience-II Neural Encoding and Decoding	Spike train statistics, Receptive fields, Linear and Nonlinear models of Receptive fields, Applications of Information Theory in neural coding and decoding	5
6	Computational Neuroscience-III Plasticity:	Synapses: structure and function, plasticity, Spike Timing Dependent Plasticity (STDP), Learning rules, Supervised and Unsupervised Learning, Classical conditioning, Reinforcement	5
Total			**30**

Textbooks:

1. Fields Virology Vol 1 and 2. B.N. Fields, D.M. Knipe, P.M. Howley, R.M. Chanock, J.L. Melnick, T.P. Monath, B. Roizman, and S.E. Straus, eds.), 3rd Edition. Lippincott-Raven, Philadelphia, PA.
2. Principles of anatomy & physiology, Tortora & G.J.Derricson, J. Willey publication (15th edition)
3. Dayan, Peter, and L. F. Abbott. Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems. Cambridge, MA: MIT Press, 2001. ISBN: 9780262041997.

Reference Books:

1. Principles of Virology: Molecular Biology, Pathogenesis, and Control of Animal Viruses. S. J. Flint, V. R. Racaniello, L. W. Enquist, V. R. Rancaniello, A. M. Skalka. Latest edition / Pub. Date: December 2003 Publisher: American Society Microbiology--- Chapters 3-13.
2. Nervous system, Columbia Encyclopedia. Columbia University Press

Detailed syllabus of Second Year Semester-IV

Course Name: Principles of Economics and Management

Course Code: HS06

Category: Humanities, Social Sciences and Management

Preamble:

The subject introduces basic concepts of Economics such as demand & supply, market structure, fiscal policy and international trade. It also introduces business lifecycle and currency exchange.

Pre-requisites:

Nil

Course Objectives:

- To have a basic understanding of micro-economic and macroeconomic concepts.
- To enable the students to understand both the theory and practice of managerial economics.
- To introduce theories and concepts in micro-economics for managerial decision making,
- To help the students in applying the knowledge so acquired in policy planning and managerial decision making.

Course Outcomes:

Learner will be able to:

CO1: Critically assess and describe the environment and the main determinants of demand and competition facing the firm.

CO2: Distinguish between the different market structures and pricing practices available to and used by firms.

CO3: Use the tools of economic theory to explain optimal production and pricing decisions by the firm in each market structure.

CO4: Understand Business Cycles, GDP measures, Inflation and Deflation, and Unemployment measure

CO5: Understand Monetary System – Basics of Monetary and Fiscal Policy, Economic Growth and Development

CO6: Understand International Trade and Capital Flows Currency Exchange Rates, describe various exchange rate regimes.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Tutorial	Theory	Tutorial
2	1	2	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory & Tutorial	40	20	40	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module name	Content	No. of Hours
1	Topics in Demand and Supply Analysis	Calculate and interpret price, income, and cross-price Elasticities of demand, compare substitution and income effects, distinguish between normal goods and inferior goods, phenomenon of diminishing marginal returns, economies of scale and diseconomies of scale	4
2	The Firm and Market Structures	Characteristics of perfect competition, monopolistic competition, oligopoly, and pure monopoly, relationships between price, marginal revenue, marginal cost, economic profit, and the elasticity of demand under each market structure, optimal price and output for firms, factors affecting long-run equilibrium, pricing strategy, type of market structure within which a firm operates	5
3	Aggregate Output, Prices, and Economic Growth	Gross domestic product (GDP) using expenditure and income approaches, compare nominal and real GDP and calculate GDP deflator, compare GDP, national income, personal income, and personal disposable income, fundamental relationship among saving, investment, the fiscal balance, and the trade balance. IS and LM curves and how they combine to generate the aggregate demand curve, causes of movements along and shifts in aggregate demand and supply curves, distinguish between the following types of macroeconomic equilibria	5
4	Understanding Business Cycles	Business cycle and its phases, theories of the business cycle, unemployment and compare measures of unemployment, explain inflation, hyperinflation, disinflation, and deflation, inflation measures, including their uses and limitations, distinguish between cost-push and demand-pull inflation	4
5	Monetary and Fiscal Policy	Compare monetary and fiscal policy, functions and definitions of money, theories of the demand for and supply of money, the Fisher effect, roles and objectives of central banks, qualities of effective central banks, monetary transmission mechanism, relationships between monetary policy and economic	4

