## GOVERNMENT ARTS COLLEGE (AUTONOMOUS) COIMBATORE-641 018

## Learning outcomes-based Curriculum Framework (LOCF) for

## M.Sc. INFORMATION TECHNOLOGY (Effective from Academic year 2021-2022)



# POST GRADUATE DEPARTMENT OF INFORMATION TECHNOLOGY

MAY-2021

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#### Preamble

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. Such changes have gained momentum with the introduction of Choice Based Credit System (CBCS) which further expects learning outcome-based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome-based curriculum will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

Tamil Nadu State Council for Higher Education (TANSCHE) has formed the State Integrated Boards of Studies, which, with great diligence and expertise has devised the mandatory areas that have to be covered for three-year undergraduation and two-year postgraduation courses to realize the facilitation of the mobility of faculty and students from one university to another and to easily solve the problem of equivalence among courses. Great care has been taken so that these areas would take 75% of the course content and the remaining 25% can be decided by the individual institutions. The areas that must be covered by the student that are mandatory for earning the degree to have due value has been worked out so that the student will gain enough depth of knowledge in the subject concerned. 25% of the syllabus should be designed by the institutions, and the areas covered under this also must have a weightage of 25%. This gives the autonomous institution seamless liberty on every Board of Studies (BOS) to innovate and experiment, and more importantly, it is here that the institution devises appropriate strategies by which (i) to make creative and critical applications of what has been learnt in the mandatory components, and (ii) to meaningfully connect the learners to the career demands and expectations. It is essential that the theoretical subject knowledge of the students must be translated into practical hands-on experience.

One of the significant reforms in the postgraduate education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the country which will help

the students to ensure similar quality of education irrespective of the institute and location. With initiatives of University Grants Commission (UGC) for nation-wide adoption and implementation of the LOCF for master's programmes in colleges, universities and HEIs in general. A Core Expert Committee (CEC) was constituted to formulate the modalities for developing the LOCF in various subjects being taught in the postgraduate courses in sciences, humanities, commerce and professional courses. The CEC also constituted the Subject Expert Committees (SEC) in various subjects to prepare detailed guidelines for the LOCF in subjects concerned.

The key components of the planning and development of LOCF are given in terms of clear and unambiguous description of the Graduate Attributes (GA), Qualification Descriptors (QD), Program Learning Outcomes (PLO) and Course Learning Outcomes (CLO) to be achieved at the end of the successful completion of each postgraduate program to be offered by HEIs. In postgraduate education in Information Technology, the programme of study leading to the degree of M.Sc. in Information Technology is discussed herewith.

The Qualification Descriptors (QD), Program Learning Outcomes (PLO) and the Course Learning Outcomes (CLO) were also finalized keeping the broad requirement of the programme in view. The LOCF also gives general guidelines for the Teaching Learning Process (TLP) corresponding to each component of theory, experiment, tutorials, projects and industrial / field visits to be followed in order to achieve the stated outcomes for each component. Finally, some suggestions for using various methods in the assessment and evaluation of learning levels of students are also made. It is a student centric framework where they are expected to learn latest trends and techniques in Information Technology like Artificial Intelligence, Internet of Things, Machine Intelligence along with advanced skill sets that include Mobile Application Development, Object Oriented Analysis and Design among many other subjects.

#### 1. Introduction

Information Technology (IT) has been evolving as an important branch of science and engineering throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Information Technology is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Information Technology can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of information technology also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both expertise in information technology and knowledge of the particular application domain.

Information Technology has a wide range of specialties. These include Advanced Java Programming, Advanced Operating Systems, Object Oriented Analysis and Design, Advanced Python Programming, C# Programming, Data Analytics with R, Cryptography and Network Security, Soft Computing, Digital Image Processing, Big Data and IPR, Open Source Tools and Cloud Computing. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Information Technology is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Information Technology, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

Universities and other HEIs introduced programmes of studies in computer science as this discipline evolved itself to a multidisciplinary discipline. Information Technology is growing rapidly. Increasing applications of computers in almost all areas of human endeavor has led to vibrant industries with concurrent rapid change in technology. Unlike other basic disciplines, developing core competency in this discipline that can be reasonably stable becomes a challenge .In India, it was initially introduced at the Master (postgraduate) level as MCA and M.Tech. Later on, engineering programmes such as B.Tech and B.E in Computer Science & Engineering and in Information Technology were

introduced in various engineering College/Institutions to cater to the growing demand for trained engineering manpower in IT industries. Parallelly, BSc and MSc programmes with specialization in Computer Science were introduced to train manpower in this highly demanding area. M.Sc. in Information Technology is introduced in different colleges and institutions.

Information Technology education at postgraduate level will result in earning a Master's degree in IT. Students so graduated, can take up programmes in CS/IT leading to research as well as R&D, can be employable at IT industries, or can pursue a teachers' training programme such as BEd in Computer Education, or can adopt a business management career. M.Sc. IT aims at laying a strong foundation of CS/IT at an early stage of the career. There are several employment opportunities and after successful completion of post graduate programme in IT, graduating students can fetch employment directly in companies as Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

The Learning Outcome-based Curriculum Framework in Information Technology is aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in information technology courses, in outcomebased curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help students learn programming techniques and code using any of the programming languages.

Many of the learning outcomes of Information Technology can be achieved only by programming a computer for several different meaningful purposes. All students must, therefore, have access to a computer with a modern programming language installed. The information technology framework does not prescribe a specific language. More importantly, students will learn to adapt to changes in programming languages and learn new languages as they are developed.

The present Learning Outcome-based Curriculum Framework for Master's degree in IT is intended to facilitate the students to achieve the following.

- ✓ To develop an understanding and knowledge of the basic theory of Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.
- $\checkmark$  To develop the ability to use this knowledge to analyze new situations
- To acquire necessary and state-of-the-art skills to take up industry challenges.
   The objectives and outcomes are carefully designed to suit to the abovementioned purpose.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
- ✓ To learn skills and tools to find the solution, interpret the results and make predictions for the future developments.

#### **1.1 Course Structure - Types of Courses**

The following types of courses are offered under CBCS-LOCF:

- Core Courses(CC): A core course is a compulsory course. A student of Post Graduate in Information Technology has to take 18 such Information Technology courses over four semesters.
- 2. Elective Courses(EC): An elective course is a course that is to be chosen from a specified set of courses.
  - a. **Skill enhancement Course**: A student has to take one such course as an individual project in semester IV.
  - b. Discipline Specific Electives(DSE): These are elective courses that provide advanced post graduate training in specialized areas of Information Technology, a set of 4, in all the four semesters of the post graduate programe.

### Learning Outcomes- Based Approach to Curriculum Planning and Development (LOACPD)

2.1 Nature of extent of the M.Sc Information Technology

Framing and implementation of curricula and syllabi is envisaged to provide an understanding of the basic connection between theory and experiment and its importance in understanding the foundation of computing. This is very critical in developing a scientific temperament and to venture a career with a wide spectrum of applications as well as theoretical investigations. The post graduate curriculum provides students with theoretical foundations and practical experience in software and technology aspects of computers. The curriculum in information technology is designed to be of enough depth and relevance to enhance student employment opportunities upon graduation. As a Master's degree program, the curriculum is based on the criterion that graduates are expected to function successfully in a professional employment environment immediately upon graduation.

M.Sc in Information Technology is generally a two-year full time degree program consisting of four semesters which develops advanced theoretical and research skills. This programme helps in building an advanced professional or academic career. It is an appropriate course for students who wish to pursue a Master of Philosophy(M.Phil) or Doctor of Philosophy (PhD) and a research or academic career. This program facilitates students who wish to pursue an independent research project in an area of interest under the supervision of an academic supervisor.

M.Sc. in Information Technology follows CBCS structure as mandated by UGC. In accordance with CBCS guidelines the courses are categorized into compulsory courses, elective courses and project.

#### **ELIGIBILITY FOR ADMISSION**

Candidates for admission to the first year course leading to the degree of Master of Science M.Sc. Information Technology will be required: A pass in B.Sc Information Technology, B.Sc Computer Science, B.Sc Computer Technology, B.C.A degree or its equivalent as per Bharathiar University eligibility norms.

#### 2.2 Aims of Master's degree programme in Information Technology

The Master of Science degree in Information Technology emphasizes problem solving in the context of algorithm development and software implementation and prepares students for effectively using modern computer systems in various applications. The curriculum provides required information Technology courses such as advanced programming languages, advanced operating system, object oriented analysis and design, data analytics, cryptography and network security, soft computing, digital image processing, big data and IPR, open source tools, cloud computing as well as elective courses in machine learning, TCP/IP, software quality assurance, mobile application development and other current topics in information technology. The main aim of this Master's degree is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. The purpose of the MSc programs in information technology are twofold: (1) to prepare the student for a position involving the design, development and implementation of computer software/hardware, and (2) to prepare the student for entry in to a program of research study in information technology/computer science and related fields.

The Master of Science in Information Technology programme focuses on the concepts and techniques used in the design and development of software systems. Students in this program explore the conceptual underpinnings of Information Technology -- its fundamental algorithms, programming languages, operating systems, and software testing techniques. In addition, students choose from a rich set of electives that includes machine learning, internet of things, TCP/IP, software quality assurance, among other topics.

#### 3. Graduate Attributes

*Graduate Attributes* (GA) are the qualities, skills and understandings that students should develop during their time with the HEI. These are qualities that also prepare graduates as agents of social good in future. Graduate Attributes can be viewed as qualities in following sub categories.

- Knowledge of the discipline
- Creativity
- Intellectual Rigor
- Problem Solving and Design
- Ethical Practices
- Lifelong Learning
- Communication and Social Skills

Among these attributes, categories of attributes under *Knowledge of the Discipline* are specific to a programme of study

#### List of graduate attributes for M.Sc. IT

The GAs can be summarized in the following manner.

- GA 1. A commitment to excellence in all scholarly and intellectual activities, including critical judgement
- GA 2. Ability to engage constructively and methodically when exploring ideas, theories and philosophies
- GA 3. Ability to develop creative and effective responses to intellectual, professional and social challenges
- GA 4. To be open-minded about cultural diversity, linguistic difference, and the complex nature of our world
- GA 5. Ability to be responsive to change, to be inquiring and reflective in practice, through information literacy and autonomous, self-managed learning
- GA 6. Ability to communicate and collaborate with individuals, and within teams, in professional and community settings
- GA 7. Ability to communicate effectively, comprehending and writing effective reports and design documentation, summarizing information, making effective oral presentations and giving and receiving clear oral instructions
- GA 8. Ability to demonstrate competence in the practical art of computing by understanding the practical methods, and using modern design tools competently for complex real-life IT problems
- GA 9.. Ability to use a range of programming languages and tools to develop computer programs and systems that are effective solutions to problems
- GA 10. Ability to understand, design, and analyze precise specifications of algorithms, procedures, and interaction behavior.
- GA 11. Ability to apply mathematics, logic, and statistics to the design, development, and analysis of software systems
- GA 12. Ability of working in teams to build software systems.
- GA 13.. Ability to identify and to apply relevant problem-solving methodologies
- GA 14. Ability to apply decision making methodologies to evaluate solutions for efficiency, effectiveness and sustainability
- GA 15. A capacity for self-reflection and a willingness to engage in self-appraisal

GA 16. Open to objective and constructive feedback from supervisors and peers

#### 4. Qualification Descriptors

Qualification descriptors are generic statements of the outcomes of study. Qualification descriptors are in two parts. The first part is a statement of outcomes, achievement of which a student should be able to demonstrate for the award of the qualification. This part will be of interest to those designing, approving and reviewing academic programmes. They will need to be satisfied that, for any programme, the curriculum and assessments provide all students with the opportunity to achieve, and to demonstrate achievement of, the outcomes. The second part is a statement of the wider abilities that the typical student could be expected to have developed. It will be of assistance to employers and others with an interest in the general capabilities of holders of the qualification. The framework has the flexibility to accommodate diversity and innovation, and to accommodate new qualifications as the need for them arises.

#### 4.1. Qualification Descriptors for M.Sc. in Information Technology

On completion of M.Sc.in Information Technology, the expected learning outcomes that a student should be able to demonstrate

- **QD-1.** A systematic, extensive and coherent knowledge and understanding of the field of information technology as a whole and its applications, and links to related disciplinary areas; including a critical understanding of the established theories, principles and concepts, and of a number of advanced and emerging issues in the field of information technology/computer science
- **QD-2.** Procedural knowledge that creates different types of professionals related to information technology, including research and development, teaching, industry and government and public service;
- **QD-3.** Skills in areas related to information technology and usage of tools and current developments, including a critical understanding of the latest developments in the area, and an ability to use established techniques of analysis and enquiry within the area of information technology.
- **QD-4.** Demonstrate comprehensive knowledge, including current research, scholarly, and/or professional literature, relating to essential and advanced

learning areas pertaining to the chosen disciplinary areas and field of study, and techniques and skills required for identifying problems and issues relating to the disciplinary area and field of study.

- **QD-5.** Demonstrate skills in identifying information needs, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, effective analysis and interpretation of data
- **QD-6.** Use knowledge, understanding and skills for critical assessment of a wide range of ideas and complex problems and issues relating to the chosen field of study.
- **QD-7.** Communicate the results of studies accurately in a range of different contexts using the main concepts ,constructs and techniques of the subjects of study;
- **QD-8.** Address one's own learning needs relating to current and emerging areas of study, making use of research, development and professional materials as appropriate

#### 5. Programme Learning Outcomes(PLO)

The student graduating with a M.Sc. degree in Information Technology

• Will be able to demonstrate:

(i) a systematic, extensive and coherent knowledge and understanding of Information Technology, as a whole and its applications, and links to related disciplinary areas of study, including a critical understanding of the established theories, principles and concepts, and of a number of advanced and emerging issues in the field of Information Technology.

(ii) Procedural knowledge that creates different types of professionals related to the subject area of study, including research and development, teaching, government and public service, for example, software engineer, developer, evaluator.

(iii) practical skills related to specialization areas within information technology as well within the subfields of information technology (computer graphics, animation, website design and development), and other related fields of study, including broader interdisciplinary subfields (digital marketing, training, etc,.).

• Demonstrate comprehensive knowledge about materials, including current research, scholarly, and professional literature, relating to essential and advanced learning areas pertaining to the chosen disciplinary areas and field of

information technology, and techniques and skills required for identifying problems and issues relating to information technology.

- Demonstrate skills in identifying information needs, collection of relevant quantitative and/or qualitative data from a wide range of sources, analysis and interpretation of data using methodologies as appropriate to information technology for formulating solutions
- Use knowledge, understanding and skills for critical assessment of a wide range of ideas and complex problems and issues relating to the field of information technology.
- Communicate the results of studies undertaken in an academic field of information technology accurately in a range of different contexts using the main concepts, constructs and techniques of the subjects of study
- Apply one's disciplinary knowledge and transferable skills to design and/or development of software for creating new software or automating the existing traditional/manual procedures and seek solutions to real-life problems.
- Ability to address one's own learning needs relating to current and emerging areas of study, making use of development and professional materials, including those related to new frontiers of knowledge.

