Academic Program: UG

Academic Year 2019-20

Syllabus

V & VI Semester B.E.

Information Science and Engineering

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,

DHARWAD – 580 002

(An Autonomous Institution recognized by AICTE & Affiliated to VTU, Belagavi)

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SDM College of Engineering & Technology, Dharwad

Date: 18-7-2019

It is certified that the scheme and syllabus for **V&VI** semester of UG program in **Information Science & Engineering** is recommended by Board of Studies of **Information Science & Engineering** Department and approved by the Academic Council, SDM College of Engineering &Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2019-20 till further revision.

Principal Chairman BoS&HoD

SDM College of Engineering & Technology, Dharwad

Department of **Information Science & Engineering**

(Our motto: Innovation through Information Technology)

College Vision and Mission

Vision:

To develop competent professionals with human values.

Mission:

1. To have contextually relevant Curricula.
2. To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
3. To enhance Research Culture.
4. To involve Industrial Expertise for connecting classroom content to real life situations.
5. To inculcate Ethics and impart soft-skills leading to overall Personality Development.

SDMCET- Quality Policy

- In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

SDMCET- Core Values

- Competency
- Commitment
- Equity
- Team work and
- Trust

Department Vision and Mission

Vision:

- To develop competent Information Technology Engineers having complete Knowledge and skills in contemporary Information Technology practices.

Mission:

- To develop contemporary curriculum in information technology delivered using innovative teaching learning practices and ICT tools.
- To provide facilities for relevant research and expose students to the best industry practices in Information Technology.
- To inculcate the best moral values and professional ethics in students.

Programme Educational Objectives (PEOs):

I. Develop into Information Technology Professionals with expertise in providing solutions to Information Engineering problems

II. Pursue higher studies with the sound knowledge of basic concepts and skills in basic science, humanities and Information Technology disciplines.

III. Exhibit professionalism and team work by providing the environment for exploring current technology trends through collaborative and complementary work ethics.

Program Outcomes (POs):

Sl. No	(A)Description of Program Outcomes
Engineering Graduates will demonstrate:	
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
(B) Description of Program Specific Outcomes (PSOs)	
13	An ability to develop logical reasoning, coding skills, analysis and mathematicalmodeling.
14	An ability to modify, debug, test and adapt software modules for varied applications.

Scheme for V Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in hours	Max. Marks	Duration in hours
15UISC500	PC	Management, Entrepreneurship and Intellectual Property Rights	4-0-0	4	50	100	3		
15UISC501	PC	Operating Systems	4-0-0	4	50	100	3		
15UISC502	PC	Database Management System	4-0-0	4	50	100	3		
15UISC503	PC	System software	4-0-0	4	50	100	3		
15UISC504	PC	Programming in Java	4-0-0	4	50	100	3		
15UISL505	PC	Database Management System Lab	0-0-2	1	50			50	3
15UISL506	PC	Java Lab	0-0-2	1	50			50	3
15UISL507	PC	Mini project – I	0-0-6	4	50	100	3		
Total			**20-0-10**	**26**	**400**	**600**		**100**	

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination*
L: Lecture **T**: Tutorials **P**: Practical
*SEE for theory courses is conducted for 100 marks and reduced to 50 marks.

Scheme for VI Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in hours	Max. Marks	Duration In hours
15UISC600	PC	Web Technology	4-0-0	4	50	100	3		
15UISC601	PC	File structures	3-0-2	4	50	100	3		
15UISC602	PC	Software Engineering	4-0-0	4	50	100	3		
15UISC603	PC	Computer Networks	3-0-0	3	50	100	3		
15UISL604	PC	Web Technology Lab	0-0-2	1	50			50	3
15UISL605	PC	Mini Project-II	0-0-6	4	50			50	3
15UISE6XX	PE	Elective – I	4-0-0	4	50	100	3		
15UISE6XX	PE	Elective – II	4-0-0	4	50	100	3		
Total			**22-0-10**	**28**	**400**	**600**		**100**	

Code	Elective – I	Code	Elective –II
15UISE620	Unix Systems Programming	15UISE623	Computer Graphics
15UISE621	Advanced Computer Architecture	15UISE624	Advanced Data Base Management System
15UISE622	Advanced Data Structures	15UISE625	System simulation and Modeling

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination*

L: Lecture **T**: Tutorials **P**: Practical

*SEE for theory courses is conducted for 100 marks and reduced to 50 marks.

Total Credits offered for the ThirdYear: 54

Detailed Syllabus
V Semester

15UISC500	Management, Entrepreneurship and Intellectual Property Rights	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Management, Entrepreneurship and Intellectual Property Rights is a core theory course at undergraduate V semester level. The objective of this course is for the students to learn and understand the spirit of entrepreneurship, management, the significance and relevance of intellectual property rights and also the various agencies involved in funding of startup companies.

Course Outcomes:

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** functions of entrepreneurs, role of entrepreneurs in economic development, the Government, Intellectual Property Right and Institutional support for entrepreneurship.	8		
CO-2	**Illustrate** the objectives and functions of government and institutional support, project report, feasibility studies, various methods involved in managerial aspects of corporate life.,	8	10	
CO-3	**Use** the techniques skills necessary for Engineering practices.	1		
CO-4	**Illustrate** the connection between entrepreneurship, liberalization, and globalization.	8		12

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	3.0							3.0		2.0		1		

Contents:

1) **Entrepreneurship**
   a. **Foundations of Entrepreneurship**: Meaning of entrepreneur, functions of entrepreneur, types of entrepreneur, concept of entrepreneurship, role of

entrepreneurs in economic development, barriers of entrepreneurship. **4 Hrs.**

b. **Small Scale Industry**: Definition, characteristics, objects, role of SSI in economic development, advantages of SSI, steps to start as SSI, impact of liberalization, privatization, globalization on SSI, definition of ancillary and tiny industry. **4 Hrs.**

c. **Government and Institutional Support**: Nature of support of government, Objectives and functions of SSI, SIDBI, DIC, single window agency, KIADB, KSSIDC, KSFC. **4 Hrs.**

d. **Preparation of Project Report:** Meaning of project identification, project report, contents and formulation, identification of business opportunities, feasibility studies, types and purpose. **6 Hrs.**

2) Management

a. **Planning:** Forecasting and Decision Making: Nature of Planning, the foundation of planning, some planning concepts, forecasting, nature of decision making, management science, tools for decision-making. **5 Hrs.**

b. **Organizing and staffing**: nature of organizing, traditional organizational theory, technology and modern organization structures, staffing technical organization, authority and power; delegation, meeting & committees. **5 Hrs.**

c. **Motivating:** Motivation, leadership, motivating and leading technical professionals. **3 Hrs.**

d. **Controlling:** process of control, financial controls, and non-financial controls. **3 Hrs.**

e. **Achieving Effectiveness as an Engineer**: Getting off to the Right Start, Charting your career, and communicating your ideas, staying technically competent, Professional Activity. **4 Hrs.**

f. **Managerial and International Opportunities for Engineers:** Management and the Engineer, International Management. **2 Hrs.**

3) Intellectual Property Rights

a. **Introduction:** Meaning and forms of intellectual property right, Copyright, Meaning of copyright, content of copy right, ownership and rights, Period of copyright, assignment and relinquishment of copyright, license, infringement of copy right, fair use, offenses and penalties**.** **3 Hrs**.

b. **Patents:** Concept of patent, patentable inventions, procedure for obtaining patent, rights and obligations of patent holders, infringements and remedies, offenses and penalties. **5 Hrs.**

c. **Industrial Designs**: Definition of design, procedure for registration, rights conferred by registration, infringements. **2 Hrs.**

d. **Trademarks:** **2 Hrs.**

Reference books:

[1] N.V.R. Naidu, T. Krishna Rao, "Management and Entrepreneurship",1/e, Ik International Pvt. Ltd., 2008

[2] Lucy C. Morse, Daniel L Babcock, "Managing Engineering and Technology", 6/e, PHI learning, 2013.