		growth, inflation, interest, and exchange rates, roles and objectives of fiscal policy, tools of fiscal policy, including their advantages and disadvantages	
6	International Trade and Capital Flows	Compare gross domestic product and gross national product, distinguish between comparative advantage and absolute advantage, compare types of trade and capital restrictions and their economic implications, describe the balance of payments accounts including their components; explain how decisions by consumers, firms, and governments affect the balance of payments; describe functions of World Bank, the International Monetary Fund, and the World Trade Organization	4
7	Currency Exchange Rates	Exchange rate and distinguish between nominal and real exchange rates and spot and forward exchange rates, calculate and interpret the percentage change in a currency relative to another currency, explain the arbitrage relationship between spot rates, forward rates, and interest rates, calculate and interpret a forward discount or premium, describe exchange rate regimes	4
Total			**30**

Suggested List of Tutorials:

1. Understand how prices get determined in markets, how market participants benefit in the form of consumer surplus and producer surplus, and the consequences of government intervention.
2. Derive the equilibrium conditions for cost minimization and profit maximization for 2 companies.
3. List the different goals and constraints that firms face.
4. Calculate Indian gross domestic product (GDP) using expenditure and income approaches
5. Compare GDP, national income, personal income, and personal disposable income for India
6. Explain the relationships between monetary policy, currency conversion, and exchange rates

Textbook:

1. Mankiw, N Gregory. (2011). Economics: Principles and Applications. Cengage Lrng.
2. Lipsey, Richard; Christal, Alec. (2007). Economics (2nd Edition) Oxford Univ Press.
3. Prof. Sahuraja, R.R. (December 2015). Managerial Economics (2ndEdition)

Reference Books:

1. Hirschey, Mark. Economics for Managers
2. Salvatore, Dominik; Rastogi, Siddharth. Managerial
3. Mankiw, N G. Ten Principles of Economics (PPT)
4. Banerjee and Warrier. (2018). "Macroeconomics – Theories and Applications". Sage Publications

Course Name: Engineering Mathematics-IV

Course Code: BS07

Category: Basic Science

Preamble:

This course introduces Linear Algebra, Fourier Series, Fourier Transform, Linear & Non-linear Programming Problems. It also gives introduction to Operation Research and basic Statistical Techniques which will be useful to the learner in Data Science domain.

Pre-requisites:

Nil

Course Objective:

- To provide students with sound foundation in applied mathematics to solve real life problems in industry.
- To provide hands on experience in using Open Source Software like SAGE/ R/PYTHON to handle real life problems.

Course Outcomes:

Learner will be able to:
CO1: Compute the rank of quadratic form and interpret its significance.
CO2: Compute Fourier series of periodic functions.
CO3: Compute the Fourier transform and inverse Fourier transform of elementary functions
CO4: Apply LPP and NLPP technique to optimize the functions.
CO5: Apply various techniques of Operation research to solve transportation and assignment problems.
Co6: Interpret the correlation and regression between two variables.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module	Detailed Contents	Hrs.
01	**Module-1: Linear Algebra: Quadratic Forms** Quadratic forms over real field, Rank Index and Signature of Quadratic forms. Class of Quadratic forms, reduction of quadratic forms to a Canonical form using congruent and orthogonal transformation.	6
02	**Module-2: Fourier Series:** Dirichlet's conditions, Definition of Fourier series and Parseval's Identity(without proof). Fourier series of periodic function with period.Fourier series of even and odd functions. Half range Sine and Cosine Series.	8
03	**Module-3: Fourier Transform** Fourier Integral Theorem (statement only). Fourier transform of a function, Fourier Sine and Cosine Integral Theorem (statement only). Fourier Cosine and Sine transform of elementary functions. Properties of Fourier Transform. Convolution Theorem and Inverse Fourier Transform.	8
04	**Module-4: Linear and Non-Linear Programming Problems** Simplex method. Artificial variables, Big-M method (Method of penalty) Duality, Dual of LPP, NLPP with one equality constraint (two or three variables) using themethod of Lagrange's multipliers, NLPP with two equality constraints, NLPP with inequality constraint: Kuhn-Tucker conditions	10
05	**Module-5: Operation research** Transportation problem, Assignment Problems, Game Theory zero sum problems only	5
06	**Module-6: Statistical Techniques** Karl Pearson's coefficient of correlation (r), Spearman's Rank correlation coefficient (R) (with repeated and non-repeated ranks), Lines of regression	8
Total		**45**