#### 6. Structure of M.Sc Information Technology Course Objectives, learning outcomes, contents, Teaching Programmes, Assessment References

Semester	Code	Part	Paper	Title of the Paper	Hrs (wk)	Internal (CA)Mark	External (ESE)Mar	Total Marks	End Sem Min.	MAT	Credits
	21MIT11C	A	Ι	Advanced Java Programming	6	50	50	100	25	50	4
	21MIT12C	А	II	Advanced Operating Systems	6	50	50	100	25	50	4
	21MIT13C	А	III	Object Oriented Analysis andDesign	6	50	50	100	25	50	4
	21MIT14C	A	IV	Advanced Python Programming	6	50	50	100	25	50	4
Ι	21MIT15P	А		<b>Practical 1 :</b> Java Programming Lab	3	50	50	100	25	50	2
	21MIT16P	A		<b>Practical 2 :</b> Python Programming Lab	3	50	50	100	25	50	2
					30			600			20
	21MIT21C	А	V	C# Programming	5	50	50	100	25	50	4
	21MIT22C	А	VI	Data Analytics with R	5	50	50	100	25	50	4
	21MIT23C	A	VII	Cryptography and Network Security	5	50	50	100	25	50	4
	21MIT24C	А	VIII	Soft Computing	5	50	50	100	25	50	4
II	21MIT25E	В	IX	Elective I	4	50	50	100	25	50	4
	21MIT26P	А		<b>Practical 3:</b> C# Programming	3	50	50	100	25	50	2

M. Sc., Information Technology Syllabi and Scheme of Examinations for the Students Admitted from 2021-2022 academic year onwards

Semester	Code	Part	Paper	Title of the Paper	Hrs (wk)	Internal (CA)Mark	External (ESE)Mar	Total Marks	End Sem Min.	TPM	Credits
				Lab							
	21MIT27P	А		<b>Practical 4:</b> R Programming Lab	3	50	50	100	25	50	2
					30			700			24
	21MIT31C	А	X	Digital Image Processing	5	50	50	100	25	50	4
	21MIT32C	А	XI	Big Data and IPR	5	50	50	100	25	50	4
	21MIT33C	А	XII	Open Source Tools	5	50	50	100	25	50	4
	21MIT34C	А	XIII	Cloud Computing	5	50	50	100	25	50	4
	21MIT35E	В	XIV	Elective II	4	50	50	100	25	50	3
ш	21MIT36P	А		<b>Practical 5</b> : Open Source Tools Lab	3	50	50	100	25	50	3
	21MIT37P	А		<b>Practical</b> <b>6:</b> Digital Image Processing Lab	3	50	50	100	25	50	3
					30			700			25
	21MIT41E	В	XV	Elective III	5	50	50	100	25	50	3
	21MIT42E	В	XVI	Elective IV	5	50	50	100	25	50	3
	21MIT43V	A		Project and Viva- Voce		50	50	100	25	50	15
IV					10			300			21
			,	Total / Credits				2300			90

#### **Electives for Second Semester: Elective – I**

- 1.1 Machine Learning
- 1.2 Grid Computing
- 1.3 Parallel Processing

#### **Electives for Third Semester: Elective – II**

2.1 Internet of Things

- 2.2 TCP/IP
- 2.3 Wireless Sensor Networks

#### **Electives for Fourth Semester: Elective – III**

- 3.1 Software Quality Assurance
- 3.2 Green Computing
- 3.3 Data Analysis and Business Intelligence

#### <u>Elective – IV</u>

- 4.1 Cyber Security
- 4.2 Mobile Application Development
- 4.3 Principles of Compiler Design

#### **GUIDELINES FOR PROJECT WORK**

The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.

• Each student should carry out individually one project work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application oriented concepts.

• The project work should be compulsorily done under the supervision of the department staff concerned.

#### Viva-Voce

• Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) and External Examiners, after duly verifying the Annexure Report available in the College.

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ADVANCED JAVA PROGRAMMING	T	21MIT11C

On Successful Completion of the Course, the students will be able to :

- CLO1 Describe about the basic object oriented concepts like encapsulation, polymorphism
- CLO2 Develop programs using conditional statements, looping constructs and functions
- CLO3 Explain about networking in advanced java using client/server communication
- CLO4 Handle different event in java using the delegation event model, event listener and class.
- CLO5 Discuss the concepts string handling
- CLO6 Illustrate the concepts of AWT
- CLO7 Analyze the interfaces and exceptions
- CLO8 Evaluate the business logic of enterprise applications using Swing

**Unit 1 :An Overview of Java -** Object-Oriented Programming - Abstraction - The Three OOP Principles - **Introducing classes:** class fundamentals – declaring objects, Introducing methods, constructors - this keyword – garbage collection - finalize () method - Method overloading - **Inheritance:** Inheritance basics – using super – method overriding – dynamic method dispatch – abstract class – final keyword

**Unit 2 : Packages and interfaces:** packages – importing packages – defining interface – implementing interfaces - **Exception handing**: types of Exceptions - uncaught Exception - try, catch, throw, throws, finally - built-in Exception- user defined exception - **Multithreading**: The Java thread model – main thread - creating a thread –**Input/Output** : I/O basics – Stream Classes – Predefined streams – Reading Console Input - Writing console output.

**Unit3: String Handling** : Special String Operations – Character Extraction – String Comparison – Modify a String – String Buffer - **The collections framework**: collection interfaces – collection classes - string tokenizer – File – Byte Streams – Character Streams –

Serialization - **Networking:** Basics – Networking classes and interfaces – InetAddress – URL – Datagrams.

**Unit 4: Applet class:** Applet basics – Applet Architecture – Applet skeleton - **Event Handling**: Delegation Event Model – Event Class – Event Listener Interfaces - **AWT**: AWT classes – window fundamentals – working with Graphics – Working with Color – Working

with Fonts - Control fundamentals – layout managers – Handling Events by extending AWT Components.

**Unit 5: Java Beans:** Introduction – Advantages – Introspection - Java Beans API - **Introducing Swing:** origins of swing – swing features – MVC Connection – Components and containers – Swing packages – A simple swing application - **Java Servlets**: Introduction – Life Cycle of a Servlet – A simple Servlet – Servlet API – javax.servlet package – javax.servlet.http package.

#### **Text Book:**

1. Herbert Schildt, "The Complete Reference Java" 7<sup>th</sup> Edition TMH Pub. Company Ltd.

#### **References :**

1. Deitel and Deitel, "Java How to Program", Seventh Edition, Pearson Education Asia.

2.Keyur shab, "Java 2 programming", Tata McGraw-Hill Pub. Company Ltd.

3.Cays S. Horstmann, Gary Cornell, "Core Java2 Vol I – Fundamentals", Pearson Edn, 2001.

4. Steven Bright, "JavaScript Fundamental A Step by Step Guide".

#### **Related Online Contents**

https://www.youtube.com/watch?v=- kpSUw\_FTg4, https://www.youtube.com/watch?v=VksxhzfD8kQ, https://www.digimat.in/nptel/courses/video/106105191/L01.html, https://www.classcentral.com/course/swayam-programming-in-java-12930

	Mapping								
Programme			Cours	e Level O	utcomes	(CLOs)			
Level Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8	
Disciplinary	✓	~						$\checkmark$	
Knowledge									
Communication							$\checkmark$		
skills									
Critical thinking			✓	✓		$\checkmark$			
Research -				✓				$\checkmark$	
related skills									
Analytical			✓		✓	$\checkmark$			
reasoning									
Life-long							$\checkmark$	$\checkmark$	
learning									
Scientific	✓	$\checkmark$						$\checkmark$	
reasoning									
Problem solving							$\checkmark$		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ADVANCED OPERATING SYSTEM	Ι	21MIT12C

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

- **CLO1** Associate the evolution and fundamentals of the Operating system
- CLO2 Discuss the Key concept of Operating System
- CLO3 To study threads and Inter Process Communication
- CLO4 To study File systems and disk page management
- CLO5 To study the fundamentals of Linux operating system
- **CLO6** Analyze the issues in designing Operating Systems
- CLO7 Analyze the usage and strengths of various algorithms of Operating
- **CLO8** Appreciate the role of various concepts and algorithms towards the

**UNIT-I:** Introduction – History of Operating systems — Computer Hardware review – Operating System Concepts – System calls – Processes – Model – Creation – Termination – Process Hierarchy – Process States – Implementation of Processes.

**UNIT-II:** Threads – Thread Usage – Classical Thread model- POSIX threads - Pop-up threads - Inter Process Communication – Race condition – Critical Region – Mutual Exclusion with busy waiting – Sleep and wakeup – Semaphores – Mutexes – Monitors - Message Passing - Classical IPC Problems: The Dining Philosophers Problem – The Readers and Writers Problem- Memory management: virtual memory – Paging- Paging tables- Speeding up paging – Page tables for large memories.

**UNIT–III:** Page replacement algorithms: the optimal page replacement algorithm- The not recently used page replacement algorithm- FIFO Page replacement algorithms – The second-chance Page replacement algorithms- The Clock Page replacement algorithms- LRU Page replacement algorithms- Simulating LRU in software- The working set Page replacement algorithms- The WSClock Page replacement algorithms.

**UNIT-IV:** File systems: File naming - File structure - File types - File access - File attributes - File operations- Directories: Single-level directory systems- Hierarchical directory systems-Path names- Directory operations- File system management and optimization: Disk space management- File system backups- File system consistency- File system performance - Defragmenting disks.

**UNIT-V:** Case studies: LINUX Operating system: Overview of Linux- Linux goals – Interfaces to Linux – The Shell – Linux Utility Programs – Kernel Structure – Processes in Linux – Fundamentals concepts – Process Management system calls – Scheduling in Linux -

Memory management in Linux – Memory Management Fundamentals – Memory management system calls – Input/ Output in Linux – I/O Fundamentals – Networking – I/O system calls - The Linux File System – File system Fundamentals – File system calls.

#### **TEXT BOOK**

1. Andrew S.Tanenbaum, "Modern Operating Systems", PHI/Eastern Economy Edition, Third Edition, 2015.

#### REFERENCES

- 1. William Stallings, "Operating Systems", Prentice Hall of India, Second Edition, 2000.
- 2. Maurice J. Bach, "The Design of the Unix Operating System", PHI, 2002.

#### FURTHER READING

- 1. https://www.cse.wustl.edu > ~cdgill > courses > cse522
- 2. https://www.tutorialspoint.com/operating\_system/os\_quick\_guide.htm
- 3. https://www.cst.cam.ac.uk > teaching
- 4. https://www.cs.unm.edu > ~eschulte > classes

Mapping								
Programme Level			Cours	se Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓	$\checkmark$				$\checkmark$	$\checkmark$	
Knowledge								
Communication		✓					✓	
skills								
Critical thinking			✓	~				
Research -related				✓				✓
skills								
Analytical	✓		$\checkmark$			~		
reasoning								
Life-long learning			~		~			~
Scientific	✓	✓					✓	
reasoning								
Problem solving				✓	~			<b>√</b>

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	<b>OBJECT ORIENTED ANALYSIS AND DESIGN</b>	Ι	21MIT13C

On Successful Completion of the Course, the students will be able to :

CLO1	Explain the Object Oriented paradigms
CLO2	Apply object oriented analysis and design to Systems development life cycle
CLO3	Analyse the various object oriented methodologies
CLO4	Generate UML diagrams for proposed systems
CLO5	Compare the object oriented analysis and design processes
CLO6	Distinguish between DBMS and OODBMS
CLO7	Evaluate the various testing strategies
CLO8	Develop a proposed system using OOAD

**UNIT-I:** Object Basics - Objects - Attributes - Class Hierarchy - Polymorphism - Object relationships and associations - Aggregations and object containment – Object Oriented systems Development life cycle - The software development process - Building high quality software - OOSD: A Use-case driven approach - Reusability.

**UNIT-II:** Object-Oriented Methodologies- Rumbaugh Object modeling technique-The Booch methodology-The Jacobson methodologies- The Unified Approach- UML- Class Diagrams-Dynamic Modeling.

**UNIT-III:** Object-Oriented Analysis process – Use-case Model-Object Analysis: Classification- Noun Phrase approach – Classes, responsibilities and collaborators – Associations-Super-Sub class relationships-Aggregation.

**UNIT-IV:** Object-Oriented Design Axioms- Design Patterns- Designing classes- Class visibility- Refining attributes-designing methods and protocols- Access layer: DBMS-OODBMS.

**UNIT-V:** Software Quality Assurance-Quality Assurance Tests-Testing strategies-Test Plan-Usability Testing-User Satisfaction Test. **Case Studies:** 1. Creating sample Use Cases and UML class diagrams 2. Developing a system using OO-SDLC approach.

#### **TEXT BOOK**

1. Ali Bahrami, "Object Oriented Systems Development", TATA McGraw-Hill Edition, 2008.

#### REFERENCES

1. Booch G., "Object oriented analysis and design", Addison-Wesley Publishing Company,2007.

2. Rambaugh J, Blaha.M. Premeriani, W., Eddy F and LoresenW."Object Oriented Modeling and Design", PHI 2005.

#### **FURTHER READING:**

1. https://fdocuments.in/document/ooad-tutorial.html

Mapping								
Programme Level		Course Level Outcomes(CLOs)						
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓	~	<ul> <li>✓</li> </ul>				✓	
Knowledge								
Communication		~			✓		✓	
skills								
Critical thinking			✓	✓				~
Research -related skills				✓				~
Analytical reasoning	~		~			~		
Life-long learning					~			~
Scientific reasoning	~	~					✓	
Problem solving					✓			

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ADVANCED PYTHON PROGRAMMING	Ι	21MIT14C

On Successful Completion of the Course, the students will be able to :

- CLO1 Discuss fundamentals of python
- CLO2 Associate the various data types and its usage
- CLO3 Analyse the concept of decision making and branching and decision making and looping
- CLO4 Explain about the arrays and strings
- CLO5 Classify different categories of functions
- CLO6 Experiment exception handling and networking
- CLO7 Infer about files and data base connectivity
- CLO8 Develop programs by their own to improve the efficiency

**UNIT-I**: Arrays: Creating an array - Importing - Indexing and Slicing - Processing the array - Types of arrays - Working with arrays using numpy - Creating array using array() - Line space - Log space - arrange() - zeros() - ones() - Mathematical operations on arrays - Comparing arrays - Aliasing the arrays - Viewing and Copying arrays - Slicing and Indexing in numpy - Dimensions of arrays - Attributes of an arrays - reshape() method - flatten() method - Working with multi-dimensional arrays - Indexing and slicing - matrices in numpy.

**UNIT–II:** Strings and Characters: Creating-Length - Indexing - Slicing - Repeating - Concatenation -Checking Membership- Comparing- Removing Spaces -Finding Substring - Counting - Strings are immutable-Replacing-Splitting and Joining-Changing Case-Checking Starting and Ending-String testing methods-Formatting-Working with characters.

Functions: Function Definition - Function Calls - Return-Pass by Object Reference - Formal, Actual, Positional, Keyword, Default and Variables Length Arguments - Local and Global Variables - Global Keyword - Passing a group of elements to the function - Recursive Function - Anonymous Functions (Lambdas).