[3] N.K. Acharya, "Text book on Intellectual Property Rights", 4/e, Asia Law House, Hyderabad, 2008

[4] P.C Tripathi, P N Reddy, "Principles of Management", 5/e, Tata McGraw-Hill, 2012.

[5] Stephan Robbins," Management", 17/e, Pearson Education, PHI, 2003.

15UISC501 Operating Systems (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Student should identify the concepts, principles and services of operating system, all fundamentals of operating system abstractions and demonstrate them, to explain protection and security requirements of operating systems analyze basic resource management techniques in job and process scheduling compare different memory management techniques and apply concurrency and synchronization techniques to write concurrent programs.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Illustrate Operating systems and their functions, Process, IPC, Scheduling, synchronization, storage management, protection and security.	1		
CO-2	Illustrate various operating system algorithms.		2	1
CO-3	Apply problem solving techniques to solve various scheduling, process synchronization and storage problems.		2,3	13

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.0	2.0	2.0										1.0	

Prerequisites:

1. Computer organization,
2. The different parts of computer system
3. High level languages such as C.

Contents:

1) **Introduction to operating systems & their classification:** What is an operating system, Mainframe systems, Desktop systems, Multiprocessor system, Distributed system, Clustered system, Real time system, Handheld system, Feature migration, Computing environments, Operating system structures: System components, OS Services, System calls, System programs, System structure, Virtual machines. **6 Hrs.**
2) **Process, Inter process Communication, Threads & CPU Scheduling:** Process concept, Process scheduling, Operation on processes, Cooperating processes, Inter process communication. Threads - Overview, Multithreading models, Threading issues, Pthreads, Java threads. CPU scheduling - Basic concepts, Scheduling criteria, Scheduling algorithms, multiple processor scheduling, real time scheduling. **8 Hrs.**
3) **Process Synchronization and handling Deadlocks:** The Critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors. Deadlock - System model, Deadlock characterization, Methods for handling deadlocks - Deadlock prevention, deadlock avoidance, Deadlock detection and recovery from deadlock. **10 Hrs.**
4) **Storage Management: Main** memory management - Background, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging. Virtual memory - Background, Demand paging, Process creation, Page replacement algorithms, Allocation of frames, Thrashing. File System interface - File concept, Access methods, Directory structure, File system mounting, File system implementation, Directory implementation, Allocation methods, and Free space management. Mass storage structures – Disk structure, Disk scheduling methods, Disk management, Swap space management. **17 Hrs.**

5) **Protection and Security :** Goals of protection , Domain of protection, Access matrix , implementation of access matrix, Revocation of access rights, The security problem, Authentication, Program threats, System threats, Securing systems and facilities, Intrusion detection, Cryptography. **6 Hrs.**

6) **Case Study - Linux operating system:** Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and output, Inter-process communication. **5 Hrs.**

Reference books:

[1] Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", 8/e, John Wiley& Sons, 2012.
[2] Milan Milankovic, "Operating system concepts and design"; 2/e,McGraw Hill 2008.
[3] Harvey M Deital, "Operating systems",1/e, Addison Wesley ,1990.
[4] D.M Dhamdhere, "Operating systems - A concept based Approach", 1/e, Tata McGrawHill ,2002.

15UISC502 Database Management System (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): The main objective of this course is to provide students with the background to design, implement, and use database management systems.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the basics of DBMS.			1
CO-2	**Design** Entity Relationship Diagrams.		3	2
CO-3	**Analyze** the basics of relational model and Formulate data retrieval queries in relational algebra.		13	14
CO-4	**Analyze and Formulate** data retrieval queries in Structured Query Language (SQL).	13		
CO-5	**Design** a database using the normal forms.	3		
CO-6	**Illustrate** the concepts of Deadlocks, Transaction Processing and Concurrency Control.		4	

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	1.0	1.0	2.5	2.0									2.5	1.0

Pre-requisites:

1. Some Programming language

Contents:

1) **Introduction to Database Systems:** Introduction, File System Vs. DBMS, Advantages of DBMS, Storage of Data in a DBMS, People who work with DBMS. **5 Hrs.**
2) **Entity Relationship Model:** Database Design Entity Type, Attributes, keys, Relationship types, Roles and Structural Constraints, Weak Entity Types, ER diagrams and Naming conventions, ER diagrams examples. **6 Hrs.**
3) **Relational Model and Relational Algebra:** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION ;Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using. **12 Hrs.**
4) **SQL Structured Query Language:** Definition and Data types, Basic Queries, Complex Queries **12 Hrs.**
5) **Database Design:** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; **11 Hrs.**
6) **Transaction Management:** ACID properties, schedule locking crash recovery, 2 phase locking, deadlocks, ARIES, LOG, WAL protocol, check pointing recovery and concurrency control. **6 Hrs.**

Beyond the Syllabus Coverage(Suggestive):

1. Seminar
2. Case Study

Reference books:

[1] Elmasri and Navathe: "Fundamentals of Database Systems",7/e, Pearson Education, 2016.
[2] Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems",3/e, McGraw-Hill, 2008
[3] Silberschatz, Korth and Sudharshan, "Data Base System Concepts", 5/e, Mc-GrawHill, 2006.
[4] C.J.Date, A. Kannan, S. Swamy natham, "An Introduction to Database Systems", 8/e, Pearson Education, 2006.

15UISC503 System Software (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): To view some of the major tasks of the system software of a computer system, focusing on internal working of the hardware and software interface of a typical system.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Apply** the architectural feature of hypothetical machine in executing assembler, loader and macro programs	2		
CO-2	**Design** assembler, loader, linker and macros using different machine dependent and independent features.	3	4	13
CO-3	**Illustrate** the different phases of compilers	2		
CO-4	**Illustrate** the operations of the text editor	2		

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level		3.0	3.0	2.0									1.0	

Pre-requisites:

1. Basic programming knowledge in C/C++.
2. Computer Science concepts: e.g. operating systems, file and I/O structures, memory structures, processes and threads.