Reference Books:

1. A text book of Applied Mathematics, P.N.Wartikar and J.N.Wartikar, Vol – I and –II by PuneVidyarthiGraha.
2. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
3. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley EasternLimited, 9thEd.
4. Matrices, Shanti Narayan.S. Chand publication
5. Operation Research ,T. Madhavan, Willey

Course Name: Operating Systems

Course Code: IT05T

Category: Core

Preamble:

This course will make students to understand the main components of an OS & their functions. To study the concepts and implementation of Process management, Memory management and file management. This will help students to study the need for special purpose operating system with the advent of new emerging technologies.

Pre-requisites:

Computer Organization & Microprocessor (IT04T)

Course Objectives:

- To understand the major components of Operating System & its functions.
- To introduce the concept of a process and its management like transition, scheduling, etc.
- To understand basic concepts related to Inter-process Communication (IPC)
- To understand the concepts and implementation of memory management policies and virtual Memory.
- To understand functions of Operating System for storage management and device management.
- To study the need and fundamentals of special-purpose operating system with the advent of new emerging technologies.

Course Outcomes:

Learner will be able to:
CO1: Describe the important computer system resources and the role of operating system in their management policies and algorithms.
CO2: Understand the process management policies and scheduling of processes by CPU.
CO3: Evaluate the requirement for process synchronization and coordination handled by operating system.
CO4: Describe and analyse the memory management and its allocation policies.
CO5: Identify use and evaluate the storage management policies with respect to different storage management technologies.
CO6: Identify the need to create the special purpose operating system.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module no	Module name	Content	No of Hours
1	Overview of Operating System	Introduction: Operating System Structure and operations, Operating system services and interface, System calls and its types, System programs, Operating System Design and Implementation, OS structure, OS debugging and generation, System boot.	3
2	Process Management	Process concept: Process Scheduling, Operation on process and Inter-process communication; Multithreading, Process: Multithreading models and thread libraries, threading issues; Process Scheduling: Basic concepts, Scheduling algorithms and Criteria, Thread Scheduling and Multiple Processor Scheduling.	7
3	Process coordination	Synchronization: The critical Section Problem, Peterson's Solution, Semaphores, Classic problems of synchronization, monitors, Deadlocks: System Model, Deadlock Characterization , Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	6
4	Memory Management	Memory Management strategies: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation; Virtual Memory Management: Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files.	6
5	Storage Management	File system: File Concept , Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection; Implementing file System: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, NFS.	4

6	Distributed Systems	Distributed operating System: Network based OS, Network Structure and Topology, Communication Structure and Protocols; Distributed File system: Naming and transparency, Remote file access, Stateful Versus Stateless Service, File Replication; Distributed Synchronization: Mutual Exclusion, Concurrency Control and Deadlock Handling,	4
Total			**30**

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Greg Gagne, Peter Baer Galvin, 8th edition Wiley.
2. Modern Operating System, Tanenbaum, Pearson Education.
3. Operating Systems: Internal and Design Principles: William Stallings, PHI

Reference Books:

1. Operating System Design and Implementation, A Tanenbaum, Pearson.
2. Real Time Systems Design and Analysis, Wiley, IEEE Press.
3. Principles of Operating Systems: Naresh Chauhan, Oxford Higher Education

Course Name: Operating Systems Lab

Course Code: IT05P

Category: Core

Pre-requisites:

Structured Programming Lab (ES04P)

Preamble:

This course will make students to understand the main components of an OS & their functions. To study the concepts and implementation of Process management, Memory management and file management. This will help students to study the need for special purpose operating system with the advent of new emerging technologies.