**UNIT-III:** Lists and Tuples: Introduction - Lists using Range() - Updating – Concatenation - Repetition - Memberships - Aliasing and Cloning Lists - Methods to Process Lists - Nested List - Creating a Tuples - Accessing the Tuple Elements - Basic Operations - Function to Process Tuples - Nested Tuples - Insertion, Deletion and Modification in Tuples.

Dictionaries: Dictionaries Operations - Methods - Using for loop with Dictionaries - Sorting the elements of a Dictionary using Lambdas - Conversion of List and String into Dictionary - Passing Dictionaries to Function - Ordered Dictionaries.

**UNIT IV :** Files: Files in python - Types of files - Opening a file - Closing a file - working with Text files containing Strings - Working with Binary files - The seek() and tell() methods - Random accessing of binary files - Zipping and unzipping files - Working with directories.

**UNIT V** :Data Frame: Creating Data frame from an Excel Spreadsheet - Creating Data frame from .csv Files - Creating Data frame from a Python Dictionary - Creating data From python List of Tuples - Operations on Data Frames. Data Visualization - Bar Graph- Histogram-Creating a Pie Chart- Creating a Line graph.

#### **TEXT BOOKS**

1. Dr. R. Nageswara Rao, "core python programming", 2017, Dreamtech Press

#### REFERENCES

- 1. Martin C. Brown, "PYTHON: The Complete Reference", McGraw-Hill, 2001.
- 2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd ednShroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/).

3. Mark Summerfield. "Programming in Python 3: A Complete introduction to the Python Language", Addison-Wesley Professional, 2009.

#### FURTHER READING

https://www.w3schools.com/python/ https://www.tutorialspoint.com/python/index.htm https://www.programiz.com/python-programming

Mapping								
Programme Level			Cours	e Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	~	$\checkmark$						~
Knowledge								
Communication							$\checkmark$	
skills								
Critical thinking			$\checkmark$	✓		$\checkmark$		
Research -related				$\checkmark$				✓
skills								
Analytical			$\checkmark$		$\checkmark$	$\checkmark$		
reasoning								
Life-long learning							$\checkmark$	$\checkmark$
Scientific			$\checkmark$				$\checkmark$	
reasoning								
Problem solving		✓		✓			✓	

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	JAVA PROGRAMMING LAB	Ι	21MIT15P

On Successful Completion of the Course, the students will be able to :

- CLO1 Demonstrate the working environment of Java
- CLO2 Develop programs using conditional statements, looping constructs and functions
- CLO3 Devise class and inheritance
- CLO4 Identify and debug errors in the program
- CLO5 learn the concepts of package and interface
- CLO6 Illustrate the concepts of multithreading
- CLO7 Analyze the objects and exceptions
- CLO8 Gain knowledge about beans and swing.

#### LIST OF PROGRAMS

- 1. Write a java program to create a class, objects using constructor.
- 2. Write a java program to implement inheritance.
- 3. Write a java program to illustrate run time exception and I/O exception.
- 4. Write a java program to create a package.
- 5. Create an Employee package to maintain the information about the employee. Use the Constructors to initialize the Employee number and use Overloading method to get the Basic pay of the employee, by using package create a java program.
- 6. Write a java program to implement multithreading.
- 7. Write a java program to create GUI components.
- 8. Write a java program to draw images and animate them.
- 9. Program to implement the concept of Decision making and branching.
- 10. Generating advertisements using Applets.
- 11. Program to draw any cartoon using Graphics.
- 12. Program to implement interfaces.
- 13. Program to perform various Mouse Events using Applets

#### **E-Learning Resources:**

- 1. https://stackify.com/java-tutorials/
- 2.<u>https://www.learnjavaonline.org/</u>
- 3.https://www.coursera.org/courses?query=java

Mapping								
Programme Level			Cours	se Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary				✓				~
Knowledge								
Communication	✓	$\checkmark$						~
skills								
Critical thinking		$\checkmark$		$\checkmark$	$\checkmark$			
Research -related		$\checkmark$				✓		
skills								
Analytical		$\checkmark$		✓			~	
reasoning								
Life-long learning								
Scientific			✓				✓	~
reasoning								
Problem solving	✓				✓			

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	PYTHON PROGRAMMING LAB	Ι	21MIT16P

On Successful Completion of the Course, the students will be able to :

- CLO1 Demonstrate the working environment of Python
- CLO2 Develop programs using conditional statements, looping constructs and functions
- CLO3 Devise lists, tuples and dictionaries
- CLO4 Identify and debug errors in the program
- CLO5 Discuss the concepts of command line arguments
- CLO6 Illustrate the concepts of files
- CLO7 Analyze the objects and exceptions
- CLO8 Gain knowledge about Regular expressions

#### LIST OF PROGRAMS

- 1. Program using Operators and Expressions.
- 2. Program using conditional control structures.
- 3. Program to explore string functions.
- 4. Program using Arrays.
- 5. Program to demonstrate the use of lists and related functions.
- 6. Program to demonstrate the use of tuple and related functions.
- 7. Program to implement a dictionary.
- 8. Program to read and write into a text file.
- 9. Program to demonstrate Data frame.
- 10. Program to demonstrate Data visualization.
- 11. Program to demonstrate binary file.
- 12. Program using numpy and lamdas.

#### **TEXT BOOK**

1. Chun, J Wesley (2010). Core Python Programming, 2nd Edition, Pearson.

#### REFERENCES

1.Martin C. Brown, "PYTHON: The Complete Reference", McGraw-Hill, 2001.

2.Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/).

3.Mark Summerfield. "Programming in Python 3: A Complete introduction to the Python Language", Addison-Wesley Professional, 2009.

#### FURTHER READING

- https://realpython.com/tutorials/advanced/
- <u>https://www.tutorialspoint.com/python/index.htm</u>
- https://www.python-course.eu/advanced\_python.php

Mapping								
Programme Level			Cours	e Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓		$\checkmark$	✓	$\checkmark$			$\checkmark$
Knowledge								
Communication		$\checkmark$						$\checkmark$
skills								
Critical thinking		$\checkmark$		$\checkmark$			✓	
Research -related								
skills								
Analytical		$\checkmark$		✓		$\checkmark$	✓	
reasoning								
Life-long learning				✓				$\checkmark$
Scientific				✓			✓	
reasoning								
Problem solving		$\checkmark$		✓				$\checkmark$

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	C# PROGRAMMING	II	21MIT21C

On Successful Completion of the Course, the students will be able to :

CLO1	Understand fundamentals of C#
CLO2	Learn the various data types and its usage
CLO3	Analyse the concept of decision making and branching and decision making and looping
CLO4	Understand about the arrays and strings
CLO5	Classify different categories of structures
CLO6	Experiment inheritance and polymorphism
CLO7	Learn about operator overloading
CLO8	Develop programs by their own to improve the efficiency

**Unit 1: Introduction to C#**: Evolution of C#, characteristics of C#, applications of C#, C# differ from C++ and JAVA - **Overview of C#**: simple C# program, namespaces, adding comments, returning a value, aliases namespaces, passing string objects, command line arguments, interactive input, mathematical functions, multiple main methods, compile time errors, program structure, program coding style. **Literals, variables and data types:** literals, variables, data types, value and reference types, declaration of variables - initialization of variables, default values, constant values, scope of variables, boxing and unboxing.

**Unit -2:Operators and Expressions:** Arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise, special operators, Expressions: arithmetic expressions, evaluation of expressions, precedence of arithmetic expressions, type conversions, operator precedence and associatively, mathematical functions. **Decision making and Branching:** Decision making with IF statement, simple IF statement – The IF ...ELSE statement – Nesting of IF..ELSE statement - ELSE....IF ladder, switch statement, '?:' conditional operator. **Decision making with looping:** WHILE statement, DO statement, FOR statement, foreach statement, jump in loop

Unit 3: Methods in C# :Declaring methods, main methods, invoking methods, nesting of methods, method parameters, pass by value, pass by reference, output parameters, variable argument lists, method overloading. Handling Arrays: one-dimensional array, creating an array, two-dimensional array, variable-size array, System. Array class, array list class. Manipulating Strings: creating strings, string methods, inserting strings, comparing strings, finding substrings, mutable strings, array of strings, regular expressions.

Unit 4 :Structures and Enumerations : Structures, structs with methods, nested structs, difference between classes and structs - enumerations, enumerator initialization, enumerator base types, enumerator type conversion. Classes and Objects: basic principles of OOP, defining a class, adding variables, methods, member access modifiers, creating objects, accessing class members, constructors, overloaded constructors, static members, static constructors, private constructors, copy constructors, destructors, member initialization, THIS reference. Inheritance and Polymorphism: classical inheritance, containment inheritance, defining a subclass, visibility control, defining subclass constructors, overriding methods, hiding methods, abstract classes and methods, sealed classes, sealed methods, polymorphism, extension methods

Unit 5:Interface and Multiple Inheritance : Defining an interface, extending an interface, implementing interfaces, interfaces and inheritance, explicit interface implementation, abstract classes and interfaces. **Operator overloading:** overloadable operators, need for operator overloading, defining operator overloading, overloading unary and binary operators, overloading comparison operators. **Delegates and Events:** delegates, delegate declaration, delegate methods, delegate instantiation, delegate invocation, using delegates, multicast delegates, events. **Managing console I/O operations:** console class, console input, console output, formatted output, numeric formatting, standard numeric format, custom numeric format

#### **TEXT BOOK**

1. E. Balagurusamy, "Programming in C# A Primer", Fourth Edition, McGraw Hill Education Private Limited, 2016.

#### REFERENCES

- 1. Stanley B.Lippman, "C# Primer A Practical Approach", Pearson Education, 2002.
- 2. Tom archer, "Inside C#", Microsoft Press, 2001.
- 3. "Microsoft C# Language Specification", Microsoft Press, 2001.
- 4. Ian Griffiths, Matthew Adams and Jesse Liberty, "Programming C# 4.0," O'Reilly 6<sup>th</sup>Ed.
- 5. SvetlinNakov& Co, Fundamentals of computer programming with C#, The Bulgarian C# Programming Book, Sofia, 2013.

Mapping								
Programme Level			Cours	se Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary		$\checkmark$			✓			
Knowledge								
Communication	~				✓	✓		
skills								
Critical thinking			✓				$\checkmark$	✓
Research -related		$\checkmark$				$\checkmark$	$\checkmark$	
skills								
Analytical		$\checkmark$				✓		
reasoning								
Life-long learning	$\checkmark$				$\checkmark$			
Scientific			✓				$\checkmark$	$\checkmark$
reasoning								
Problem solving	$\checkmark$				$\checkmark$			

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	DATA ANALYTICS WITH R	II	21MIT22C

On Successful Completion of the Course, the students will be able to :

- CLO1 Discuss the basics of R, data types and variables.
- CLO2 Write programs using decision making and looping statements and to know how to create functions and strings
- CLO3 Analyze the use of different R data structures, packages and input/output features
- CLO4 Distinguish between Import and Export of Data
- CLO5 Apply the different data visualization methods
- CLO6 Create the data sets in the formats and able to perform data analysis
- CLO7 Apply Statistical Analysis
- CLO8 Analyze the datasets using supervised and unsupervised algorithms

**UNIT-I:** Introduction to R- Features of R- Installation of R- Getting started- Variables in - Input of Data- Output in R- In-Built Functions in R- Packages in R. Data types of R- Vectors – Matrices - Arrays – Lists – Factors – Data Frames.

**UNIT-II:** Programming in R- Decision making structures- Loops- User-defined Functions-User-defined Package- Reports using Rmarkdown. Data Exploration and Manipulation-Missing Data Management- Data Reshaping through Melting and Casting- Special Functions across Data Elements. Import and Export of Data- Import and Export of Data in Text file-Import and Export of Data in Excel.

**UNIT-III:** Visualization Techniques- Basic Visualization- Pie Chart- Bar Chart- Histograms-Line Chart- Box-and-Whisker Plot- Bubble Plot- Scatter Plot- ggplot2.

**UNIT-IV:** Statistical Analysis- Basic statistics- Descriptive statistics- Measures of Central Tendency- Mean- Median- Mode- Measures of Variability- Variance-Standard Deviation-Range- Rank. Simulation and Distributions- Normal Distribution- Binomial Distribution.

**UNIT-V:** Machine Learning- Unsupervised Machine Learning Algorithms- Dimensionality Reduction- Principal Component Analysis- Clustering- K-Means Clustering- Hierarchical Clustering. Supervised Machine Learning Problems- Simple Linear Regression. Supervised Machine Learning Algorithms- K-Nearest Neighbor's Algorithm for Classification Problems, Support Vector Machines for Classification Problems - Decision Tree for Classification Problems.

#### **TEXT BOOK**

1. Bharti Motwani "Data Analytics with R", First Edition, Wiley, 2019.

#### REFERENCES

1. Sudhamathy G and JothiVenkateswaran C, "R Programming: An Approach to Data Analytics", MJP Publishers, 2019.

2. Bhuvaneswari V, "Data Analytics with R-Step by Step", SciTech Publications, 2016.

3. Nina Zumel, John Mount, "Practical Data Science with R", Manning, 2014.

4.Mark Gardener, "Beginning R- The Statistical Programming Language", Wiley India Pvt Ltd, 2012.

5. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics, Pearson India Education Services Pvt Ltd., 2016.

#### **FURTHER READING**

1. https://onlinecourses.swayam2.ac.in/aic20\_sp35/preview

- 2. https://www.manning.com/books/practical-data-science-with-r-second-edition
- 3. https://education.emc.com/guest/campaign/data\_science.aspx
- 4. https://www.thoughtworks.com/big-data-analytics

Mapping									
Programme Level			Cours	se Level O	utcomes(	CLOs)			
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8	
Disciplinary	✓		$\checkmark$						
Knowledge									
Communication					$\checkmark$	$\checkmark$			
skills									
Critical thinking	✓	$\checkmark$	✓	✓	✓	✓	✓	$\checkmark$	
Research -related	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	✓	✓	✓	
skills									
Analytical	✓	$\checkmark$	✓	✓	✓	✓	✓	✓	
reasoning									
Life-long learning			$\checkmark$	✓		$\checkmark$	$\checkmark$		
Scientific	✓	$\checkmark$	$\checkmark$	✓	$\checkmark$	$\checkmark$			
reasoning									
Problem solving	$\checkmark$	✓	✓	✓	✓		✓		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	CRYPTOGRAPHY AND NETWORK SECURITY	II	21MIT23C

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

CLO1	Discuss the basic categories of threats, various types of attacks and
CLO2	Importance and application of each of confidentiality, integrity, authentication and availability and Classical Encryption Techniques
CLO3	Discuss DES, AES, RSA algorithm and Key management concept
CLO4	Explain Message Authentication & Hash Functions and algorithms
CLO5	Explain Electronic Mail Security and IP Security Architecture
CLO6	Discuss the System Security, Malicious Software and trusted system
CLO7	Analysis the symmetric and asymmetric cryptography
CLO8	Analysis and interpret the Viruses and Related Threats

**UNIT-I** :Introduction: Security Trends - Security Attacks - Security Services - Security Mechanisms - A Model for Network Security. Classical Encryption Techniques: Symmetric Cipher Model - Substitution Techniques - Transposition Techniques - Steganography. Block Ciphers and the Data Encryption Standard: Block Cipher Principles - The Data Encryption Standard - the Strength of DES - Block Cipher Design Principles.