Contents:

1) **Machine Architecture and Assemblers :**Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples. Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures.. **7 Hrs.**
2) **Assemblers M/c Dependent and Independent Features :** Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation. Machine Independent Features - Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking. **8 Hrs.**
3) **Assembler Design options and Introduction to Loaders:** Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler, Implementation Example-MASM Assembler. Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader. **5 Hrs.**
4) **Loaders M/c Dependent, Independent Features and Design Options:** Machine-Dependent Loader Features - Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader. Machine-Independent Loader Features- Automatic Library Search, Loader Options. Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples - MS-DOS Linker. **8 Hrs.**
5) **Macro Processor:**Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options – Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples - ANSI C Macro Processor. **7 Hrs.**
6) **Compilers:** Intermediate Code generation : Basic compiler functions-grammars, lexical analysis, Syntactic analysis,: Revisited. Intermediate Code generation - Three address code, Types and Declarations, Translation of expressions. **7 Hrs.**
7) **Text Editors**: Overview of the editing Process, User interface, Editor Structure. Interactive debugging system, Debugging functions and capabilities, Relationship with other parts of the system, user interface criteria

10 Hrs.

Reference books:

[1] Leland L. Beck and D. Manjula, "System Software", 3rd Ed., Pearson Education, 2012.
[2] Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers-Principles, Techniques and Tools", 2nd Edition, Addison-Wesley, 2008
[3] D. M. Dhamdhere, "System Programming and Operating Systems", 2nd Ed., Tata McGraw Hill, 2008.
[4] John J. Donovan, "System Programming", 2nd Ed., Tata McGraw Hill, 2004.

15UISC504 Programming in Java (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Student should understand the Object Oriented Principles, be able to create Java classes and implement the concepts of reusability (inheritance, overloading), multi-threading, exception handling and learn to develop GUI applications.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the use of java constructs in programming.	2	1	3,14
CO-2	**Implement** the concepts of object oriented programming using Java language.	3	1,2	13
CO-3	**Illustrate** the concepts of interfaces, packages and multi-threaded programming in problem solving.	1,2	3	13,14
CO-4	**Apply** exception handling in Java programs.	2,14	1	3
CO-5	**Develop** GUI applications using frames, events and other features available in AWT and Swing packages.	2,14	1	3
CO-6	**Use** JDBC and MySQL database to build Java applications that interact with databases.	1,2	3,14	5

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.33	2.83	1.67		1.0								1.0	2.0

Prerequisites:

Basic programming skills

Contents:

1) **Introduction to Java:** Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs. Data types and other tokens: Boolean variables, int, long, char, operators, arrays, whitespaces, literals, assigning values; Creating and destroying objects; Access specifiers. Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Typecasting; Arrays, Strings; Control Statements: Selection statements, iteration statements, Jump Statements. **8 Hrs.**
2) **Classes:** Class Fundamentals, Declaring objects, Object Reference Variables, Constructors, this keyword, Garbage collection, finalize( ) method
   Inheritance: Inheritance basics, Using super keyword, Multi-level hierarchy, Method overriding, Dynamic Method Dispatch
   Packages and Interfaces: Packages, Access Protection, Importing packages, Interfaces **10 Hrs.**
3) **Exception handling in Java:** Exception-handling fundamentals,Exceptiontypes,Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements; throw, throws and finally clauses, Java's built-in exceptions, Creating Own Exception Subclasses**8 Hrs.**
4) **Multi-Threaded Programming:** Multi-Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing Runnable; Thread priority; Thread exception; Synchronization **8 Hrs.**
5) **GUI Programming :** Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features Using Swing Components **10 Hrs.**
6) **MySQL and JDBC** : The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Metadata **8 Hrs.**

Reference books:

[1] HerbertSchildt: "Java The Complete Reference" 8th Edition, McGraw Hill Education, 2017
[2] Jim Keogh: "J2EE The Complete Reference", McGraw Hill Education, 2007

15UISL505 Database Management System Lab (0-0-2) 1

Contact Hours: 36

Course Learning Objectives (CLOs): The major objective of this lab is to provide a strong formal foundation in database concepts, technology and practice to the participants, to groom them into well-informed database application developers. Rather than imparting isolated knowledge/experience fragments in each of concepts, technology and practice, the course will aim at achieving a good blend of the three. The overriding concern, therefore, is to include just enough concepts and theory to motivate and enrich the practical component, and to include technology component to maximize the relevance of the course to the industry without sacrificing the long-term objectives of rigor and foundational strength that can withstand the vagaries of technological advance.

Course Outcomes(COs):

ID	Description of the course outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Design and implement** a database schema for a given problem-domain.	3		1
CO-2	**Analyze** the given database and **apply** the normalization.	3		
CO-3	**Demonstrate** SQL DML/DDL commands.	13,14		
CO-4	**Design and build** a GUI using a GUI building tool.		3	
CO-5	**Develop** solutions for real life problems by working in teams.		4	

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	1.0		2.8	2.0									3.0	3.0

Pre-requisites:

1.Some programming language

2. Logical reasoning

Contents:

PART-A

- Analyze the given data and implement the following,
- Create the database design
- Create ER models and tables
- Create constraints/ inserting the records
- Write queries in SQL using DDL,DML commands
- Write queries using aggregate functions,groupby,having clause/union,intersect,minus
- Subqueries returning single/multiple rows
- Co-related sub queries
- Joins,View

PART-B

- Design and implement a real-world database application in the form of a project

Reference books/manual:

[1] Raghu Ramakrishnan and Johannes Gehrke,"Database Management Systems",3/e, McGraw-Hill, 2011

[2] Elmasri and Navathe: "Fundamentals of Database Systems",4/e, Pearson Education, 2008.

[3] Silberschatz, Korth and Sudharshan, "Data Base System Concepts", 5/e, Mc-GrawHill, 2008.

[4] C.J.Date, A. Kannan, S. Swamynatham, "An Introduction to Database Systems"8/e, Pearson Education, 2006.

15UISL506	Java Lab	(0-0-2) 1

Contact Hours: 36

Course Learning Objectives (CLOs): Student should understand the Object Oriented Principles, be able to create Java classes and implement the concepts of reusability (inheritance, overloading), multi-threading, exception handling and learn to develop GUI applications.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the use of java constructs in programming.	2	1	3,14
CO-2	**Implement** the concepts of object oriented programming using Java language.	3	1,2	13
CO-3	**Illustrate** the concepts of interfaces, packages and multi-threaded programming in problem solving.	1,2	3	13,14
CO-4	**Apply** exception handling in Java programs.	2,14	1	3
CO-5	**Develop** GUI applications using frames, events and other features available in AWT and Swing packages.	2,14	1	3
CO-6	**Use** JDBC and MySQL database to build Java applications that interact with databases.	1,2	3,14	5

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.33	2.83	1.67										1.0	2.0

Prerequisites:

1. Object -Oriented Programming
2. Basic programming skills.

Contents:

1. Programs on Classes
2. Programs on Exceptions
3. Programs on Inheritance
4. Programs on Multi-threaded Programming
5. Programs on Swing
6. Programs onMySQL and JDBC

Reference books:

[1] HerbertSchildt: “Java The Complete Reference” 8th Edition, McGraw Hill Education, 2017
[2] Jim Keogh: “J2EE The Complete Reference”, McGraw Hill Education, 2007