Course Objectives:

- To gain practical experience with designing and implementing concepts of operating systems such as system calls, CPU scheduling, process management, memory management, file systems and deadlock handling using C language in Linux environment.
- To familiarize students with the architecture of Linux OS.
- To provide necessary skills for developing and debugging programs in Linux environment.
- To learn programmatically to implement simple operation system mechanisms

Course Outcomes:

Learner will be able to:
CO1: Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux
CO2: Implement various process scheduling algorithms and evaluate their performance
CO3: Implement and analyze concepts of synchronization and deadlocks.
CO4: Implement various Memory Management techniques and evaluate their performance.
CO5: Implement and analyze concepts of virtual memory.
CO6: Demonstrate and analyze concepts of file management and I/O management techniques.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals

Learners are expected to perform practicals based on the following suggested topics.

Sr No	Suggested Topic(s)
1	Explore usage of basic Linux Commands and system calls for file, directory and process management.
2	Write shell scripts to do the following: a. Display OS version, release number, kernel version b. Display top 10 processes in descending order c. Display processes with highest memory usage. d. Display current logged in user and log name. e. Display current shell, home directory, operating system type, current path setting, current working directory.
3	Write a program to demonstrate the concept of non-preemptive scheduling algorithms.
4	Write a program to demonstrate the concept of preemptive scheduling algorithms
5	Write a C program to implement solution of Producer consumer problem through Semaphore
6	a. Write a program to demonstrate the concept of deadlock avoidance through Banker's Algorithm b. Write a program demonstrate the concept of Dining Philospher's Problem
7	Write a program to demonstrate the concept of dynamic partitioning placement algorithms
8	a. Write a program to demonstrate the concept of demand paging for simulation of Virtual Memory implementation b. Write a program in C demonstrate the concept of page replacement policies for handling page faults eg: FIFO, LRU etc.
9	a. Write a C program to simulate File allocation strategies typically sequential, indexed and linked files b. Write a C program to simulate file organization of multi-level directory structure
10	Write a program in C to do disk scheduling - FCFS, SCAN, C-SCAN

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Greg Gagne, Peter Baer Galvin, 8th edition Wiley.
2. Modern Operating System, Tanenbaum, Pearson Education.
3. Operating Systems: Internal and Design Principles: William Stallings, PHI

Reference Books:

1. Operating System Design and Implementation, A Tanenbaum, Pearson.
2. Real Time Systems Design and Analysis, Wiley, IEEE Press.
3. Principles of Operating Systems: Naresh Chauhan, Oxford Higher Education

Course Name: Computer Networks

Course Code: IT06T

Category: Core

Preamble:

This course is to provide students with an overview of the concepts and fundamentals of computer networks. To understand the protocol layering and physical level communication. This subject will help to analyse the performance of a network. It helps to learn the functions of OSI & TCP/IP model and the various routing protocols.

Pre-requisites:

Fundamentals of Computer Hardware and Networking **(**ES06T)

Course Objectives:

- Discuss the fundamentals of networks for data communication and transmission.
- Describe the various techniques for both analog and digital data communication and its standards.
- Apply the various error detection and correction techniques to solve collisions problems.
- Identify and classify the various network layer protocols to apply in various networks.
- Discuss the various protocols and techniques used in transport layer and application layer.