**UNIT- II:** Advanced Encryption Standard: Evaluation Criteria for AES - The AES Cipher. Public-key Cryptography and RSA: Principles of Public-Key Cryptosystems - The RSA Algorithm. Key Management - Diffie-Hellman Key Exchange - Elliptic Curve Arithmetic -Elliptic Curve Cryptography

**UNIT-III:** Message Authentication and Hash Functions: Authentication Requirements - Authentication Functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs. Hash and MAC Algorithms: Secure Hash Algorithm. Digital Signatures and Authentication Protocols: Digital Signatures - Authentication Protocols - Digital Signature Standard. Authentication Applications: Kerberos -X.509 Authentication Service - Public-key infrastructure.

**UNIT-IV:** Electronic Mail Security: Pretty Good Privacy - S/MIME. IP Security: IP Security overview -IP Security Architecture - Authentication Header - Encapsulation Security Payload. Web Security: Web Security Considerations - Secure Socket Layer and Transport Layer Security - Secure Electronic Transaction.

**UNIT-V:** System Security: Intruders - Intrusion Detection - Password Management. Malicious Software: Viruses and Related Threats - Virus Countermeasures. Firewalls: Firewall Design Principles. Trusted Systems - Common Criteria for Information Technology Security Evaluation.**Casestudy :** Analysis the symmetric and asymmetric cryptogram algorithm

#### **TEXT BOOK**

1. William Stallings, "Cryptography and Network Security Principles and Practices", 4<sup>th</sup> Edition, PHI/Pearson Education.

#### REFERENCES

- 1. Bruce Schneir, "Applied Cryptography", CRC Press.
- 2. A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied Cryptography", CRC Press, 1997.
- 3. Ankit Fadia, "Network Security", MacMillan, 2<sup>nd</sup> Edition.

#### **FURTHER READING**

<u>https://www.youtube.com/watch?v=C\_e37dfGmNA</u> <u>https://www.youtube.com/watch?v=C\_e37dfGmNA</u> http://www.inf.ufsc.br > material-cripto-seg > Stallings https://www.garykessler.net > library > crypto

Mapping								
Programme Level			Cours	e Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary		$\checkmark$				✓	$\checkmark$	
Knowledge								
Communication	~				✓			
skills								
Critical thinking		$\checkmark$				$\checkmark$	$\checkmark$	
Research -related	$\checkmark$				$\checkmark$	✓		
skills								
Analytical			$\checkmark$				$\checkmark$	✓
reasoning								
Life-long learning	$\checkmark$				$\checkmark$			
Scientific		$\checkmark$				✓	$\checkmark$	
reasoning								
Problem solving	$\checkmark$				✓	✓		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	SOFT COMPUTING	Π	21MIT24C

On Successful Completion of the Course, the students will be able to :

- CLO1 Understand the basics of neural networks and their architectures
- CLO2 Analyse the back propagation networks
- CLO3 Compare the three layers of neural networks
- CLO4 Understand the fundamentals of genetic algorithms
- CLO5 Evaluate the basic operators of genetic algorithms
- CLO6 Differentiate between crisp sets and fuzzy sets
- CLO7 Analyse propositional and predicate logics of fuzzy relations and Defuzzification
- CLO8 Evaluate real time applications of neural networks, genetic algorithms and fuzzy systems

**Unit-I:** Fundamentals of Neural Networks: Basic concepts of Neural Networks –Human Brain – Model of an Artificial Neuron – Neural Network Architectures – Characteristics of Neural Networks – Learning methods – Early Neural Network Architectures – Some Application domains.

**Unit-II:** Backpropagation Networks: Architecture of a Backpropagation Network – Backpropagation Learning: Input Layer Computation – Hidden Layer Computation – Output Layer Computation – Calculation of Error – Training of Neural Network – Effect of Learning Rate ' $\eta$ ' – Effect of Tuning parameters of the Back Propagation Neural Network – Selection of various parameters in BPN.

**Unit-III:** Fundamentals of Genetic Algorithms: History – Basic Concepts – Creation of Offsprings - Working Principle – Encoding – Fitness Function – Reproduction. Genetic Modelling: Basic Operators: Cross over – Mutation – Difference and Similarities between Genetic Algorithm and other Traditional Methods – Issues for GA Practitioners – Benefits of GA – When to use GA – GA Applications.

**Unit-IV**: Fuzzy Set Theory: Fuzzy versus crisp, Crisp sets: Operation on Crisp sets- Properties of Crisp Sets-Partition and Covering. Fuzzy sets: Membership Function – Basic fuzzy set Operations-properties of fuzzy sets. Crisp relations: Cartesian product-Other Crisp Relations-Operations on Relations. Fuzzy relations: Fuzzy Cartesian product- Operations on Fuzzy Relations.
**Unit-V:** Fuzzy Logic and Inference: Crisp logic: Laws of Propositional Logic-Inference in propositional Logic. Predicate logic: Interpretations of Predicate Logic Formula – Inference in Predicate Logic. Fuzzy logic: Fuzzy Quantifiers – Fuzzy Inference, Fuzzy rule based system – Defuzzification – Application - Air conditioner controller.

### **TEXT BOOK**

1. S.Rajasekaran&G.A.VijayalakshmiPai, "Neural Networks, Fuzzy logic, and Genetic Algorithms Synthesis and Applications, PHI, Second Edition 2017.

## REFERENCES

- 1. James A. Freeman, David M.Skapura, "Neural Networks-Algorithms, Applications, and Programming Techniques", Pearson Education.
- 2. Fredric M. Ham, Ivica Kostanic, "Principles of Neuro computing for science of Engineering", TMCH.

### **FURTHER READING**

- 1. https://nptel.ac.in/courses/127/105/127105006/
- 2. https://www.iitg.ac.in/rkbc/CE602/CE602/Genetic%20Algorithms.pdf

	Mapping							
Programme Level			Cours	se Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓			$\checkmark$	$\checkmark$	$\checkmark$		
Knowledge								
Communication			$\checkmark$					✓
skills								
Critical thinking			~		~			✓
Research -related	$\checkmark$			$\checkmark$		$\checkmark$		
skills								
Analytical		$\checkmark$		✓			✓	
reasoning								
Life-long learning			$\checkmark$		~			✓
Scientific	✓			$\checkmark$			✓	
reasoning								
Problem solving			✓					✓

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	<b>C# PROGRAMMING LAB</b>	Π	21MIT26P

On Successful Completion of the Course, the students will be able to :

- CLO1 Demonstrate the working environment of C#
- CLO2 Develop programs using conditional statements, looping constructs and functions
- CLO3 Devise lists, arrays and strings
- CLO4 Identify and debug errors in the program
- CLO5 Discuss the concepts of structure and enumerations
- CLO6 Illustrate the concepts of class and objects
- CLO7 Analyze the inheritance and polymorphism
- CLO8 Gain knowledge about Operator overloading

### LIST OF PROGRAMS

- 1. Write a C# program to generate Fibonacci series and Prime numbers
- 2. Write a C# program to find sum of N odd numbers and find sum of sin series.
- 3. Write a C# program to demonstrate the concept of classes and objects.
- 4. Write a C# program for Calculation of nCr and nPr values.
- 5. Write a C# program to display scholarship details using Constructor and Destructor.
- 6. Write a C# program for implement Function Overloading using Arithmetic Operations.
- 7. Write a C# program for Student details using inheritance.
- 8. Write a C# program for Sales bill preparation using interface.
- 9. Write a C# program for Student Mark statement preparation.
- 10. Write a C# program for Display clock time using delegates and events.
- 11. Write a C# program for Passing values from one form to another form.
- 12. Write a C# program to Create user login form.
- 13. Write a C# program for matrix multiplication and addition of two matrices.

- 14. Write a C# program for reverse the string and Concatenate two strings.
- 15. Write a C# program for sort the given numbers in ascending order.
- 16. Write a C# program for sum of the given digits and print the multiplication table.

# **E-Learning Resources:**

- 1.<u>https://csharp-station.com/c-resources-learn-c-interactively/</u>
- 2.<u>https://www.codecademy.com/learn/learn-c-sharp</u>
- 3.https://codecondo.com/15-resources-to-learn-c#programming-for-beginners/

			Мар	ping				
Programme Level			Cour	se Level C	Outcomes	(CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary		✓				✓	✓	
Knowledge								
Communication	✓				✓			
skills								
Critical thinking		$\checkmark$				✓	✓	
Research -related	✓				✓	$\checkmark$		
skills								
Analytical			$\checkmark$				$\checkmark$	✓
reasoning								
Life-long learning	✓				✓			
Scientific		$\checkmark$				$\checkmark$	$\checkmark$	
reasoning								
Problem solving	✓				✓	✓		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	R PROGRAMMING LAB	II	21MIT27P

# LIST OF PROGRAMS

- 1. Read a CSV & EXCEL file and perform subsets of dataset and merging datasets.
- 2. Write a R program to print squares of numbers in sequence by using
  - a) Calling a Function without an Argument
  - b) Calling a Function with Argument Values
  - c) Calling a Function with Default Argument
  - d) Lazy Evaluation of Function
- 3. Create a R Program:
  - a) To add two vectors
  - b) To find Mean, Median, Mode and Standard deviation
  - c) To find out sample from a population
- 4. Write a R program to visualize the data using Bar Chart, Box plot, Histogram and Scatter plot.
- 5. Write a R language program using a) Linear regression b) Multiple regression
- 6. Write a R language program using
  - a) Normal distribution
  - b) Binomial distribution
  - c) Poisson distribution
- 7. Write a R program to implement an Apriori algorithm to extract association rules of data mining.
- 8. Write a R program to Implement K-Means clustering technique.
- 9. Write a R program to Implement any one Hierarchical Clustering.
- 10.Write a R program to Implement any one Partitioning Around Medoid Clustering.
- 11. Write a R program to Implement classification using Decision Tree.
- 12. Write a R program to implement SVM for classification.

## **E-Learning Resources:**

- 1. https://cran.r-project.org/doc/
- 2. http://spoken-tutorial.org/tutorial-search/?search\_foss=R&search\_language=English
- 3. https://www.w3schools.in/r/

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	DIGITAL IMAGE PROCESSING	III	21MIT31C

On Successful Completion of the Course, the students will be able to :

- CLO1 Get an introduction to Digital image processing and the basic steps
- CLO2 Know about representation of images and mathematical transformations
- CLO3 Visualise image enhancement techniques
- CLO4 Know about image restoration procedures
- CLO5 Explain the image compression procedures
- CLO6 Study the image segmentation and representation techniques
- CLO7 Self study the process of image interpolation and image registration
- CLO8 Apply the above procedures in and execute through Matlab or GNU Octave

**UNIT-I:** Introduction:- Digital Image-Digital Image Processing-Origins of Digital Image Processing- Applications of Digital Image Processing-Basic steps in Digital Image Processing. Digital Image Fundamentals: Light and the Electromagnetic Spectrum-Image sensing and acquisition-Image sampling and quantization-Basic relationships between pixels-Linear and non-linear operations.

**UNIT-II:** Intensity Transformation and Spatial Filtering : The basics of Intensity Transformation and Spatial Filtering - Some Basic intensity transformation functions - Histogram Processing: Histogram equalization - Fundamentals of spatial filtering : The Mechanics of spatial filtering - spatial correlation and convolution. Smoothing spatial filters : smoothing linear filters - order statistics (non linear ) filters, Sharpening spatial filters : Foundation - using the second derivative for image sharpening - The Laplacian.

**UNIT-III:** Image restoration and reconstruction : A Model of the Image degradation/Restoration Process - Noise Models - restoration in the presence of noise only - spatial filtering - Mean Filters-Order statistics filters-Adaptive filters. Color image processing : Color fundamentals - Color Models.

**UNIT-IV:** Image Compression: Fundamentals – Some basic compression methods – Huffman coding-Arithmetic coding – LZW coding - Bit-Plane coding – Run-Length coding.

**UNIT-V:** Image Segmentation: Fundamentals – Point, Line, and Edge Detection - Background - detection of isolated points - line detection - edge models - basic edge detection

Image Representation : Bounder (Border) Following - Chain Codes - Polygonal Approximations using Minimum Perimeter Polygons - Other Polygonal Approximation Approaches.Case study : Study of Image Interpolation and Image Registration

# **TEXT BOOK**

1. Gonzalez R C., and Woods R.E., "Digital Image Processing", Prentice Hall, Third Edition.

## REFERENCES

- 1. R.C. Gonzalez, R.E. Woods and L. Eddins, "Digital Image Processing using MATLAB", Prentice Hall, Second Edition, India.
- 2. Prathap R, "Getting started with MATLAB 7: A Quick introduction for Scientists and Engineers", Oxford University Press, 2005.
- 3. B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis ", Prentice Hall, India.

# **FURTHER READING**

Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine 1. Vision", Thomson Publishers, Second Edition.

https://web.stanford.edu/class/ee368/handouts.html

Mapping								
Programme Level			Cours	e Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓	$\checkmark$	✓	✓	✓	✓	✓	
Knowledge								
Communication			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		
skills								
Critical thinking							$\checkmark$	$\checkmark$
<b>Research</b> -related			$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	
skills								
Analytical		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
reasoning								
Life-long learning				$\checkmark$	$\checkmark$			
Scientific							$\checkmark$	$\checkmark$
reasoning								
Problem solving			$\checkmark$	$\checkmark$	✓	✓	✓	$\checkmark$

Year	Subject Title	Semester	Subject Code	
2021-2022 onwards	Big Data and IPR	IV	21MIT32C	

On Successful Completion of the Course, the students will be able to :

- CLO1 Point out the salient features of Big Data
- CLO2 Explain the concepts of Big Data Architecture
- CLO3 Discuss the utilization of business intelligence applications
- CLO4 Infer the methodology of Big Data analytics
- CLO5 Explain the basic concepts of Intellectual Property Rights
- CLO6 Discuss the basic concepts of WTO
- CLO7 Impart the knowledge of Copyright
- CLO8 Impart the knowledge of Trade Mark

**Unit I:Introduction to Big Data:** Description of Big Data – Industry examples of Big Data – The value of Data. Information Creation through Analytics : Introduction to the concepts of Analytics- Business Intelligence – Data mining and the Value of Data – Six Sigma Analytics – Sector of Analytics.

**Unit II :Big Data Analytics – Architecture , Implementation methodology and Tools** : Big Data Analytics – Architectures, Frame works and Tools- Big Data analytics and Methodology – Challenges- Big Data Analytics in Healthcare – Big Data Analytics of Cancer Blogs

**Unit III:Introduction to Intellectual Property (IP) and World Trade Organization** (WTO): IP- Definition – Introduction – WTO – Fundamentals of Patent: History of Patent – Condition for Grand of Patent – Inventions those are not Patent – Process and Product patent – Procedure for grant of patent – E Filling – Temporal and special Aspect – rights of Patentee – Patent office and register of patent – PCT – Marketing rights – Milestones in Indian patent Law.