15UISL507	Mini Project - I	(0-0-6) 4

Contact Hours: 60

Course Learning Objectives (CLOs): Understand programming language concepts, particularly Java and object-oriented concepts. Plan, analyze, design and implement a software project. Demonstrate independent learning. Demonstrate the ability to locate and use technical information from multiple sources. Demonstrate an understanding of professional ethics. Participate in a class or project team. Demonstrate the ability to communicate effectively in speech. Demonstrate the ability to communicate effectively in writing. Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project. Learn about and go through the software development cycle with emphasis on different processes - requirements, design, and implementation phases. Gain confidence at having conceptualized, designed, and implemented a working, medium sized project with their team.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Apply** problem solving and programming skills for identified problem statement.	2, 13	1	14
CO-2	**Design** the system for an identified requirement	3	4	1
CO-3	**Analyze and Incorporate** the changes in the development cycle.	4, 2	13	1, 14
CO-4	**Use** modern tools for realizing the solution.	5		14
CO-5	**Demonstrate** an ability to work in a team	9		11
CO-6	**Demonstrate** an ability to present the work carried out both in written and oral form.	10		11

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	1.33	3.0	3.0	2.5	3.0				3.0	1.0			2.5	1.0

Prerequisites:

1. Software Engineering
2. Database Management Systems
3. Web Technology

VI Semester

15UISC600	Web Technology	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Student should understand the WWW, html5 tags, java scripts,servlets and should be able to develop and deploy web applications on http servers.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the structure of the World Wide Web.	3	1,2	
CO-2	**Use** JDBC, J2EE and MySQL database for applications.	1	2,3	13,14
CO-3	**Develop** and **deploy** simple web applications using HTML5, Applets, Servlets PHP and MySQL	1	2,3	13,14

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.67	2.0	2.33										1.0	1.0

Prerequisites:

Basic programming skills

Contents:

1) **Introductionto WWW**: WWW 1.0, HTML, HTML5 Tags, java scripts. **8 Hrs.**
2) **Applets**: The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); AppletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console. **12 Hrs.**
3) **MySQL**: Introduction to MySQL Designing Databases Basic SQLDatabase Structures Backing Up and Restoring MySQL Database. **10 Hrs.**
4) **PHP:**PHP Introduction, Embedding PHP into HTML, Configuration, Quick Examples, Language Syntax, Built-In PHP Functions, PHP and MySQL, Project. **10 Hrs.**
5) **Servlets**: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet

Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking **12 Hrs.**

Reference books:

[1] James Lee and Brent Ware : "Open Source Web Development with LAMP-Using Linux, Apache, MySQL, Perl and PHP", 5th edition Addison – Wesley/Person Education 2010

[2] Jim Keogh: "J2EE The Complete Reference", McGraw Hill Education, 2007

[3] Robert W.Sebesta: "Programming the World Wide Web", 4th edition, Pearson Education.

15UISC601 File Structures (3-0-2) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Student should understand the basics ofFile manipulation techniques, storage devices, compression techniques, storing the data in a proper format which is used for indexing and tree building for enhanced searching.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the concepts of physical and logical files, the organization of secondary storage devices, the need for record access by key values, Field and Record organization, different compression techniques, Space reclaiming techniques in files for storage compaction, the indexing concepts, B- trees, hashing and extendible hashing.	1		
CO-2	**Illustrate** the concepts of file handling using C/C++, the concepts of file manager, I/O buffer, I/O processor and buffering strategies, concepts of field structuring and record structuring in files	2, 13	1	
CO-3	**Compare** different storage devices, different buffering strategies.		1, 2, 13	
CO-4	**Solve** problems on space estimation on disks, length estimation on tapes	2, 13	1	
CO-5	**Apply** the basics of object-orientation to write functions for	2, 13	1	14

	implanting various record formats, compression techniques for a given data sets, building rules of B-trees for carrying out various operations on a B tree for a given set of data.													
PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.2	2.75											2.75	1.0

Prerequisites:

1. Database Management System
2. Basic programming skills.

Contents:

1) **File Processing Operations :** Physical and logical files, opening, reading & writing and closing files in C, seeking and special characters in files, physical devices and logical files, file-related header files in C **6 Hrs.**
2) **Secondary Storage Disks:** organization, tracks, sectors, blocks, capacity, non-data overhead, cost of a disk access,Magnetic Tape – types, performance, organization estimation of tape length and data transmission times, disk vs. tape, CD-ROM – CD-ROM as a file structure, physical organization, strengths and weakness of cd-roms, storage hierarchy **6 Hrs.**
3) **Byte Journey and buffer Management:** File manager, I/O buffer, I/O processing, buffer strategies and bottlenecks. **5 Hrs.**
4) **File Structure Concepts:** A stream file, field structures, reading a stream of fields, record structures and that uses a length indicator, Mixing numbers and characters – use of a hex dump, reading the variable length records from the files. **5 Hrs.**
5) **Managing records in C files:** Retrieving records by keys, sequential search, direct access, choosing a record structure and record length, header records, file access and file organization. **5 Hrs.**
6) **Organizing files for performance:** Data compression, reclaiming space – record deletion and storage compaction, deleting fixed-length records for reclaiming space dynamically, deleting variable-length records, space fragmentation, replacement strategies.**5 Hrs.**
7) **Indexing:** Index, A simple index with an entry sequenced file, basic operations on an indexed, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure –

inverted lists. **5 Hrs.**

8) **Indexed sequential file access and prefix B+ Trees:** Indexed sequential access, maintaining a sequence set, adding a simple index to the sequence set, the + tree, simple prefix B+ content of the index: separators instead of keys, the simple prefix B tree maintenance, index set block size, internal set block size, internal structure of index set blocks: a variable B+ treeorder B-tree, loading a simple prefix. **5 Hrs.**

9) **Hashing:** Hashing, Collisions in hashing, a simple hashing algorithms, hashing functions and record distributions, memory requirements, collision resolution by progressive overflow, buckets, deletions. **5 Hrs.**

10) **Extendable hashing:** Working of extendable hashing, implementation, deletion, extendable hashing performance Designing file structure for CD-ROM Tree structure on CD-ROM, hashing files on CD-ROM, CD-ROM file structure. **5 Hrs.**

Reference books:

[1] Michael J. Folk, Bill Zoellick and Greg Riccardi, "File Structures – An Object Oriented Approach with C++", 3/e, Pearson, 2006.

[2] A. A. Putambekar, "Data and File Structures" , 3/e, Technical Publications, 2009

15UISC602	Software Engineering	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Student should understand the need for a process of software development, complexity of system development, types of systems and quality requirements, analysis of any problem domain and formulation of requirements and assessment of quality, contemporary modeling, designing, development and validation techniques. software project management issues like cost estimation, resource requirements and project scheduling and tracking.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the need for Software Engineering, Development practices & Estimation techniques	1		

CO-2	**Derive** the SDLC, Requirement gathering & analysis process, Software approaches, staff estimations, benefits & architecture	1,2	4
CO-3	**Apply** suitable development models for software development, Scheduling, organizing, team structures, Design review techniques, CASE to various development activities		10,12
CO-4	**Illustrate** the risks management & various testing techniques in software developments, different Life cycle models, contrasts in testing		10,12

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	3.0	1.0	2.0	1.5						1.0		1.0		

Prerequisites:

1. Basics of Computer programming.
2. Any Computer Programming Language.

Contents:

1) **Introduction:** The Software Engineering Discipline-Evaluation and Impact, Programs vs. Software Products, Why study of Software Engineering? Emergence of Software Engineering, Notable Changes In software Development Practice, Computer System Engineering. Software Life Cycle: Why Use a life Cycle Model? Classical Waterfall Model, Iterative Waterfall Model, Prototype Model, Evolutionary Model, Spiral Model, Compression of Different Life Cycle Models. **9 Hrs.**
2) **Software Project Management:** Responsibilities of Software Project Manager, Project Planning, Metrics For Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO- A Heuristic Estimation Techniques, Halstead's Software Science-An Analytical Technique, Staffing Level Estimation, Scheduling, Organization And Team Structure, Staffing, Risk Management, Software Configuration Management, Miscellaneous Plans. **6 Hrs.**
3) **Requirements Analysis and Specification:** Requirements Gathering andAnalysis, Software Requirement Specification (SRS), Formal System Development Techniques, Axiomatic Specification, Algebraic Specification.