Course Outcomes:

Students will be able to:
CO1: Describe the functions of each layer in OSI and TCP/IP model.
CO2: Explain the types of transmission media with real time applications.
CO3: Describe the functions of data link layer and explain the protocols.
CO4: Classify the routing protocols and analyze how to assign the IP addresses for the given network.
CO5: Describe the Session layer design issues and Transport layer services.
CO6: Explain the functions of Application layer and Presentation layer paradigms and Protocols.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	**ISA**	**MSE**	**ESE**	**Total**
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to Computer Networks	Introduction: Definition of a Computer Network; What is a Network? Components of a computer network: Use of Computer networks; Networks for companies, Networks for people, Social Issues: Classification of networks; Local area networks, Metropolitan area networks, Wide area networks, Networks Software; Protocol hierarchy, Design issues for the layers, Merits and De-merits of Layered Architecture, Reference models; The OSI Reference Model, The TCP/IP Reference Model, Comparison of the OSI & the TCP/IP Reference Models.	6
2	Physical Layer	Introduction: Network topologies; Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison, Considerations when choosing a Topology: Switching; Circuit switching, Message switching, Packet switching, Multiplexing; FDM – Frequency division multiplexing, WDM – Wavelength division multiplexing, TDM – Time division multiplexing, Transmission medium; Guided & Unguided Transmission medium.	4
3	Data Link Layer	Design issues of DLL, ARQ strategies: Error Detection and correction, Data Link layer protocols: HDLC and PPP, The channel allocation problem, Multiple access protocols: ALOHA, Slotted ALOHA, CSMA Protocol, CSMA/CD Protocol, CSMA/CA Protocol, Random Access channel, Controlled Access channel, Channelization.	6
4	Network Layer	Design issues of Network layer, Principles of Routing; Types of routing algorithms, Classes of routing algorithms, Properties of routing algorithms, Routing algorithms; Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Link state routing,Congestion control mechanism, Protocols: RIP,OSPF,BGP. IPv4 and IPv6 Protocol, Subnetting, Supernetting. IPv6 Addressing, Transition from IPV4 to IPV6	6

5	Transport and Session Layer	Transport Layer Services, Connectionless & Connection-oriented Protocols, Transport Layer protocols: User Datagram Protocol: UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, A TCP Connection, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers. Session Layer: Session layer design issues, Session Layer protocol - Remote Procedure Call (RPC),	4
6	Presentation and Application Layer	Compression: Comparison between Lossy Compression and Lossless Compression, Huffman Coding, Speech Compression, LZW, RLE, Image Compression – GIF, JPEG. Application layer: Standard Client-Server Protocols: World Wide Web, HTTP, FTP, Electronic Mail, Domain Name System (DNS), SNMP	4
Total			**30**

Textbooks:

1. Behrouz A. Forouzan, Forouzan Mosharrat , Computer Networks A Top down Approach, Mc Graw Hill education.
2. Andrew S Tanenbaum, Computer Networks -, 4th Edition, Pearson Education.
3. Ranjan Bose, Information Theory, Coding and Cryptography, Ranjan Bose, Tata McGrawHill , Second Edition.
4. Diane Teare, Authorized Self- Study Guide Designing for CISCO Internetwork Solutions(DESGN), Second Edition.

Reference Books:

1. Andrew S Tanenbaum, Computer Networks -, 4th Edition, Pearson Education.
2. Behrouz A. Forouzan, Data Communications and Networking, 4th Edition, Mc Graw Hill education.S. Keshav, An Engineering Approach to Computer Networks, 2nd Edition, Pearson Education.
3. B. A. Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill edition, Third Edition.
4. Ranjan Bose, Information Theory, Coding and Cryptography, Ranjan Bose, Tata McGrawHill , Second Edition.
5. Khalid Sayood, Introduction to Data Compression, Third Edition, Morgan Kaufman.

Course Name: Computer Networks Lab

Course Code: IT06P

Category: Core

Preamble:

This course is to provide students with an overview of the concepts and fundamentals of computer networks. To understand the protocol layering and physical level communication. This subject will help to analyse the performance of a network. It helps to learn the functions of OSI & TCP/IP model and the various routing protocols.