**Unit IV :Copyright**: What is Copyright –Meaning of Publication – Copyright office and board – Copyright Registration – Ownership and rights of the Owner- Term – Registration of copyright – Rights of broadcasting organization and performers- international copyright-internet and copyright issues .

**UNIT V :Trade Mark** : Developing a Trade Mark- Condition for trade mark – Register of Trade Mark – Trends in Trade Mark applications – Term of Trade Mark- Assignment and Transmission- Certification- Infringed – Remedies of Trade Mark- Appellate Board –

Cybersquatting and Trade Mark.

# **TEXT BOOKS**

- 1) Big Data, Mining, and Analytics by Stephan Kudyba, CRC Press, 2015
- 2) Intellectual Property Rights edited by Neeraj Pandey, KhushdeepDharni, PHI Learning Private Limited 2014.

# REFERENCES

- 1) Big data analytics for cloud, IoT and cognitive Computing edited by Kai Hwang, Min Chen. Publication for Wiley in the year 2018.
- 2) Big data analytics Turning Big Data into Big Money edited by Frank Ohihorst. Publication by Wiley in the year 2015.
- 3) Big Data Principles and Paradigms edited by RajkumarBuyya, Rodrigo N .Calheiros, Amir VahidDastjerdi.

# **FURTHER READING:**

www.tutorialspoint.com www.nptel.ac.in

Mapping								
Programme Level			Cours	e Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓	✓	✓	✓		✓	✓	✓
Knowledge								
Communication	✓	$\checkmark$						
skills								
Critical thinking	✓		$\checkmark$	✓				
Research -related	✓		$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	
skills								
Analytical		$\checkmark$	$\checkmark$	$\checkmark$				
reasoning								
Life-long learning	✓	$\checkmark$						
Scientific	✓	$\checkmark$	$\checkmark$	$\checkmark$				
reasoning								
Problem solving			✓	✓				

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	OPEN SOURCE TOOLS	III	21MIT33C

On Successful Completion of the Course, the students will be able to :

CLO1	Explain the basics of free open source tools
CLO2	Discuss and learn linux operating system, apply linux commands to write shell program
CLO3	Estimate and Analyze the use of PHP Language, create database using Mysql
CLO4	Explain Peal language and create programs
CLO5	Discuss Ruby and Apply Rails to evaluate programs
CLO6	Analyze problems and evaluate the results in PHP, Peal, Ruby
CLO7	Explain and Apply open source concept in the real time environment
CLO8	Create database in Mysql and apply queries to get reports

**UNIT-I:** Introduction to OSS :Introduction - Need for Open Source Applications – Advantages and Disadvantages of FOSS - History - Meaning and Extraction of the Terms Free Software and OSS - Free Software Foundation and Open Source Initiative Presentation- Free Software and OSS Licenses Comparison - Licensing - Familiar Licenses - Free and OSS (Game Theory) - Security and Reliability - Economical Aspects and Adoption - Applications of Open Source Software – Open source grid computing : Open Grid Service Architecture – Security Issues – Globus Toolkit – Open source cloud: Introduction-FOSS cloud software environment.

**UNIT-II:** Open Source OS Linux: Linux Basics: Introduction - Kernel/User Mode – Process – Advanced Concept-Scheduling – Personalities- Cloning - Signals - Development with Linux - OSS Installation. Linux shell Commands – Vi Editor - Shell programming: Shell Syntax - Variables – conditions – control structures – functions – commands – command execution.

**UNIT-III:** PHP: Introduction – Identifier -Variables - Constants – Data types – Operators – Conditional Statements – loops. Advanced PHP –Arrays – Get and Post – Object oriented concepts – Strings –File handling. MySQL Databases – Setting –Starting, terminating and writing own SQL programs – record selection technology, strings functions, date and time – starting query – generating summary – working with metadata – using sequences – PHP and MySQL databases.

UNIT-IV: PERL: Introduction - advantages -working environment of PERL - variables -

strings - statements - subroutines - files - packages and modules - Object-Oriented PERL.

**UNIT-V**: Ruby on Rails: Welcome to Ruby –Conditions, methods, loops and blocks - classes and objects. Welcome to rails: Connecting to databases – working with databases.

### TEXT BOOKS

- 1. M.N. Rao, "Fundamentals of open source software", PHI Learning Private Limited, 2015.
- 2. Neil Matthew and Richard Stones, "Beginning Linux Programming", 4th Ed WROX, 2011.
- 3. Steven Holzner, "Beginning ruby on rails", Wiley publishing, Inc, 2007.

### REFERENCES

1. Chris DiBona, Danese Cooper and Mark stone O Reilly,"Open Sources 2.0 – The Continuing Evolution", First Edition, 2005.

- 2. Elliot White III, Jonathan.D.Eisenhamer, "PHP 5 in practice" pearson Education, 2007.
- 3. Paul Du Bois, O Reilly Publishers," My SQL- Cookbook", Second Edition, 2010.
- 4. Larry Wall, Tom Christiansen, Jon Orwart- O Reilly, "Programming PERL", 3rd Edn, 2010.
- 5. Yashavant P. Kanetkar," Unix Shell Programming", BPB publications, 2003.

Mapping								
Programme Level			Cours	se Level C	)utcomes	(CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	$\checkmark$	$\checkmark$	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Knowledge								
Communication	$\checkmark$		✓	$\checkmark$	$\checkmark$			
skills								
Critical thinking		✓	✓	$\checkmark$	$\checkmark$		$\checkmark$	
Research -related	$\checkmark$		✓		$\checkmark$	$\checkmark$		✓
skills								
Analytical	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$
reasoning								
Life-long learning		✓	✓	$\checkmark$		✓	✓	✓
Scientific								
reasoning								
Problem solving			✓	$\checkmark$	✓	✓	✓	

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	CLOUD COMPUTING	III	21MIT34C

On Successful Completion of the Course, the students will be able to:

CLO1	Explain Cloud deployment models
CLO2	Discuss the basic knowledge on virtualization
CLO3	Explain the concept of cloud computing services and its business value
CLO4	Analyze various web-based applications for collaborating everyone in
CLO5	Analyze on cloud mobility and governance
CLO6	Assess various industrial platforms for the developments
CLO7	Discuss Cloud Management
CLO8	Analyze the cloud platforms in the Industry

**UNIT-I:** Introduction- Benefits – Why cloud – cloud and virtualization – cloud service requirements – dynamic cloud infrastructure – cloud computing characteristics – cloud adoption – cloud rudiments. Cloud deployment models: Cloud characteristics – measured service accounting – cloud deployment models – security in a public cloud – public versus private clouds – cloud infrastructure self-service.

**UNIT-II:** Cloud as a service: Gamut of cloud solutions – principal technologies- cloud strategy – cloud design and implementation using SOA – conceptual cloud model – cloud service defined. Cloud solutions: Cloud Ecosystem – cloud business process management – cloud service management – On-premise cloud orchestration and provisioning engine – computing on demand.

**UNIT-III**: Cloud offerings: Information storage, retrieval, archive and protection-cloud analytics – testing under cloud – information security – virtual desktop infrastructure-storage cloud. Cloud Management: Resiliency – provisioning – asset management-cloud governance – high availability and disaster recovery – charging models, usage reporting, and metering.

**UNIT-IV:** Cloud Virtualization Technology: Virtualization defined – virtualization benefits – server virtualization. Cloud Infrastructure: Storage virtualization – storage area networks-network- attached storage – cloud server virtualization

UNIT-V: Cloud Platforms in the Industry: Amazon web services: Compute services – Storage

Services – Communication Services. Google App Engine: Architecture and core concepts - Application life cycle – Cost Model. Microsoft Azure: Azure core concepts - SQL Azure - Windows Azure platform appliance.

# **TEXT BOOKS**

1. Dr.KumarSaurabh "Cloud Computing-Architecting Next-Gen Transformation Paradigms", 4<sup>th</sup> Edition, Wiley India Pvt Ltd, 2018. (Unit-I to IV)

2. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing Foundations and Applications Programming", Morgan Kaufmann Pub 2013. (Unit-V)

## REFERENCES

1. Michael Miller, "Cloud computing web based application that change the way you work & collaborate online", Pearson Education, 2013.

2. RajkumarBuyya, James Broberg, Andrzej Goscinski, "Cloud computing principles and paradigms", Wiley India, 2014.

## **FURTHER READING**

- 1. https://onlinecourses.nptel.ac.in/noc21\_cs14/preview
- 2. https://www.tutorialspoint.com/cloud\_computing/index.htm
- 3. https://www.javatpoint.com/cloud-computing-tutorial

	Mapping								
Programme Level			Cours	e Level O	utcomes(	(CLOs)			
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8	
Disciplinary	✓		$\checkmark$		✓				
Knowledge									
Communication					✓	✓			
skills									
Critical thinking	✓	✓		✓	✓		✓		
Research -related	✓	✓	$\checkmark$	✓	✓	✓	✓	✓	
skills									
Analytical	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		✓		✓	
reasoning									
Life-long learning			$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$		
Scientific	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	✓			
reasoning									
Problem solving	$\checkmark$			$\checkmark$			✓		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	OPEN SOURCE TOOLS LAB	III	21MIT36P

On Successful Completion of the Course, the students will be able to :

CLO1 Demonstrate the working environment of Linux CLO2 Develop programs using conditional statements, looping constructs and CLO3 Creating website CLO4 Analyze cookies and sessions in the program CLO5 Explain the concepts of command line arguments CLO6 Illustrate the concepts of files, forms, mails Analyze the objects CLO7 Develop real time applications CLO8

# LIST OF PHP PROGRAMS

- 1. Write a PHP program to display current date and time
- 2. Write a PHP program to check user login and password
- 3. Write a PHP program to create a college website
- 4. Write a PHP program for cookies and session scripts
- 5. Write a PHP program to perform file read, write, open and append operation
- 6. Write a PHP program to create a library information using inheritance
- 7. Write a PHP program for online examination
- 8. Write a PHP program to send the mail using mail concept
- 9. Write a PHP program for super market billing system
- 10. Write a PHP program for online recharging

# LIST OF SHELL PROGRAMS

1.Write a shell script with menu driven to check if the input string or the given number is a palindrome or not.

2. Write a shell script which displays:

- i. List of all files in the current directory to which you have read, write and execute permissions.
- ii. Receive any number of file names as arguments and whether the argument supplied is a

file or directory. If it is a directory that should be appropriately reported. If it is a file name then the name of the file as well as the number of lines present in it should be reported.

3. Write a shell script to accept a number in the command line and display the sum of thdigits of that number and the sum up to that number.

4. Write a shell script with menu driven for computing factorial value of a given number and generating Fibonacci series of the given number of terms using recursive functions.

5. 3	Write a	shell	script with menu	driven for file	e manipulation	which includes	
i) (	Create a	ı file	ii)	Edit a file	iii) Remove a	a file/directory	iv) Copy a
	file	<b>v</b> ) A	Append contents i	nto a file	vi). Display c	ontent of a file	

6. Write a shell program to count the number of words, characters, white spaces and special symbols in a given text.

- 7. Write a shell script to sort the given N numbers and print the biggest and smallest numbers and their corresponding positions.
- 8. Write a shell program to perform case conversion.

9. Write a shell program to find the grade of the student from his mark statement.

10. Write a shell script to check the status of a file using a test command.

	Mapping									
Programme Level			Cours	e Level O	utcomes(	CLOs)				
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8		
Disciplinary	~	$\checkmark$	✓	✓	✓	✓	$\checkmark$	~		
Knowledge										
Communication										
skills										
Critical thinking		$\checkmark$	$\checkmark$	$\checkmark$	✓	✓	$\checkmark$	~		
Research -related		$\checkmark$		✓	✓		✓			
skills										
Analytical	✓	$\checkmark$	✓	✓	✓	✓	✓	~		
reasoning										
Life-long learning	~	$\checkmark$	$\checkmark$	$\checkmark$	✓	✓	$\checkmark$	~		
Scientific	~	$\checkmark$	$\checkmark$	$\checkmark$	✓	✓	$\checkmark$	~		
reasoning										
Problem solving	<ul> <li>✓</li> </ul>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	~		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	DIGITAL IMAGE PROCESSING LAB	III	21MIT37P

On Successful Completion of the Course, the students will be able to :

- CLO1 Demonstrate how an image can be read and displayed
- CLO2 Develop programs for image quantization and transformations
- CLO3 Calculate the histogram and display the histogram plot
- CLO4 Implement filters for smoothing and sharpening of an image
- CLO5 Add and remove noise in an image
- CLO6 Illustrate the Color complement and slicing transformations
- CLO7 Implement segmentation techniques
- CLO8 Implement Compression techniques

### LIST OF PROGRAMS

- 1. Write a program to demonstrate arithmetic operations on images.
- 2. Write a program to perform image quantization.
- 3. Write a program to perform basic gray level transformations.
- 4. Write a program to calculate the histogram of an image and display the histogram plot.
- 5. Write a program to adjust the intensity of an image.
- 6. Write a program to implement the smoothing and sharpening spatial filter.
- 7. Write a program to add and remove the noise in image.
- 8. Write a program to implement the Mean filter and order statistics filter for noise reduction.
- 9. Write a program to implement the Adaptive filters for noise reduction.
- 10. Write a program to perform color complement transformation.
- 11. Write a program to perform color slicing transformation.
- 12. Write a program to separate RGB components and represent the three individual components
- 13. Write a program to implement compression techniques
- 14. Write a program to implement segmentation
- 15. Write a program to implement interpolation

Mapping									
Programme Level			Cours	e Level O	utcomes(	CLOs)			
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8	
Disciplinary	✓	$\checkmark$	$\checkmark$	✓	✓	✓	✓	✓	
Knowledge									
Communication									
skills									
Critical thinking		$\checkmark$		$\checkmark$	$\checkmark$		$\checkmark$	✓	
Research -related				✓	✓	✓	✓	✓	
skills									
Analytical		$\checkmark$		✓	$\checkmark$	✓	✓	✓	
reasoning									
Life-long learning							✓	✓	
Scientific				$\checkmark$	$\checkmark$	$\checkmark$	✓	✓	
reasoning									
Problem solving		$\checkmark$	$\checkmark$	✓	✓	✓	✓	✓	

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-I:MACHINE LEARNING	II	21MIT25E

On Successful Completion of the Course, the students will be able to :

- CLO1 Explain the objectives of Machine Learning and to learn how to use different notations of it and different types of Learning
- CLO2 Discuss and Learn the fundamental algorithms
- CLO3 Explain the concepts of Neural Networks and Deep Learning.
- CLO4 Discuss, Analyze and Use the different types of classification and clustering as per the necessity of application.
- CLO5 Explain the different concepts in Unsupervised Learning such as to evaluate Density Estimation , number of clusters,

**Unit I:** What is Machine Learning-(Supervised Learning, Unsupervised Learning ,Semi-Supervised Learning ,Reinforcement Learning)\*.Notation and Definition-Data Structures, Capital Sigma Notation, Capital Pi Notation, Operation on Sets, Operation on Vectors, Functions , Max and Arg Max, Assignment Operator, Derivative and Gradient, Random Variable ,Unbiased Estimators, Bayes Rule, Parameter Estimation, Parameters Vs Hyper parameters, Classification vs Regression, Model-Based vs Instance-Based Learning, Shallow vs Deep Learning.