7Hrs.

4) **Software Design:** What is good software design, Cohesion and coupling, Next arrangement, Software design approaches, Object oriented vs. function oriented design. **5 Hrs.**
5) **Function-Oriented Software Design:** Overview of SA/SD Methodology, Structured analysis, Data flow diagram, Extending DFD technique to real life systems, Structured design, detailed design, Design review. **5 Hrs.**
6) **Object Modeling Using UML:** Overview of object-oriented concepts, Unified modeling language (UML), UML diagram, Use case model, Class diagram, Interaction diagram, Activity diagram, State chart diagram. Object-Oriented Software Development: Design patterns, A generalized object-oriented analysis and design, Examples, OOD goodness criteria. **6 Hrs.**
7) **Coding and Testing:** Coding, Code review, Testing, Testing in the large vs.testing in the small, Unit testing, Black-box testing, Debugging, Program analysis tools, Integration testing, System testing, Some general issues associated with testing. **5 Hrs.**
8) **Software Reliability and Quality Management:** Software reliability, Statistical testing, Software quality management system, ISO 9000, SEI capability maturity model, Personal software process (PSP), Six sigma. **Computer Aided Software Engineering:** Case and its scope, Case environment, Case support in software life cycle, Other characteristics of case tools, Towards second generation case tool, Architecture of a case environment. **5 Hrs.**
9) **Software Maintenance:** Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. **Software Reuse:** What can be rescued?, Why almost no reuse so far, Basics issues in any reuse program, A reuse approach, Reuse at organization level. **4 Hrs.**

Reference books:

[1] Rajib Mall, “Fundamentals of software engineering” ,2/e, PHI publication,2013
[2] JalotePankaj, “An integrated approach to Software Engineering” , 2/e, Narosa 2005
[3] Pressman R, “Software Engineering. Practitioner Approach” ,3/e,TMH, 2010

[4] Jacobson I, “Object Oriented Software Engineering”, 2/e,Addison Wesley, 2005

15UISC603 Computer Networks (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): The course is designed to expose the students to build an understanding of the fundamental concepts of computer networking. The course focuses on to Familiarize the student with the basic taxonomy and terminology of the computer networking area. It also introduces the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** various network layer protocols.	1		
CO-2	**Illustrate** the various applications of Transport layer		1, 13	
CO-3	**Illustrate** the importance of application layer and its components		1, 13	
CO-4	**Apply** the concept of IP address for a given networking scenario.	2, 13	1	
CO-5	**Apply** routing algorithms for a given network	2, 13	1	

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.2	3.0											2.5	

Prerequisites:

1. Data Communication

Contents:

1) **Network Layer:** Introduction**:** Logical Addressing: IPV4 address,IPv6 Address, Internet Protocols: Internetworking, IPv4, IPV6 **6 Hrs.**
2) **Network layer: Address Mapping:** Address Mapping, ICMP, IGMP, and ICMPv6. **6 Hrs.**
3) **Network Layer: Routing:** Delivery, forwarding, Unicast routing Protocols,

Multi cast routing protocols **6 Hrs.**

4) **Transport Layer: Congestion Control and QOS:** Process –to –process delivery, UDP, TCP, SCTP. **6 Hrs.**
5) **Transport Layer: Congestion Control and QOS:** Data Traffic, Congestion, Congestion Control, Congestion Control in TCP, Quality of Service, and Techniques of improve QOS, Integrated Services and Differentiated Services. **6 Hrs.**
6) **Application Layer: HTTP, FTP, SMTP and DNS:** Principles of Application-Layer Protocols, The World Wide Web: HTTP, File Transfer: FTP Electronic Mail in the Internet, The Internet's Directory Service: DNS **6 Hrs.**
7) **Network Management: SNMP:** Network management system, SNMP **3 Hrs.**

Beyond the Syllabus Coverage (Suggestive):
NS2 Simulation of different network protocols

Reference books:

[1] BehrouzForouzan, “Data Communications and Networking”, 4/e, McGraw Hill,2006
[2] Fred Halsall, “Computer Networking and the Internet” 5/e, Addison Wesley,2005
[3] Andrew Tanenbaum, “Computer Networks” ,4/e, Prentice Hall, 2006
[4] BehrouzForouzan, “TCP/IP Protocol Suite”, 3/e, McGraw Hill, 2005

15UISL604 Web Technology Lab (0-0-2) 1

Contact Hours: 36

Course Learning Objectives (CLOs): Student should understand the WWW, html5 tags, java scripts, servlets and should be able to develop and deploy web applications on http servers.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the structure of the World Wide Web.	3	1,2	
CO-2	**Use** JDBC J2EE and MySQL database for applications.	1	2,3	13,14
CO-3	**Develop** and **deploy** simple web applications using HTML5, Applets,	1	2,3	13,14

	Servlets PHP & MySQL													
PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.67	2.0	2.33										1.0	1.0

Prerequisites:

1. Basic programming skills.

Contents:

1) Programs on HTML
2) Programs on javascripts
3) Programs on applets
4) Programs on MySQL
5) Installing of MySQL and Tomcat and Apache HTTP servers
6) Programs on Servlets

Reference books:

[1] James Lee and Brent Ware : "Open Source Web Development with LAMP-Using Linux, Apache, MySQL, Perl and PHP", 5th edition Addison – Wesley/Person Education 2010
[2] Jim Keogh: "J2EE The Complete Reference", McGraw Hill Education, 2007
[3] RobertW.Sebesta: "Programming the World Wide Web", 4th edition, Pearson Education.

15UISL605 Mini Project- II (0-0-6) 4

Contact Hours: 60

Course Learning Objectives (CLOs): Though the Specific objectives of this course depends on the Project chosen, below the generic objectives of this course:

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Demonstrate** through involvement in a team project the central elements of team building and team management	5,10	4	
CO-2	**Prepare** a project plan for a software project that includes estimates of		12	

	size and effort, a schedule, resource allocation, configuration control, change management, and project risk identification and management.													
CO-3	**Indicate** an approach to risk that will help to secure the on-time delivery of software.									11				
CO-4	**Compare** and contrast the different methods and techniques used to assure the quality of a software product												13	
PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level				2.0	3.0					3.0	2.0	2.0	1.0	

Prerequisites: Knowledge of
a) Software Engineering concepts
b) Any Programming Language

Guidelines for Conduction

Spirit of The Course: To ensure that undergraduates can successfully apply the knowledge they have gained through a project, demonstrates the practical application of principles learnt in different courses and enables students to integrate material learnt at different stages of the curriculum up to the 6th semester; also appreciating the need for domain knowledge for certain applications, and that this may necessitate study within that domain.