Pre-requisites:

Fundamentals of Computer Hardware and Networking Lab **(**ES06P), Structured Programming Lab (ES04P)

Course Objectives:

- To get familiar with the basic network administration commands
- To install and configure network simulator and learn basics of TCL scripting.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To implement client-server socket programs.
- To observe and study the traffic flow and the contents of protocol frames.
- To design and configure a network for an organization

Course Outcomes:

Learner will be able to:
CO1: Execute and evaluate network administration commands and demonstrate their use in different network scenario
CO2: Demonstrate the installation and configuration of network simulator.
CO3: Demonstrate and measure different network scenarios and their performance behavior.
CO4: Implement the socket programming for client server architecture.
CO5: Analyze the traffic flow of different protocols
CO6: Design a network for an organization using a network design tool

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals

Learners are expected to perform practicals based on the following suggested topics.

Sr No	Suggested Topic(s)
1	Study, understand and perform various networking commands: Ping, Tracert, trace route, ipconfig, ifconfig, nslookup, netstat
2	Installation and configuration of NS2- Introduction to TCL Hello Programming
3	Simulate a simple wired Network in various topologies using NS2
4	Simulate a simple wireless Network using NS2 and Analyse Packet Delay, Packet Loss and Throughput of Networks
5	Write a program for error detecting code (CRC and Checksum)
6	Write a program to find the shortest path between Source and Destination using Dijkstra's Routing algorithm
7	Implement the Bit stuffing framing method in Data Link Layer
8	Installation and configuration of Cisco packet tracer Design various network topologies using CPT: Bus, star, Ring and mesh
9	Installation and configuration of Wireshark tool Study the packet transmission using Wireshark and understand/visualize the IP protocol
10	Perform Socket Programming with C/Java 1.TCP Client, TCP Server

Text Books:

1. Computer Network Simulation in NS2 Basic Concepts and Protocol Implementation.-Prof Neeraj Bhargava,Pramod
2. Singh Rathore,Dr.Ritu Bhargava,Dr.Abhishek Kumar, First Edition.BPB Publication.
3. Packet analysis with Wire shark, Anish Nath, PACKT publishing
4. TCP/IP Protocol Suite 4th Edition by Behrouz A. Forouzan

Reference Books:

1. NS2.34 Manual
2. Practical Packet Analysis: Using Wireshark to Solve Real-World Network Problems by Chris Sanders

Course Name: Database Management Systems

Course Code: IT07T

Category: Core

Preamble:

Database Management Systems course is intended to deliver students the elementary concepts of a database management system. It also introduces advanced level areas like transaction processing, concurrency control and recovery management.

Pre-requisites:

Data Structures & Analysis (IT01T)

Course Objectives:

- To learn the basics and understand the need of database management system.
- To construct conceptual data model for real world applications
- To Build Relational Model from ER/EER.
- To introduce the concept of SQL to store and retrieve data efficiently.
- To demonstrate notions of normalization for database design.
- To understand the concepts of transaction processing- concurrency control & recovery procedures.

Course Outcomes:

Learner will be able to:
CO1: Identify the need of Database Management System.
CO2: Design conceptual model for real life applications.
CO3: Create Relational Model for real life applications
CO4: Formulate query using SQL commands.
CO5: Apply the concept of normalization to relational database design.
CO6: Demonstrate the concept of transaction, concurrency control, and recovery.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module no.	Module Name	Content	No of Hours
1	Introduction to Database Systems	Introduction, Characteristics of Database, File system v/s Database system, Advantages and disadvantages of database, Data abstraction, Data independence, Database users, database languages, DBMS system architecture, Database Administrator (DBA), Role of DBA	4
2	The Entity-Relationship Model	The Entity-Relationship (ER) Model, Entity and its types, Attributes and types of attributes, Relationship Types, Relationship Sets, Mapping Cardinality, ER diagram Generalization, Specialization, Aggregation, Extended Entity-Relationship (EER) Model.	4
3	Relational Model & Relational Algebra	Introduction to Relational Model, Relational Model Constraints and Relational Database Schemas, Concept of Keys: Primary Kay, Secondary key, Foreign Key, Mapping the ER and EER Model to the Relational Model, Introduction to Relational Algebra, Relational Algebra Operators, Relational Algebra Queries	5
4	Structured Query Language (SQL)	Overview of SQL, Data Definition Commands, Set Operations, nullvalues, Data Manipulation Commands, Data Control Commands, Complex Retrieval Queries using Group By, Nested queries, Integrity constraints in SQL. Security and authorization: Grant & Revoke in SQL, Aggregate functions, Hierarchical retrieval of data Functions and Procedures in SQL, cursors.Trigger and its types	7
5	Relational Database Design	Design guidelines for relational Schema, Functional Dependencies and types, Database tables and normalization, Need for normalization, Definition of Normal Forms- 1NF, 2NF, 3NF & The Boyce-Codd Normal Form (BCNF), introduction to multi valued dependency	6

Module no.	Module Name	Content	No of Hours
6	Transaction Management, Concurrency & Recovery	Transaction concept, State Diagram, ACID Properties, Transaction Control Commands, Concurrent Executions, Serializability – Conflict and View, Concurrency Control: Lock-based-protocols, Deadlock handling Timestamp-based protocols Recovery System: Recovery Concepts, Log based recovery methods.	6
Total			**30**

Text Books:

1. Korth, Slberchatz, Sudarshan, Database System Concepts, 6th Edition, McGraw Hill
2. Elmasri and Navathe, Fundamentals of Database Systems, 6th Edition, Pearson education

Reference Books:

1. Raghu Ramkrishnan and Johannes Gehrke, Database Management Systems, TMH
2. Peter Rob and Carlos Coronel, — Database Systems Design, Implementation and Management, Thomson Learning, 9th Edition.
3. SQL & PL / SQL for Oracle 11g Black Book, Dreamtech Press
4. G. K. Gupta : "Database Management Systems", McGraw – Hill

Course Name: Database Management Systems Lab

Course Code: IT07P

Category: Core

Preamble:

Database Management Systems course is intended to deliver students the elementary concepts of a database management system. It also introduces advanced level areas like transaction processing, concurrency control and recovery management.

Pre-requisites:

Structured Programming Lab (ES04P)

Course Objectives:

- To identify and define problem statements for real life applications
- To construct conceptual data model for real life applications
- To Build Relational Model from ER/EER and demonstrate usage of relational algebra.
- To Apply SQL to store and retrieve data efficiently

Course Outcomes:

Learner will be able to:
CO1: Design ER model for given real world application
CO2: Design Relational model for real world application
CO3: Write and execute DDL statements
CO4: Write and execute DML statements
CO5: Write and execute TCL statements
CO6: Design PL/SQL procedures and functions

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals

Learners are expected to perform practicals based on the following suggested topics.

Sr No	Suggested Topic(s)
1	Identify real world problem and develop the problem statement. Design an Entity- Relationship (ER) / Extended Entity- Relationship (EER) Model.
2	Mapping ER/EER to Relational schema model.
3	Create a database using DDL and apply integrity constraints.
4	Perform data manipulations operations on populated database.
5	Perform Authorization using Grant and Revoke.
6	Implement Basic and complex SQL queries.
7	Implementation of Views and Triggers.
8	Demonstrate database connectivity using JDBC.
9	Execute TCL commands.
10	Implement functions and procedures in SQL
11	Implementation of Cursor.
12	Mini Project

Text Books:

1. SQL & PL / SQL for Oracle 11g Black Book, Dreamtech Press

Reference Books:

1. G. K. Gupta : "Database Management Systems", McGraw – Hill

Course Name: Skill Based Lab - Python

Course Code: IT08

Category: Core

Preamble:

Python is next generation multi-purpose programming language, that allows different users to create applications of various domains. Students will be able to learn primary fundamentals of python programming and potential of python is to achieve modern computing requirements.