**Unit II :** Linear Regression- Logistic Regression- Decision Tree Learning-(Support Vector Machine)\*- Dealing with Noise, Dealing with Inherent: Non-Linearity-k-Nearest Neighbors-Anatomy of a Learning Algorithm-Building Blocks of a Learning- Algorithm Gradient Descent.

**Unit III:** Basic Practice: Feature Engineering-One-Hot Encoding-Binning-Normalization-Standardization-Dealing with Missing Features -Data Imputation Technique-.Learning Algorithm Selection-Three sets- Underfitting and Overfitting Regularization-Model Performance Assessment-Hyper Parameter Tuning-Deep Learning-Convolutional Neural Network, Recurrent Neural Network

**Unit IV**:Kernal Regression, Multiclass Classification ,One-class Classification, (Multi-Label Classification)\*,Ensemble Learning, Learning to Label Sequences, Sequence-to- Sequence Learning, Active Learning ,Semi-Supervised Learning ,One-Shot Learning, Zero-Shot Learning.

**Unit V:** Unsupervised Learning- Density Estimation-(Clustering, K-Means)\* DBSCAN and HDBSCAN-Determining the Number of Clusters-Dimensionality Reduction- Principal Component Analysis-Outlier Detection.Case Study: Important things to know about how to build a sales prediction model for a retail store at a glance

## TEXT BOOK:

1. AndriyBurkov,(2019)."The Hundred-Page Machine Learning Book".

### **REFERENCES:**

- 1. Introducing Machine Learning,(2019)MATLAB eBook, Math works Inc.
- 2 Y. S. Abu Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBookPublishers, 2012.
- 3 P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012

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

1 https://www.geeksforgeeks.org/machine-learning/

2 https://www.tutorialspoint.com/machine\_learning/

3 www.neuraldesigner.com

Mapping									
Programme	Co	Course Level Outcomes(CLOs)							
Level Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5				
Disciplinary	$\checkmark$	✓	✓	✓	~				
Knowledge									
Communication skills		<b>√</b>	~	~	~				
Critical thinking			~	~	~				
Research -			✓	✓					
related skills									
Analytical				✓	✓				
reasoning									
Life-long			$\checkmark$	✓	✓				
learning									
Scientific	✓			✓	✓				
reasoning									
Problem solving	~	~	~	~	~				

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-I: GRID COMPUTING	II	21MIT25E

On Successful Completion of the Course, the students will be able to :

CLO1 Explain grid computing and grid activities

CLO2 Analyse the grid architecture

- CLO3 Evaluate the relationship between web services and grid services
- CLO4 Describe the Open Grid Service architecture components
- CLO5 Explain the Common Management Model
- CLO6 Discuss Resource management on the grid
- CLO7 Apply data management services on the grid
- CLO8 Evaluate real time examples of grid computing

**UNIT-I:** Introduction to Grid computing: Early Grid activities – Current Grid activities – Grid Business Areas – Grid applications – Grid computing organizations and their roles.

**UNIT-II:** The grid computing anatomy: the grid problem - Grid Architecture-Virtual organizations – grid computing roadmap. Service oriented architecture - Web service architecture - XML messages and enveloping - Service message description mechanisms - relationship between web service and grid service.

**UNIT-III:** Open grid services architecture (OGSA) - OGSI – OGSA use cases: Commercial Data Center (CDC), National Fusion Collaborator (NFS), online media and entertainment – OGSA platform components.

**UNIT-IV:** OGSA basic services: Common Management Model (CMM) - Service Domains - Policy Architecture – security architecture- Meeting and Accounting – Common distributed logging - Distributed areas access and replication.

**UNIT-V:** Resource management on the grid - Grid resource management systems - work management layers of grid computing Globus gt3 toolkit: gt3 software architecture model - Resource Allocation- Resource management services – Data management services. **Case Study:** Application of Grid Computing in E-Governance

# **TEXT BOOK**

1. Josh Joseph, Craig fellenstein, "GRID COMPUTING", IBM press, Pearson Education Indian Reprint, 2005.

# REFERENCES

- 1. Ian foster, Carl kesselman, Morgan Kaufmann, "The grid2: blue print for a new computing infrastructure", II Edition.
- 2. Frederic Magoules, "Fundamentals of Grid Computing: Theory, Algorithms and Technologies", CRC Press, 2009.
- 3. Christophe Cerin, Gilles Fedak, "Desktop Grid Computing", CRC Press, 2012.

# FURTHER READING

- 1. https://nptel.ac.in/courses/108/107/108107113/
- 2.<u>https://www.btechguru.com/prepare--anna-university--computer-science-and-engineering--grid-and-cloud-computing--computing--3--56</u>

Mapping									
Programme Level			Cours	e Level O	utcomes(	CLOs)			
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8	
Disciplinary	~		$\checkmark$		✓	✓		$\checkmark$	
Knowledge									
Communication		$\checkmark$	$\checkmark$	$\checkmark$		✓	✓		
skills									
Critical thinking	~	$\checkmark$			$\checkmark$	$\checkmark$			
Research -related			$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$	
skills									
Analytical	✓	$\checkmark$				$\checkmark$	$\checkmark$		
reasoning									
Life-long learning		$\checkmark$	$\checkmark$	$\checkmark$			✓		
Scientific	$\checkmark$			$\checkmark$		$\checkmark$		$\checkmark$	
reasoning									
Problem solving		$\checkmark$		$\checkmark$	$\checkmark$		$\checkmark$		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-I: PARALLEL PROCESSING	II	21MIT25E

On Successful Completion of the Course, the students will be able to :

CLO1	Explain the basics of Parallelism
CLO2	Analyze the concepts of Parallel computer Structures
CLO3	Evaluate Virtual memory system
CLO4	Able to build different input and output subsystems
CLO5	Describe various pipeline mechanism.
CLO6	Create and Analyze various Vector processing requirements
CLO7	Evaluate and analyse about SMID
CLO8	Discuss various Multiprocessing operating systems

**UNIT-I:** Evolution of Computer Systems – Parallelism in Uniprocessor Systems – Parallel Computer Structures – Parallel Processing Applications.

**UNIT-II:** Hierarchical Memory Structure – Virtual Memory System – Memory allocation and management – Cache memories and management – Input-Output subsystems.

**UNIT-III:** Pipelining: An Overlapped Parallelism – Instruction and arithmetic pipelines – Principles of designing pipelined processors – Vector processing requirements.

**UNIT-IV:** SIMD array processors – SMID interconnection networks – Parallel algorithms for array processors – Associative array processing.

**UNIT-V:** Functional Structures – Interconnection networks – Parallel memory organizations – Multiprocessor operating systems – Parallel algorithms for multiprocessors.

# **TEXT BOOK**

1. Kai Hwang & Faye A. Briggs, "Computer Architecture and Parallel Processing", McGraw Hill International Editions, Computer science series.

# REFERENCES

- Bharat Bhushan Agarwal and Sumit Prakash Tayal, "Computer Architecture and Parallel Processing" Kindle Edition.
   Rajaraman V, "Parallel Computers Architecture and Programming".

Mapping								
Programme Level			Cours	e Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓				✓	✓		
Knowledge								
Communication		$\checkmark$		$\checkmark$		$\checkmark$		✓
skills								
Critical thinking	✓				$\checkmark$			
Research -related			$\checkmark$				✓	✓
skills								
Analytical	✓			✓				✓
reasoning								
Life-long learning		$\checkmark$				$\checkmark$		
Scientific				✓				✓
reasoning								
Problem solving		$\checkmark$				$\checkmark$		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-II: INTERNET OF THINGS	III	21MIT35E

On Successful Completion of the Course, the students will be able to :

CLO1	Explain the vision of IoT
CLO2	Design a portable IoT using Ardunio/equivalent boards and relevant
CLO3	Deploy web services to access/control IoT devices
CLO4	Discuss Import and Export of Data
CLO5	Apply the different data acquiring techniques
CLO6	Deploy an IoT application and connect to the cloud
CLO7	Apply Tomography and layer attack model
CLO8	Analyze applications of IoT in real time Scenario

**UNIT-I:**Internet of Things: An Overview: Conceptual Framework - Architectural View - Sources - M2M Communication. Design Principles of Connected Devices: IoT/M2M Systems Layers and Design Standardisation - Communication Technologies - Data Enrichment, Data Consolidation and Device Management- Ease of Designing and Affordability.

**UNIT-II:** Design Principles for Web Connectivity: Web Communication Protocols for Connected Devices– Message Communication Protocols for Connected Devices- Web Connectivity for Connected- Devices Network using Gateway, SOAP, REST, HTTP RESTful and Web Sockets. Internet Connectivity Principles: Internet Connectivity- Internet based Communication -IP Addressing in the IoTMedia Access Control – Application layer protocols: HTTP, HTTPS and FTP.

**UNIT-III**: Data Acquiring, Organising, Processing and Analytics: Data Acquiring and Storage – Organising the Data – Transactions, Business Processes, Integration and Enterprise Systems – Analytics -Knowledge Acquiring, Managing and Storing Processes. Data Collection, Storage and Computing using Cloud Platform: Cloud Computing Paradigm – Everything as a Service and Cloud Service Models - IoT Cloud based Services.

**UNIT-IV:** Sensors, Participatory Sensing, RFIDs and WSN: Sensor Technology – Participatory Sensing, Industrial and Automotive IoT – Sensor Data Communication Protocols - RFID and WSN Technology. Prototyping the Embedded Devices for IoT and M2M: Embedded computing basics- Platforms for Prototyping – Things always connected in to the Internet/Cloud.

**UNIT-V:** IoT Privacy, Security and Vulnerabilities Solutions: Vulnerabilities, Security Requirements and Threat Analysis – IoT Security Tomography and Layered Attacker Model – Security Models, Profiles and Protocols for IoT. Business Models and Processes using IoT:Business Models and Business Model Innovation – Value Creation – Business Model Scenarios for IoT. Case Study: Building any two real time devices using IoT.

### **TEXT BOOK**

1. Raj Kamal, "Internet of Things-Architecture and Design Principles", Tata McGraw Hill Publications, 1<sup>st</sup> Edition.

### REFERENCES

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things-A Hands-on Approach", University Press, 2015.

2. Michael Miller, "The Internet of Things", Pearson Education, 2015.

### **FURTHER READING**

https://www.guru99.com/iot-tutorial.html https://www.javatpoint.com/iot-internet-of-things

Mapping								
Programme Level			Cours	se Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓	✓			✓		✓	
Knowledge								
Communication		✓	$\checkmark$	✓		✓		✓
skills								
Critical thinking	✓				✓		✓	
Research -related	✓		$\checkmark$		✓		✓	
skills								
Analytical	✓	$\checkmark$			$\checkmark$			✓
reasoning								
Life-long learning		$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$		
Scientific	✓		$\checkmark$	$\checkmark$	$\checkmark$			
reasoning								
Problem solving			$\checkmark$	✓	✓			

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-II: TCP / IP	III	21MIT35E

On Successful Completion of the Course, the students will be able to :

- CLO1 Explain the basics of OSI and TCP/IP Models
- CLO2 Discuss the IPV4 addressing
- CLO3 Discuss ARP Concepts
- CLO4 Explain the basics of RARP
- CLO5 Impart the knowledge of ICMP
- CLO6 Discuss the concepts of IGMP and TCP
- CLO7 Distinguish between the concepts of UDP and FTP
- CLO8 Explain the concepts of DHCP and SNMP

**UNIT-I:** Introduction: A Brief History – Protocols and Standards – Standards Organizations. The OSI Model and TCP/ IP protocol Suite: The OSI Model- TCP/IP Protocol Suite – Addressing. Underlying Technologies: Connection Devices.

**Unit II:** IPv4 Addresses: Introduction – Classful addressing – Classless addressing. IPv4: Introduction- Datagram – Fragmentation – options – Checksum- IP over ATM- IP Package.

**Unit III** : Address Resolution protocol(ARP): Address mapping - ARP protocol – ATMARP –ARP Package -Internet Control Message Protocol (ICMP) : Introduction - Messages— ICMP Package.

**UNIT-IV:** Multicasting and Multicast Routing Protocol: Introduction - IGMP - Group Management – IGMP Message. Introduction to Transport Layer: Transport Layer Services. User Datagram Protocol: UDP Services. Transmission Control Protocol: TCP services.

**Unit V:** Host Configuration (DHCP): Introduction – DHCP operation. Domain Name system (DNS) – Name Space - DNS in the Internet. File Transfer and TFTP: FTP. Electronic Mail: User Agent – Message Transfer Agent (SMTP). Network Management: (SNMP) – Concept – Management Components – SMI – MIB-SNMP.

### **TEXT BOOK**

1. Behrouz A. Forouzan, "TCP/IP Protocol Suite", Tata Mcgraw-Hill Publishing Company,

Fourth edition.

## REFERENCES

W. Richard Stevens, "TCP/IP Illustrated: The Protocols", Vol.1, Pearson Education.
 Comer, "Internetworking with TCP/IP: Principles, Protocols & Architecture", Vol.1, Fourth Edition, Pearson Education
 www.w3schools.com

www.tcpguide.com

www.redbooks.ibm.com

Mapping									
Programme Level			Cours	se Level O	utcomes(	CLOs)			
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8	
Disciplinary	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	✓	$\checkmark$	
Knowledge									
Communication	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	✓	$\checkmark$	
skills									
Critical thinking			✓	✓	✓	✓	✓	✓	
Research -related	✓	$\checkmark$			✓		✓	✓	
skills									
Analytical	✓	$\checkmark$		✓			✓	✓	
reasoning									
Life-long learning		$\checkmark$	$\checkmark$	$\checkmark$			✓	~	
Scientific		$\checkmark$			✓				
reasoning									
Problem solving		$\checkmark$			✓		✓	✓	

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-II: WIRELESS SENSOR NETWORKS	ш	21MIT35E

On Successful Completion of the Course, the students will be able to :

- CLO1 Explain the basics of Wireless sensor networks
- CLO2 Discuss about the canonical problems
- CLO3 Summarize Network sensor Concepts
- CLO4 Explain the basics of geographical routing
- CLO5 Impart the knowledge of Infrastructure establishment
- CLO6 Discuss the concepts of Network sensor databases
- CLO7 Explain the concepts of query propagation
- CLO8 Discuss the concepts of sensor platform and tools

**UNIT-I:** Introduction - Unique Constraints and Challenges -Advantages of Sensor Networks -Energy advantage -Detection advantage -Sensor Network Applications -Habitat monitoring-Tracking chemical plumes -Smart Transportation-Collaborative Processing -Key Definitions of Sensor Networks. **Canonical Problem:** Localization and Tracking -A Tracking Scenario -Problem Formulation -Sensing model –Collaborative localization Bayesian state estimation -Distributed Representation and Inference of States -Impact of choice of representation -Design desiderata in distributed tracking -Tracking Multiple Objects -State-space decomposition -Data association -Sensor Models -Performance Comparison and Metrics.