1. Students Form a Team. Size f the team can vary from 3 to 4. With genuine explanation bigger or smaller is team is allowed.
2. Guide for this course is a must and will be chosen by team itself by interacting with faculty.
3. In consultation with Guide, Team will prepare the project plan and its specific outcomes, which Team promises/declares to accomplish.
4. Project Report: A Course closure document outlining the problems, specifications, including the survey of literature, various results obtained, solutions and the problems faced deviation from the promised milestones, testing report, user manual, appendix reference etc is expected to be produced by each team of project.
5. Demonstration, seminar, quiz, tests, Viva-Voce, publications, Reports can be used for the evaluation.
6. There can be designated Committee to monitor this process of Mini Project.

15UISE620	Unix System Programming	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): In this course, students will learn to develop complex system-level software in the C programming language while gaining an intimate understanding of the UNIX operating system and its programming environment, topics covered will include the user/kernel interface, fundamental concepts of UNIX, user authentication, basic and advanced I/O, file systems, signals, process relationships, and inter-process communication. Fundamental concepts of software development and maintenance on UNIX systems.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** various POSIX and UNIX standards, UNIX File system, Process and control, signals and daemon processes.	1		
CO-2	**Illustrate** the characteristics of various API's and system calls.		1,13	3
CO-3	**Write** C/C++ programs in UNIX/POSIX platform to use and implement various system calls.	13	2	1,3
CO-4	**Demonstrate** race conditions, exec system calls, job control, signals and processes through different system calls.	13	2	1,3

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	1.75	2.0	1.0										2.0	

Prerequisites:

1. This course requires programming in C/C++.
2. Operating system fundamentals and UNIX shell commands

Contents:

1) Introduction: UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. UNIX and

POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics. **6 Hrs.**

2) **UNIX Files**: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs. **12 Hrs.**
3) **UNIX Processes** : The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimitFunctions, UNIX Kernel Support for Processes. **7Hrs.**
4) **Process Control**: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Orphaned Process Groups. **10 Hrs.**
5) **Signals and Daemon Processes**: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model **9Hrs.**
6) **Interprocesscommunication:**Overview of IPC Methods, Pipes, popen, pcloseFunctions,Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores,Socket API functions - socket, bind, listen, accept, connect,close Protocol and address families, ,Client-server example using TCP, Client-server example using UDP. **8Hrs.**

Beyond the Syllabus Coverage:

Linux command implementation / Demonstrator of open source software from students

Reference books:

[1] W. Richard Stevens, Stephen A. Rago," Advanced Programming in the UNIX

Environment", 2/e,Addison-Wesley, 2005.
[2] Terrence Chan," Unix System Programming Using C++", Prentice Hall India, 1999.
[3] Maurice.J.Bach," The Design of the UNIX Operating System", Prentice Hall of India,1988.
[4] UreshVahalia," Unix Internals", Pearson Education,2001

15UISE621 Advanced Computer Architecture (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Discuss the concept of parallel processing and the relationship between parallelism and performance. Appreciate that multimedia values (e.g., 8-/16-bit audio and visual data) can be operated on in parallel in 64-bit registers to enhance performance. Explain the concept of branch prediction its use in enhancing the performance of pipelined machines. Understand how speculative execution can improve performance. Provide a detailed description of superscalar architectures and the need to ensure program correctness when executing instructions out-of-order. Explain speculative execution and identify the conditions that justify it.Discuss the performance advantages that multithreading can offer along with the factors that make it difficult to derive maximum benefits from this approach.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the fundamentals of computer design, Instruction and Thread level parallelism, memory hierarchy and multicore architecture	1		
CO-2	**Apply** the concept of Instruction and Thread Level Parallelism for various scheduling and synchronization problems.	2	13	1,4
CO-3	**Apply** the concept of memory design for the given constraints	2	13	1,4
CO-4	**Analyze** the performance of a system which uses instruction and thread level parallelism.		2,4	1,13

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14

Mapping Level	1.6	2.33		1.33								1.66	

Prerequisites:

1. Digital Electronics
2. Study of microprocessors with assembly language programming
3. Computer Organization

Contents:

1) **Fundamentals of Computer Design:** Introduction Defining computer architecture; Performance; Quantitative Principles of computer design. Pipeline hazards; Implementation of pipeline. **7 Hrs.**
2) **Instruction –Level Parallelism** – 1: ILP: Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling; Hardware based speculation. **8 Hrs.**
3) **Instruction –Level Parallelism** – 2: Exploiting ILP using multiple issue and static scheduling; Non linear pipeline scheduling; Exploiting ILP using dynamic scheduling, multiple issue and speculation; The Intel Pentium 4 as example. **7 Hrs.**
4) **Multiprocessors and Thread –Level Parallelism**: Introduction; Symmetric shared memory architectures; Performance of symmetric shared memory multiprocessors; Distributed shared memory and coherence; Basics of synchronization; Models of Memory Consistency. **8 Hrs.**
5) **Review Of Memory Hierarchy:** Introduction; Cache performance; Cache Optimizations,Virtualmemory**.** **8 Hrs.**
6) **Memory Hierarchy Design:** Introduction; Memory technology and optimizations; Protection:Virtualmemory and virtual machines. **7 Hrs.**
7) **Multi core Architecture**: Design Challenges; role of compilers and software development; Intel tools for software developer; Case study on Intel core processors (Core 2 duo/i3/i5/i7) **7 Hrs.**

Reference books:

[1] John L. Hennessey and David A. Patterson, “Computer Architecture, A Quantitative Approach”, 4/e, Elsevier, 2007.
[2] Kai Hwang, “Advanced Computer Architecture Parallelism, Scalability, Programmability”, 2/e,Tata McGraw Hill, 2003.

[3] David E. Culler, Jaswinder Pal Singh, Anoop Gupta, “Parallel Computer Architecture, A Hardware / Software Approach”,1/e, Morgan Kaufman, 1999

15UISE622	Advanced Data Structures & Algorithms	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Students should understand mathematical skills for algorithm design, analysis, evaluation and computational cost; and also identify the skills to design and implement efficient programming solutions to various problems; develop application knowledge of dynamic programming, graphs, hash tables, sorting, and searching and tree structures.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Analyze** algorithms and determine algorithm correctness and compare the time efficiency		2	
CO-2	**Apply** algorithm design techniques and advanced data structures to solve problems.	2		

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level		2.5												

Prerequisites:

1. Data Structure
2. Discrete Mathematical and Graphical Structures

Contents:

1) **Binary Search Trees:** Definition, Insertion, Deletion **4 Hrs.**
2) **Hash Tables:** Hash functions, Open Addressing, Perfect Hashing **6 Hrs.**
3) **B-Trees:** Introduction, Definition, Basic Operations, Deleting a key from B-tree **6 Hrs.**
4) **Binomial Heaps:** Binomial trees and binomial heaps, operations on binomial heaps. **5 Hrs.**
5) **Fibonacci Heaps:** Structure of Fibonacci heaps, Mergeable – heap operations, Decreasing a key and deleting a node, Bounding the maximum degree. **7 Hrs.**