Pre-requisites:

Object Oriented Programming (ES05T)
Object Oriented Programming Lab (ES05P)

Course Objectives:

- Acquire basic programming skills in Python.
- Understand various Object-oriented programming concepts in Python
- Understand basic python libraries

Course Outcomes:

Learner will be able to:
CO1: Demonstrate the basic concepts of python programming with the help of data types, operators and expressions, console input/output
CO2: Use various decision making statements and functions
CO3: Demonstrate operations on various builtin types like list,tuple,set and dictionary
CO4: Identify object-oriented programming constructs for developing large, modular and reusable real-time programs CO5: To create arrays and manipulate them using numpy library
CO6: Learn the fundamentals of matplotlib and pandas library

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	4	-	2

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of practical

Learners are expected to perform practical based on the following suggested topics.

Sr. No.	Suggested Topic(s)
1	Implement programs using Input and output functions
2	Implement a programs using if else control statement
3	Implement programs using looping constructs
4	Implement programs using user defined functions
5	Implement Programs to demonstrate various functions on Lists and tuples
6	Implement programs to perform functions on Sets and dictionaries
7	Implement programs on arrays using numpy
8	Implement programs on basic concepts of OOP.
9	Implement programs on concept of abstract classes
10	Implement programs using matplotlib library
11	Implement programs using pandas library

Reference Books:

1. James Payne, "Beginning Python: Using Python and Python 3.1,Wrox Publication
2. Dr. R. Nageswara Rao,Core Python Programming , Dreamtech Press, Wiley Publication.
3. Magnus Lie Hetland,Beginning Python From Novice to Professional, Second Edition, Apress Publication.

Appendix A

General Education (GE) Sub-Categories

GE Sub-Category	GE Sub-Category Code
Arts	A
Social and Behavioral Science	SB
Creativity and Innovation	CI
Political Science	PS
Physical Education and Wellness	PEW
Finance	F
Natural Science	NS
Wonders of Infrastructure	WI

Courses under General Education (GE) Category

Course Code	Course Name	Credits
GEA01	Voice Culture for Professional Speaking	2
GEA02	Various Dance Forms	2
GEA03	Exploring Indian Art	2
GESB01#	Social Service Internship/ Project	3
GESB02	Universal Human Values	2
GESB03	Indian Traditional Knowledge System	2
GESB04	Corporate and Social Etiquettes	2
GESB05	Global Citizenship Education	2
GESB06	Responsibility towards sustainable environment	2
GESB07	Psychology	2
GECI01	Design Thinking	3
GECI02	Innovation and Entrepreneurship	1
GEPS01	Indian Constitution	2
GEPS02	Four Pillars of Democratic Nation	2
GEPEW01	Wellness – Body, Mind & Spirit	2
GEPEW02	IQ vs EQ	2
GEPEW03	Nutrition and Physical Wellness	2
GEF01	Basics of Finance & Legal aspects for Business	2
GEF02	Financial Management for beginners	2
GENS01	Facets of Astronomy	2
GENS02	Modern Farming	2
GEWI01	Railways - Wonders of Infrastructure	2
GE01$	Internship with other Institutes (Credit Transfer)	4

 # For GESB01- Social Service Internship/ Project: 2 hours / week slot will be provided during the semester (in regular timetable). Additional work of 60 hours needs to be completed during the semester (besides regular timetable) or after the semester (during inter semester break).
$ For GE01- Internship with other Institutes (Credit Transfer): Internship with other reputed institutes equivalent to 4 credits is recommended to be done by learner during second year inter semester break (i.e. summer break between semester 4 and semester 5).

Note: 07 credits, of required 14 credits, under GE category are exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the AY 2023-24 onwards. Such students can opt for any courses from the above list to fulfil the required credits for the award of degree.

(Draft Copy of Programme Scheme (R-2022), Subject to approval of Academic Council, Vidyalankar Institute of Technology)