**UNIT-II:** Networking Sensors -Key Assumptions -Medium Access Control - The S-MAC Protocol - IEEE 802.15.4 Standard and ZigBee -General Issues- Geographic, Energy-Aware Routing -Unicast Geographic Routing - Routing on a Curve -Energy-Minimizing Broadcast - Energy-Aware Routing to a Region -Attribute-Based Routing - Directed Diffusion - Rumor Routing Geographic Hash Tables.

**UNIT-III:** Infrastructure Establishment - Topology Control - Clustering -Time Synchronization - Clocks and Communication Delays -Interval Methods- Reference Broadcasts - Localization and Localization Services -Ranging Techniques –Range Based Localization Algorithms -Other Localization Algorithms -Location Service.

**UNIT-IV: Sensor Network Databases** -Sensor Database Challenges -Querying The Physical Environment - Query Interfaces -Cougar sensor database and abstract data types -Probabilistic queries - High-level Database Organization - In-Network Aggregation - Query propagation and aggregation - TinyDB query processing - Query processing scheduling and optimization - Data-Centric Storage -Data Indices and Range Queries –One-dimensional indices- Multi-

dimensional indices for orthogonal range searching –Non orthogonal range searching -Distributed Hierarchical Aggregation - Multi-resolution summarization - Partitioning the summaries -Fractional cascading -Locality preserving hashing - Temporal Data-Data aging -Indexing motion data.

**UNIT-V: Sensor Network Platforms and Tools** - Sensor Network Hardware -Berkeley motes - Sensor Network Programming Challenges -Node-Level Software Platforms -Operating system: TinyOS - **Imperative language:**nesC -Dataflow style language: TinyGALS -Node-Level Simulators - ns-2 and its sensor network extensions –TOSSIM-Programming Beyond Individual Nodes: State-centric programming - Collaboration groups -PIECES: A state-centric design framework -Multitarget tracking problem revisited.

## **TEXT BOOK**

1. Feng Zhao and Leonidas GuibasMargan, "Wireless Sensor Networks- An Information Processing Approach", Kaufmann Publisher (An Imprint Elsevier), 2004.

## REFERENCES

- 1. Holger Karl & Andreas Willig, John, "Protocols And Architectures for Wireless Sensor Networks", Wiley, 2005.
- 2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Mapping								
Programme Level			Cours	se Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓		$\checkmark$		$\checkmark$		✓	
Knowledge								
Communication		$\checkmark$				✓		
skills								
Critical thinking	✓		$\checkmark$		$\checkmark$		✓	
Research -related				$\checkmark$				✓
skills								
Analytical		$\checkmark$				✓		
reasoning								
Life-long learning			$\checkmark$				✓	
Scientific	✓		$\checkmark$		$\checkmark$		✓	
reasoning								
Problem solving			$\checkmark$				$\checkmark$	

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-III: SOFTWARE QUALITY ASSURANCE	IV	21MIT41E

On Successful Completion of the Course, the students will be able to :

- CLO1 Distinguish between software errors, faults and failures and the need for software quality requirements
- CLO2 Classify software requirements into software quality factors, Analyse SQA
- CLO3 Design the elements of development plan and quality plan, compare team
- CLO4 Identify the risks and benefits of external participants
- CLO5 Analyse the contribution of CASE tools to software product quality
- CLO6 Preparing templates and checklists, Imparting the knowledge of training and
- CLO7 Implementation of Software quality metrics
- CLO8 Evaluate SQA project process IEEE standards

**UNIT I:** Introduction: What is software? – Software errors, faults and failures – Classification of the causes of software errors – Software quality – Software quality assurance – definition and objectives. Software quality factors: The need for comprehensive software quality requirements – Classification of software requirements into software quality factors – Product operation software quality factors – Product revision software quality factors – Product transition software quality factors. The components of the SQA system – overview: The SQA system – an SQA architecture – Pre project components – SQA standards, system certification, and assessment components – Organizing for SQA – the human components.

**UNIT II:** Development plan and quality plan objectives – Elements of the development plan – and quality plan- Integrating quality activities in the project life cycle: Factors affecting intensity of quality assurance activities in the development process – Verification, validation and qualification – A model for SQA defect removal effectiveness and cost. Reviews: Review objectives – Formal design reviews (DRs) – Peer reviews – A comparison of the team review methods – Expert opinions.

**UNIT III:** Software maintenance components: High quality– Pre-maintenance software quality components – Maintenance software quality assurance tools. Types of external participants – Risks and benefits of introducing external participants – Assuring quality of external participants' contributions: objectives. CASE tools and their effect on software quality: CASE tool – The contribution of CASE tools to software product quality, to software maintenance quality to improved project management.

**UNIT IV**: Procedures and work instructions: The need – procedures manuals – work instruction manuals– Preparation, implementation and updating. Supporting quality devices: Templates – Checklists. Staff training and certification: "3S" development team – The objectives – The training and certification process – Determining training and updating needs – Defining positions requiring certification – Planning the certification processes – Delivery of training and certification programs.**Case Studies**: Refer to the "3S" development team case, list the decisions made by the team leader that created the problematic situation

**UNIT V**: Software quality metrics: Classification of software quality metrics – Process metrics – Product metrics – Implementation of Software quality metrics - Quality management standards: ISO 9001 and ISO 9000-3 – Certification according to ISO 9000-3 – Capability Maturity Models – CMM and CMMI assessment methodology. SQA project process standards – IEEE standards: IEEE Std 1012 – verification and validation – IEEE Std 1028 – Reviews.

### **TEXT BOOK**

1. Daniel Galin, "Software Quality Assurance from Theory to Implementation", Pearson Publication, 2009.

### REFERENCES

1. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.

2. Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 1997.

### **FURTHER READING**

https://www.tutorialspoint.com/software\_quality\_management/

Mapping								
Programme Level			Cours	se Level O	utcomes	(CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓			✓	✓			
Knowledge								
Communication		$\checkmark$	$\checkmark$		✓	✓		✓
skills								
Critical thinking	✓	$\checkmark$	$\checkmark$	✓			✓	
Research -related			$\checkmark$		✓	✓		✓
skills								
Analytical		$\checkmark$	$\checkmark$	✓			✓	✓
reasoning								
Life-long learning	✓	$\checkmark$		$\checkmark$		✓		
Scientific	✓		$\checkmark$		✓		✓	
reasoning								
Problem solving		$\checkmark$		✓	✓	✓		✓

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-III: GREEN COMPUTING	IV	21MIT41E

On Successful Completion of the Course, the students will be able to :

- CLO1 Infer how to build environmentally responsible business policies, practices and metrics.
- CLO2 Get an insight into Software induced energy consumption
- CLO3 Explain the concepts of green assets and modelling, green enterprise architecture, green information system.
- CLO4 Know about Green Enterprise Architecture
- CLO5 Discuss the concepts of Grid framework and green data centre.
- CLO6 Be aware on the socio-cultural aspects of Green IT
- CLO7 Foresee the emergent carbon issues
- CLO8 Apply Green IT strategies and applications to a home, Hospital, packaging industry and telecom sector.

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

**UNIT-II:** Green Assets and Modeling: Green Assets: Buildings, Data Centers, Networks, and Devices –Green Business Process Management: Modeling, Optimization, and Collaboration –Green Enterprise Architecture –Environmental Intelligence –Green Supply Chains –Green Information Systems: Design and Development Models.

**UNIT-III:**Grid Framework: Virtualizing of IT systems –Role of electric utilities, Telecommuting, teleconferencing and teleporting –Materials recycling –Best ways for Green PC –Green Data center –Green Grid framework.

**UNIT-IV:** Green Compliance and Green Mobile : Socio-cultural aspects of Green IT –Green Enterprise Transformation Roadmap –Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future -Green mobile -optimizing for minimizing battery consumption -Web, Temporal and Spatial Data Mining Materials recycling.

**UNIT-V:** Case Studies: The Environmentally Responsible Business Strategies (ERBS) –Case Study Scenarios for Trial Runs –Case Studies –Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

## **TEXT BOOK**

1. BhuvanUnhelkar,(2011) "Green IT Strategies and Applications –UsingEnvironmental Intelligence", CRC Press.

### REFERENCES

- 1. Alin Gales, Michael Schaefer, Mike Ebbers, (2011)"Green Data Center: steps for the Journey", Shoff/IBM rebook.
- 2. John Lamb,(2009)"The Greening of IT", Pearson Education.
- 3. Jason Harris,(2012) " Green Computing and Green IT Best Practices on Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting", Emereo Publishing.

Mapping								
Programme Level	Course Level Outcomes(CLOs)							
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓	$\checkmark$	✓	✓	✓	✓	✓	✓
Knowledge								
Communication	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
skills								
Critical thinking					$\checkmark$		$\checkmark$	$\checkmark$
Research -related							$\checkmark$	$\checkmark$
skills								
Analytical		$\checkmark$	$\checkmark$		$\checkmark$	✓	✓	✓
reasoning								
Life-long learning	$\checkmark$	$\checkmark$				✓	✓	✓
Scientific							✓	✓
reasoning								
Problem solving		$\checkmark$	✓	✓	✓	✓	✓	✓

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-III DATA ANALYSIS AND BUSINESS INTELLIGENCE	IV	21MIT41E

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

- CLO1 Explain the concepts of Data Warehousing and Statistics
- CLO2 Analyze the correlation between various parameters of a data set using
- CLO3 Design a Data Warehouse and Analyze using OLAP
- CLO4 Apply Predictive and Prescriptive Analytics in Business
- CLO5 Identify suitable technique for various stages of data analytics

**Unit:I :** DATA WAREHOUSING:Introduction – Data warehouse architecture – Dimensional Modeling – Aggregate Function –Summarisability – Fact-Dimension Relationship – OLAP Operations – Lattice of Cuboids –OLAP Server – ROLAP – MOLAP – Data Mart – ETL – Data Cleaning – ELT vs ETL – Cloud Data Warehousing.

**Unit:II :** STATISTICS FOR DATA ANALYSIS: Measures of Central Tendency and Dispersion: Arithmetic Mean - Median and Quantiles - Mode- Geometric Mean -Harmonic Mean. Measures of Dispersion: Range and Interquartile Range -Absolute Deviation, Variance, Standard Deviation - Coefficient of Variation. Correlation: Correlation and Causation - Types of Correlation - Karl Pearson's Coefficient Correlation - Rank Coefficient of Correlation. Regression: Correlation and Regression - Graphic Method, Algebraic Method - Regression Line - Regression Equation - Mathematical Equation. Chi Square Test: Test of Goodness of Fit - Test of Independence - Test of Homogeneity.

**Unit:III:** ANALYTICS: A COMPREHENSIVE STUDY :Business Analytics – Analytics – Software Analytics – Embedded Analytics – Learning Analytics – Predictive Analytics – Prescriptive Analytics – Social Media Analytics – Behavioral Analytics.Analyse and predict results based on historical patterns.

**Unit:IV:** BUSINESS INTELLIGENCE: Business Intelligence – Mobile Business Intelligence – Real-Time Business Intelligence – Context Analysis – Business Performance Management – Business Process Discovery –Information System – organizational Intelligence – Data Visualization – Data Profiling – Data Cleansing –Process Mining – Competitive Intelligence

# **Unit:V :** BUSINESS INTELLIGENCE TOOLS:

BI Tools Overview – BI Tools (Any One Tool in Depth): Microsoft Power BI – IBM Cognos -Tableau – Micro Strategy – QlikView. **CASESTUDY:** Data Warehouse Design for Hospital -Design Business Intelligence Model and Conduct Analysis. Expert lectures, online seminars – webinars

# **TEXT BOOKS:**

1 Arun K Pujari "Data Mining Techniques", 3rd Edition, University Press, 2013.

2 R.S.N.Pillai, Bagavathi, "Statistics Theory and Practice", 8th Edition, S.Chand Publishing, 2016.

3 Drew Bentley, "Business Intelligence and Analytics", Library Press, 2017.

# **REFERENCES:**

1 Jiaweu Gab, MicgekubeJanver, Jian Pei, "Data Mining Concepts", Third Edition, MorganKaufmann Publications, 2012.

2 Christian Heumann, Michael Schomaker, Shalabh "Introduction to Statistics and Data Analysis With Exercises, Solutions and Applications in R", Springer, 2016.

3 Olivia Parr Rud "Business Intelligence Success Factors: Tools for Aligning Your Business in the Global Economy", John Wiley & Sons, Inc., 2009.

# **FURTHER READING:**

1. https://www.tutorialspoint.com/power\_bi/index.htm

2. https://tekslate.com/cognos

3.https://help.tableau.com/current/guides/get-started-tutorial/en-us/get-startedtutorialhome.htm

4. https://www.guru99.com/microstrategy-tutorial.html

5. https://www.edureka.co/blog/qlikview-tutorial/

Mapping							
Programme	Course Level Outcomes(CLOs)						
Level Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5		
Disciplinary	$\checkmark$	$\checkmark$	✓	~	✓		
Knowledge							
Communication		$\checkmark$	✓	~	✓		
skills							
Critical thinking	$\checkmark$		✓		✓		
Research -	$\checkmark$	$\checkmark$	✓	~			
related skills							
Analytical		$\checkmark$		$\checkmark$			
reasoning							
Life-long learning	$\checkmark$		✓		✓		
Scientific		$\checkmark$		~	✓		
reasoning							
Problem solving		$\checkmark$	$\checkmark$	$\checkmark$	✓		

Year	Subject Title	Sem	Sub. Code
2021-22 Onwards	ELECTIVE-IV: CYBER SECURITY	IV	21MIT42E

On Successful Completion of the Course, the students will be able to :

- CLO1 Explain the basics of cyber security and network security
- CLO2 Discuss about the principles of windows security
- CLO3 Discuss attacker techniques and motivations concepts
- CLO4 Impart the knowledge of fraud techniques
- CLO5 Impart the knowledge of vulnerabilities
- CLO6 Learn the concepts of malicious code
- CLO7 Analysis the concepts of defense and analysis techniques
- CLO8 Compare the malicious code

**UNIT I:** Cyber Security Fundamentals -Network Security Concepts: Information assurance fundamentals, Basic Cryptography, Encryption, Firewalls. Microsoft Windows Security Principles: Tokens, Messages, Program execution, Firewall.

**UNIT II:** Attacker Techniques and Motivations- Antiforensics: Tracks and techniques, Fraud techniques: Phishing, Smishing, Vishing, and Mobile Malicious Code, Rogue Antivirus, Click Fraud, Threat infrastructure.

**UNIT III:** Exploitation- Shell code, Integer Overflow Vulnerabilities, Format String Vulnerabilities, SQL Injection, Malicious PDF Files, Web Exploit Tools.

**UNIT IV:** Malicious Code-Self-Replicating Malicious Code, Persistent Software Techniques, Root kits, Spywares, Attacks against Privileged User Accounts and Escalation of Privileges, Stealing Information and Exploitation.