6) **Data Structures for Disjoint Sets:** Disjoint Set Operations, Linked list representation of disjoint sets, Disjoint-set forests, Analysis of union by rank with path compression. **4 Hrs.**
7) **Graph Algorithms:** Maximum Flow: Flow Networks, The Ford-Fulkerson method. **6 Hrs.**
8) **Sorting Networks:** Comparison Networks, The zero-one principle, Abitonic sorting network, A merging network, A sorting network **7 Hrs.**
9) **String Matching:** The naïve string matching algorithm, The Rabin –Karp algorithm, String matching with finite automata, The Knuth-Morris-Pratt algorithm. **7 Hrs.**

Beyond the Syllabus Coverage(Suggestive):

1. Case study

Reference books:

[1] Cormen T.H et al, "Introduction to Algorithms", 2/e, PHI, 2001.
[2] S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani, "Algorithms",3/e,Mcgraw-Hill, 2006
[3] J. Kleinberg and E. Tardos," Algorithm Design", 2/e, Addison-Wesley, 2006

15UISE623 Computer Graphics (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Student should understand the basics of, Interactive computer graphics architecture, Modeling and Geometric transformations of 2D/3D objects, Graphics API programming.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the significant features, basic elements of computer graphics and different lighting and shading effects on given objects.	1		
CO-2	**Demonstrate** 2D/3D graphics primitives, polygon filling, transformations and views for a	2	1,3,13	10

	given geometric object.													
CO-3	**Illustrate** the characteristics of various OpenGL API.						13			1				
CO-4	**Use** OpenGL programming to implement problems related to computer graphics.						2,13						1,5,10	
PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	2.0	3.0	2.0		1.0					1.0			2.66	

Prerequisites:

1. Fundamental knowledge in linear algebra and Coordinate geometry.
2. Data structures and any programming language.

Contents:

1) **Introduction:** Introduction to Computer Graphics and Basics of OpenGL: Applications of computer graphics, A graphics system, Images: Physical and synthetic, Imaging systems, the synthetic camera model, the programmer's interface, Graphics architectures, Graphics Programming: The Sierpinski gasket. **04 Hrs**.
2) **OpenGL Basics :**The OpenGL API, Primitives and Attributes, Color, Viewing, Control Functions, The two dimensional gasket program, Polygons and recursion, the three dimensional gasket. **08 Hrs.**
3) **Input and Interaction:** Interaction, Input devices, Programming Event-Driven input: Menus, Picking, Building interactive models, Animating interactive programs, Design of interactive programs. **07 Hrs.**
4) **Basic Raster Algorithms:** Overview, Rasterization, Bresenham's algorithm: line and circles, Filling rectangles, Filling polygons, Antialiasing, Clipping a line, Clipping polygon, Polygon mesh and Parametric curves. **09 Hrs.**
5) **Geometric Objects and Transformations:** Scalars, Points, and Vectors, Three- dimensional Primitives, Coordinate Systems and Frames, Frames in OpenGL, Modeling a Colored Cube, Affine Transformations, Rotation, Translation and Scaling, Transformations in Homogeneous Coordinates, Concatenation of Transformations, OpenGL Transformation Matrices.**12 Hrs.**
6) **Viewing:** Simple Projections, Viewing with a computer, Positioning of camera, Projections in OpenGL, Hidden Surface removal. **06 Hrs.**
7) **Lighting and Shading :** Light and matter, Light sources, The Phong lighting model, Light sources in OpenGL , Polygon Shading , Approximation of

sphere by recursive subdivision , Specification of matrices in OpenGL, Shading of the sphere model. **06 Hrs.**

Reference books:

[1] Edward Angel, “Interactive Computer Graphics: A Top-down Approach Using OpenGL”, 5/e, Addison-Wesley, 2012.
[2] Donald D. Hearn, M. Pauline Baker, Warren Carithers, “Computer Graphics with OpenGL”, 4/e, Addison-Wesley, 2010.
[3] John Hughes, A. V. Dam, M. McGuire, David F., James D. Foley, Steven K.F., Kurt A.” Computer Graphics: Principles and Practice “, 3/e, Pearson, 2013.
[4] Edward Angel, “OpenGL: A Primer “, 3/e, Addison-Wesley, 2007.

15UISE624	Advanced Database Management System	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): Student should understand and define parallel and distributed databases and its applications. Show applications of Object Oriented database. Explain basic concepts, principles of intelligent databases. Utilize the advanced topics of data warehousing and mining. Infer emerging and advanced data models.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level	Moderate Level (2)	Slight Level (1)
CO-1	Select the appropriate high performance database like parallel and distributed database.			1
CO-2	Infer and represent the real world data using object oriented database.		3	2
CO-3	Outline the different data mining and data warehouse applications.	1		

CO-4	Extend to learn enhanceddatamodelsforsomeadvanc edapplications.												3	
CO-5	Apply PL/SQL for different databases.							3						
PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO 12	PSO 13	PSO 14
Mapping Level	2.6	2.33	2.0											

Prerequisites:

1. Data Base Management Systems concepts.

Contents:

1. **ReviewofRelationalDataModelandRelationalDatabaseConstraints:**Relationalmodel concepts;Relationalmodelconstraintsandrelationaldatabaseschemas;Update operations, anomalies, dealingwith constraint violations, Types and violations.Overview ofObject-Oriented Concepts – Objects, Basic properties. Advantages, examples, Abstract data types, Encapsulation, class hierarchies, polymorphism, examples.

   8 Hrs

   Object andObject-Relational Databases: Overview of OOP; Complex objects; Identity, structure etc. Object model of ODMG, Object definition Language ODL; Object QueryLanguage OQL; Conceptual design ofObject database. Overview of objectrelationalfeaturesofSQL;Object-relational featuresofOracle;Implementation andrelatedissuesforextended typesystems;syntax anddemoexamples.

   8Hrs

2. **Parallel and Distributed Databases :** Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations; Introductiontodistributeddatabases;DistributedDBMSarchitectures;Storingdatain a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updatingdistributeddata;Distributedtransactions;DistributedConcurrencycontroland Recovery.

   8 Hrs

3. **Data warehousing,DecisionSupportandDataMining :**Introductiontodecision support;OLAP,multidimensionalmodel;;Finding answers

quickly;ImplementationtechniquesforOLAP;DataWarehousing;Viewsand Decision support, Viewmaterialization, Maintaining materializedviews.Introduction to Data Mining;Counting co-occurrences;Clustering;;Incrementalminingand datastreams;Additionaldataminingtasks.

8 Hrs

4. **EnhancedDataModelsforSomeAdvancedApplications :**Activedatabaseconcepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems;Genomedatamanagement.
   6 Hrs.

5. **PL/SQL: Basics**, Cursors, Exceptions, Subprograms, Packages.
   14 Hrs

Reference books:

[1] Raghu Ramakrishnan and Johannes Gehrke: "Database Management Systems", 3/e, McGraw-Hill,2009,

[2] Elmasri and Navathe , "Fundamentals of Database System",5/e, Pearson Education, 2011

[3] Conolly and Begg, "Database Systems",4/e, Pearson Education,2008

15UISE625 System Simulation and Modeling (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): The purpose of this course is to provide students with an opportunity to develop skills in modeling and simulating a variety of management-related problems. After learning the simulation techniques, the students are expected to be able to solve real world problems which cannot be solved strictly by mathematical approaches.

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the basics of simulation modeling, event scheduling, and probability distribution, properties of random numbers and simulation of computer systems.	1	3	6
CO-2	**Apply** event scheduling, list processing, statistical techniques,	1,3	2	4

	random number and random variategeneration for simulation modelsand Identify the system related terms in the given system													
CO-3	**Analyze** output data produced by a model and test validity of the model													
CO-4	**Analyze** the performance of given real time system using simulation													
PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level	3.0	2.0	2.75	2.0	3.0	1.33	1.5				1.0			

Prerequisites:

1. Probability and statistics

Contents:

1) **Introduction to Simulation:** When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.**5 Hrs.**
2) **Simulation Examples:** Characteristics of Queuing Systems; Queuing Notation; Simulation of Queuing Systems; Simulation of Inventory Systems **6 Hrs.**
3) **General Principles:** Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event scheduling; List processing. **5 Hrs**.
4) **Statistical Models in Simulation:** Review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions **6 Hrs.**
5) **Random-Number Generation:** Properties of Random Numbers; Generation of Pseudo-Random Numbers; Techniques for Generating Random Numbers; Tests for Random Numbers. **6 Hrs.**
6) **Random-Variate Generation:** Inverse Transform technique: Exponential Distribution, Uniform Distribution, Discrete Distributions; Acceptance-Rejection Technique: Poisson Distribution. **5 Hrs.**
7) **Input Modeling:** Data Collection; Identifying the distribution with Data; Parameter Estimation; Goodness of Fit Tests; Selecting Input Models without

Data; Multivariate and Time-Series Input Models. **7 Hrs.**

8) **Verification and Validation of Simulation Models:** Model Building, Verification and Validation; Verification of Simulation Models; Calibration and Validation of Models **6 Hrs.**
9) **Simulation of Computer Systems:** Introduction; Simulation Tools; Model Input; High-Level Computer-System Simulation; CPU Simulation; Memory Simulation. **6 Hrs.**

Reference books:

[1] Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicol, "Discrete-Event System Simulation",5/e, Prentice-Hall India, 2009
[2] Averill M. Law, W. David Kelton, "Simulation Modeling and Analysis",5/e, McGrawHill,2014
[3] Bernard P. Zeigler, "Guide to modeling and Simulation of systems", 1/e, Springer publications,2012

SDM College of Engineering & Technology, Dharwad

Odd Semester 2019-20

Academic Calendar for UG Programmes

Sl. No.	Particulars	Date
1	Registration	27-07-2019 to 31-07-2019
2	Induction program for First Semester (Tentative)	01-08-2019 to 14-08-2019

3	Teaching Commences for odd semester except I Sem	01-08-2019
4	Last date for registration with late fee	06-08-2019
5	Teaching Commences for I semester	16-08-2019
6	Display of attendance	16-09-2019
7	Internal Assessment – IA– I	18-09-2019 to 20-09-2019
8	Communication of performance to the parents	26-09-2019
9	Last date to drop the course	27-09-2019
10	Display of attendance	02-11-2019
11	Internal Assessment –IA– II	04-11-2019 to 06-11-2019
12	Students Feedback	11-11-2019 to 15-11-2019
13	Communication of performance to the parents	13-11-2019
14	Last date to withdraw the course	13-11-2019
15	Teacher – Parents Meet	16-11-2019
16	Internal Assessment –IA– III	27-11-2019 to 29-11-2019
17	Last day of teaching for Odd Semester	30-11-2019
18	Final Lab Assessments	03-12-2019 to 10-12-2019
19	Display of consolidated Continuous Internal Evaluation (CIE) & Attendance	05-12-2019
20	Communication of performance to the parents	05-12-2019
21	Semester End Examination	13-12-2019 to 27-12-2019
22	Inter Semester Recess	28-12-2019 to 12-01-2020
23	Declaration of Results	09-01-2020
24	Communication of performance to the parents by putting on website	10-01-2020
25	Makeup SEE for odd semesters	11-01-2020 to 18-01-2020
Commencement of Even Semester :		**13-01-2020**

Dean (Academic Program) **PRINCIPAL**

Academic Calendar (Tentative) for Even Semester 2019-20
B.E. &M.Tech

Sl. No.	Particulars	Date
1	Registration	09-01-2020 to 11-01-2020
2	Commencement of Teaching	13-01-2020
3	Last date for registration with late fee	18-01-2020
4	Display of attendance	18-02-2020
5	Internal Assessment – IA– I	24-02-2020 to 26-02-2020
6	Communication of performance to the parents	03-03-2020
7	Last date to drop the course	04-03-2020
8	Parents Meet	14-03-2020
9	Insignia – 2020	20-03-2020 & 21-03-2020
10	Display of attendance	30-03-2020
11	Internal Assessment – IA– II	01-04-2020 to 03-04-2020
12	Last date to withdraw the course	08-04-2020
13	Communication of performance to the parents	11-04-2020
14	Feedback by Students	20-04-2020 to 25-04-2020
15	Internal Assessment –IA– III	04-05-2020 to 06-05-2020
16	Last day of teaching for Even Semester	06-05-2020
17	Final Lab Assessments	09-05-2020 to 20-05-2020
18	Display of consolidated Continuous	09-05-2020

	Internal Evaluation (CIE) marks & Attendance for 8th semester	
19	Semester End Examination for 8th semester	11-05-2020 to 19-05-2020
20	Display of consolidated CIE marks & Attendance for 2nd, 4th & 6thsemesters (Both for UG & PG)	13-05-2020
21	Communication of performance to the parents	14-05-2020
22	Project exam for 8th semester	21-05-2020 to 26-05-2020
23	Semester End Examination for 2nd, 4th & 6th semesters (Both for UG & PG)	22-05-2020 to 05-06-2020
24	Results for 8th semester	30-05-2020
25	Summer vacation	06-06-2020 to 31-07-2020
26	Announcement of Results for 2nd, 4th & 6th semester (Both for UG & PG)	12-06-2020

Supplementary Semester: 12-06-2020 to 27-07-2020

Commencement of next Academic Year 2020 - 21: 01-08-2020

Dean (Academic Program) **PRINCIPAL**

Supplementary Semester Calendar for B.E./M.Tech/MBA – 2020

Sl. No.	Particulars	VII & VIII Sem (B.E.)	I to VI Sem (B.E.), M.Tech& MBA

1	Registration	01-06-2020 to 03-06-2020	06-06-2020 to 08-06-2020
2	Teaching Commences	01-06-2020	12-06-2020
3	Registration with special permission by Principal	04-06-2020	12-06-2020
4	Internal Assessment (IA) – I	13-06-2020 & 15-06-2020	24-06-2020 & 25-06-2020
5	Internal Assessment (IA) – II	25-06-2020 & 26-06-2020	03-07-2020 & 04-07-2020
6	Internal Assessment (IA) – III	10-07-2020 & 11-07-2020	13-07-2020 & 14-07-2020
7	Display of consolidated Continuous Internal Evaluation (CIE) marks & Attendance	13-07-2020	16-07-2020
8	Supplementary SEE	14-07-2020 to 17-07-2020	18-07-2020 to 23-07-2020
9	Declaration of results	22-07-2020	27-07-2020

Dean (Academic Program) **PRINCIPAL**