**UNIT V:** Defense and Analysis Techniques-Memory Forensics, Honey pots, Malicious Code Naming, Automated Malicious Code Analysis Systems, Intrusion Detection Systems.

### **TEXT BOOK**:

1. James Graham, Richard Howard and Ryan Olson, (2011), Cyber Security Essentials. Auerbach Publications Taylor & Francis Group.

# **REFERENCES:**

1.Chwan -Hwa(john)Wu, J.David Irwin, (2013), Introduction to Computer Security and Cyber Security. CRC Press T&F Group.

# **FURTHER READING:**

1.https://www.ncyte.net/resources/cybersecurity-curriculum

2.https://cybersecurity.umcs.lublin.pl/wpcontent/uploads/kmazur/WSEI2019/Cyber\_Security\_Essentials.pdf

3. https://www.edureka.co/blog/what-is-computer-security/

Mapping								
Programme Level		Course Level Outcomes(CLOs)						
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary		✓	✓	✓	~			✓
Knowledge								
Communication	✓	$\checkmark$	$\checkmark$				✓	✓
skills								
Critical thinking		$\checkmark$		✓	✓			$\checkmark$
Research -related		$\checkmark$	$\checkmark$	$\checkmark$	✓			$\checkmark$
skills								
Analytical	✓		$\checkmark$		✓		✓	$\checkmark$
reasoning								
Life-long learning		$\checkmark$		$\checkmark$	✓		$\checkmark$	$\checkmark$
Scientific	✓		$\checkmark$		✓	✓	✓	
reasoning								
Problem solving		$\checkmark$				✓	✓	✓
Year	Subject Title	Sem	Sub. Code					
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2021-22 Onwards	ELECTIVE-IV: MOBILE APPLICATION DEVELOPMENT	IV	21MIT42E					

#### **Course Learning Outcomes**

On Successful Completion of the Course, the students will be able to :

CLO1	Discuss the concept of Android OS
CLO2	Describe the concept of IDE and Android Studio
CLO3	Know about activities, fragments and intents
CLO4	Explain layouts and components of a screen
CLO5	Design user interfaces using views
CLO6	Know about database and content providers
CLO7	Know the concept of messaging
CLO8	Apply the concepts to build an app

**UNIT-I:** Getting started with Android programming : What is Android ? - Obtaining the required tools - Launching your first Android Application.Using Android Studio for Android development - Exploring the IDE, Using code completion , Debugging your Application - Publishing your Application.

**UNIT-II:** Activities, fragments and intents: Understanding Activities - Linking Activities using intents - Fragments - Displaying Notifications.Getting to know the Android user interface : Understanding the components of a screen - Adapting to display orientation

**UNIT-III:** Designing Your User Interface with Views :Using basic views - Using picker views - Using list views to display long lists - Understanding specialized fragments Displaying pictures and menus with Views : Using image views to display pictures - Using menus with views

**UNIT-IV:** Data Persistence : Saving and loading user preferences - Persisting data to files - creating and using databases . Content providers : Sharing data in Android - Using a content provider - Creating your own content providers.

**UNIT-V:** Messaging : SMS Messaging - sending Email. Location Based Services. :displaying Maps - Getting location data - Monitoring a location.Case study : Build an app for Courses in GAC/ Routing inside GAC, Hospital information in Coimbatore.

### **TEXT BOOK**

1. J.F.DiMarzio, "Beginning Android Programming with Android Studio", John Wiley and Sons,

# 2017, Fourth Edition.

# REFERENCES

- 1. Wei-Meng Lee, "Beginning Android Application Development", Wiley Publishing Inc, 2011
- 2. Reto Meier and Wrox Wiley, "Professional Android 4 Application Development", John Wiley & Sons Inc, 2012.

# FURTHER READING

- 1. ZiguradMednieks, LaridDornin, G.BlakeMeike, Masumi Nakamura, "Programming Andriod", O'Reilly,2013.
- Robert Green, Mario Zechner, "Beginning Android 4 Games Development", Apress Media LLC, New York, 2011. <u>https://www.tutorialspoint.com/android/index.htm</u>

https://www.javatpoint.com/android-tutorial https://developer.android.com/guide

Mapping								
Programme Level		Course Level Outcomes(CLOs)						
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓	~	✓	✓	✓	✓	✓	✓
Knowledge								
Communication	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		✓	$\checkmark$	
skills								
Critical thinking					$\checkmark$	✓	✓	✓
Research -related					✓	✓		✓
skills								
Analytical			✓	$\checkmark$	$\checkmark$	✓		✓
reasoning								
Life-long learning					$\checkmark$	✓	✓	✓
Scientific	✓	$\checkmark$	✓	✓				
reasoning								
Problem solving			✓	✓	✓	✓	✓	✓

<b>x</b> 7	
Y	ear

# **Subject Title**

# **ELECTIVE-IV:** PRINCIPLES OF COMPILER DESIGN

2021-22 Onwards

**21MIT42E** 

## **Course Learning Outcomes**

On Successful Completion of the Course, the students will be able to :

CLO1	Understand the basics of Compiler Design
CLO2	Apply the concepts of regular expressions, conversion of NFA to DFA
CLO3	Implement a Lexical Analyzer
CLO4	Able to build different parsing techniques
CLO5	Create intermediate code and work with control statements
CLO6	Build and evaluate a DAG
CLO7	Evaluate and analyse error deduction and recovery
CLO8	create code generation and code optimization

UNIT-I: Introduction – Structure of a Compiler – Compiler writing Tools – Basic constructs of High Level Programming languages: Data structures, Parameter transmission. Lexical analysis - Role of lexical analyser - Finite automata - Regular expressions to Finite automata - NFA to DFA -Minimising the number of states of a Deterministic Finite Automata - Implementation of a Lexical Analyser.

UNIT-II: Parsing techniques - Context free grammars - Derivations and Parse trees - Ambiguity -Capabilities of Context free grammars - Top down and Bottom up parsing - Handles - Shift Reduce parsing – Operator precedence parsing – Recursive descent parsing – Predictive parsing.

UNIT-III: Automatic parsing techniques - LR parsers - Canonical collection of LR(0) items -Construction of SLR parsing table – LR(1) sets of items Construction – Construction of canonical LR Parsing Tables.

UNIT-IV: Syntax Direction Translation – Semantic actions – Implementation of Syntax Directed Translators - Intermediate Code: Postfix notation, Quadruples, Triples, Indirect triples - Methods of translation of Assignment statements, Boolean expressions and Control statements.

UNIT-V: Symbol tables and Code generation: Representing information in a Symbol Table – Data Structures for Symbol table - Introduction to Code Optimization: Basic blocks - DAG representation - Error detection and recovery - Introduction to Code Generation.

# **TEXT BOOK**

1. Aho A. V. R, Ullman J. D., "Compilers, Principles, Techniques and Tools", Addison Wesley, 2001.

# REFERENCES

1. Dhamdhere D. M., "Compilers construction Principles and Practice", Macmillan India Ltd.

- 2. Puntambekar A A., "Principles of Compiler Design", Technical publications, 2009.
- 3. Dr.R.Venkatesh, Dr.N.UmaMaheshwari and Dr.S.Jeyanthi., "Compiler Design" Yes Dee Publisher 2015.

# FURTHER READING

- 1. <u>https://www.tutorialspoint.com/compiler\_design/index.htm</u>
- 2. https://www.geeksforgeeks.org/compiler-design-tutorials/

Mapping								
Programme Level			Cours	e Level O	utcomes(	CLOs)		
Outcomes	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary	✓				✓			✓
Knowledge								
Communication				$\checkmark$		$\checkmark$		
skills								
Critical thinking		$\checkmark$		$\checkmark$				✓
Research -related			$\checkmark$					
skills								
Analytical		$\checkmark$		✓	✓		✓	
reasoning								
Life-long learning							✓	
Scientific			$\checkmark$			✓		✓
reasoning								
Problem solving		$\checkmark$		✓	✓		✓	

#### 7. Teaching Learning Methodologies

The teaching-learning process should be in-line with the course objective and outcomes. Teaching has to ensure that the suggested outcomes are ensured for each course and overall programme. Teaching-aids should be used wherever required to facilitate proper and impactful learning. Blended learning is recommended with the use of MOOC platforms and classroom teaching.

To meet the set objectives of the course and enable students achieve the expected outcomes of the course the teaching-learning process should be appropriately chosen. Though the teachers are best positioned to create innovative models suitable for teaching the course, certain well accepted and widely tested processes are suggested to achieve the desired outcomes.

**Classroom teaching**- Regular classroom and face to face teaching and tutorials can be primarily used for imparting theoretical foundations of Information Technology. Applications of the same may be explained from time to time so that the student can appreciate the theory.

**Laboratory-** Lab exercises in programming and usage of package/ software tools should be made mandatory and integral part. Open source software/Packages should be preferred over proprietary tools wherever available.

**Seminars-** Guest lectures and seminars involving industry experts and eminent teachers should be arranged to help the students understand the practices in the industry and developments in the field.

**Assignments** – Home assignments should be designed to make student collect information from various sources and solve unfamiliar problems and make comparisons of solutions

**Project -** The project in the final semester should be defined based on the student proposals keeping in mind that opportunity to demonstrate the knowledge and skills gained during the course. One-One mentoring support should be provided.

**Simulation -** Packages to provide simulated environments to teach various components of networking and hardware working should be used wherever feasible.

### 8.Assessment and outcome Measurement Methods

The recommendations given by UGC is that assessment should be viewed not only merely as a testing by the institution to evaluate the students' progress, but also as a valuable tool for a student to learn what is expected of him/her, where their level of knowledge and skill is lacking, and perhaps most importantly, what he/she could do to improve these levels with the valuable inputs of the lecturers. Assessment methods are the strategies, techniques, tools and instruments for collecting information to determine the extent to which students demonstrate desired learning outcomes. In the M.Sc. IT programme, the assessment and evaluation methods focus on testing the conceptual understanding of the basic ideas of computer software, development of programming skills and experimental techniques, retention and ability to apply the knowledge acquired to real-life applications, and to solve new problems and communicate the results and findings effectively Several methods can be used to assess student learning outcomes.

The continuous assessment occurs on a regular and continuous basis, involves the monitoring of students, is integrated with teaching, involves a systematic collection of marks into a final score, and may be used to determine the students' final grades.

# GOVERNMENT ARTS COLLEGE (AUTONOMOUS) COIMBATORE - 641 018

### **DEPARTMENT OF INFORMATION TECHNOLOGY**

## DISTRIBUTION OF MARKS FOR CONTINUOUS INTERNAL ASSESSEMENT(CIA) AND COMPREHENSIVE EXTERNAL EXAMINATIONS(CEE)

### **BOARD OF STUDIES APPROVED SYLLABUS, 2021-2022 ONWARDS**

### A) PG THEORY PAPER

F	<b>PG THEORY PA</b>	PG TOTAL		
Maximum INT.	Maximum	External Passing	Max. Marks	Passing Minimum
MARKS #	EXT. MARKS	Minimum		
50	50	25	100	50

# No passing minimum for Internal Marks

### **B) PG PRACTICAL PAPER**

	PG PRACTICA	PRACTICAL TOTAL		
Maximum INT. MARKS #	Maximum EXT. MARKS	External Passing Minimum	Max. Marks	Passing Minimum
50	50	25	100	50

# No passing minimum for Internal Marks

### C) PG PROJECT

PG PROJECT			PROJECT TOTAL	
Maximum INT.	Maximum	<b>External Passing</b>	Max. Marks	Passing Minimum
MARKS #	EXT. MARKS	Minimum		
50	50	25	100	50

# No passing minimum for Internal Marks

# GOVERNMENT ARTS COLLEGE (AUTONOMOUS) COIMBATORE - 641 018 DEPARTMENT OF INFORMATION TECHNOLOGY

## **BOARD OF STUDIES APPROVED SYLLABUS, 2021-2022 ONWARDS**

### COMPONENTS OF CONTINUOUS INTERNAL ASSESSMENT FOR PG-50 MARKS

Average of two IAT (INTERNAL ASSESSMENT TEST) for 50 marks each will be converted to 30 marks for CIA calculation.

### A) THEORY PAPER

# IAT- INTERNAL ASSESSMENT TEST

COMPO	<b>NENTS</b>	MARKS	TOTAL
IAT-I	50	50+50 converted to 30 marks	
IAT-II	50		
Assignment @		10	50 marks
Seminar		5	
Class Participatio	on	5	

@- Two assignments to be given with 5 Marks each.

### **B) PRACTICAL PAPER**

COMPONENTS	MARKS	TOTAL
Model Practical	50 converted to 30 marks	
Observation Notebook	15	50 marks
Skill	5	

### C) PROJECT

COMPONENTS	MARKS	TOTAL
Periodic Review	40	50 Marks
Regularity	10	

#### SEMESTER EXAMINATION QUESTION PAPER FORMAT FOR PG

#### Max.Marks:50

### PART-A

#### I Choose the Best Answers (5\*1=5 Marks)

With 4 distractors – Avoid using none of the above , all of the above Question 1 from Unit – I Question 2 from Unit – II Question 3 from Unit – III Question 4 from Unit – IV Question 5 from Unit – V

### **II.** Answer any three questions (3\*2=6 Marks)

# Short answers not exceeding 25 words each

Question 6 from Unit – I Question 7 from Unit – II Question 8 from Unit – III Question 9 from Unit – IV Question 10 from Unit – V

#### **PART-B** (5\*3=15 Marks)

### Short Answers not exceeding 100 words each Answer all Questions

Question 11. a) or b) From Unit - I Question 12. a) or b) From Unit - II Question 13. a) or b) From Unit - III Question 14. a) or b) From Unit - IV Question 15. a) or b) From Unit - V

### **PART-C (3\*8=24 Marks)**

Answers any Three questions not exceeding 750 words each

Question 16. From Unit - I Question 17. From Unit - II Question 18. From Unit - III Question 19. From Unit - IV Question 20. From Unit - V

### **INTERNAL EXAMINATION QUESTION PAPER FORMAT FOR PG**

#### Max. Marks:50

### PART-A

### I Choose the Best Answers (5\*1=5 Marks)

With 4 distractions – Avoid using none of the above , all of the above Question 1 from Unit – I Question 2 from Unit – II Question 3 from Unit – III Question 4 from Unit – IV Question 5 from Unit – V

### II Answer Any THREE Questions(3\*2=6 Marks)

Question 6 from Unit – I Question 7 from Unit – II Question 8 from Unit – III Question 9 from Unit – IV Question 10 from Unit – V

### **PART-B** (5\*3=15 Marks)

# Short Answers not exceeding 25 words each Answer all Questions

Question 11. a) or b) From Unit - I Question 12. a) or b) From Unit - II Question 13. a) or b) From Unit - III Question 14. a) or b) From Unit - IV Question 15. a) or b) From Unit - V

#### PART-C (3\*8=24 Marks)

### Answers any Three questions not exceeding 200 words each

Question 16. From Unit - I Question 17. From Unit - II Question 18. From Unit - III Question 19. From Unit - IV Question 20. From Unit - V