PERIYAR UNIVERSITY

SALEM-636011

DEGREE OF BACHELOR OF SCIENCE

Syllabus for

B.Sc., Computer Science(Cyber Security)

(SEMESTER PATTERN- CBCS)

(For Candidates admitted in the colleges affiliated to Periyar University from 2023-2024 onwards)

1. Introduction

B.Sc. Computer Science (Cyber Security)

B.Sc. Computer Science with Cyber Security Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. 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 state which will help the students to ensure similar quality of education irrespective of the institute and location.

Cyber Security is the study of Security, quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. 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. Computer Application 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 evencomputerprogrammers.ComputerApplicationcanbeseenonahigherlevel,as a science of problem solving and problem solving requires precision, creativity, and careful reasoning.

The ever-evolving discipline of computer Application also has strong connections to other disciplines. Many problems in science, engineering, healthcare, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Cyber security has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty are a focuses on specific challenges. Computer Science Cyber security is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic.

Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

Programme Outcome, Programme Specific Outcome and Course Outcome

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. The key core area so for study in Mathematics include Algebra, Analysis (Real &Complex), Differential Equations, Geometry, and Mechanics.

The Students completing this programme will be able to present Cyber security clearly and precisely, make abstract ideas precise by formulating the min the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINESBASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**U.G.**
Programme Code:	
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study. **PO2: Communication Skills:** Ability to express thoughts and ideas **e**ffectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holesin the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation. **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team. **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

	PO11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO13: Moral and ethical awareness/reasoning**: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including learning how to learn that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	**PSO1**: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making. **PSO 2**: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment. **PSO 3**: To familiarize students to the concepts and theoriesrelated to Finance, Investments and Modern Marketing. **PSO 4**: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens. **PSO 5:** Enhance skills of analytical and critical thinking toanalyze effectiveness of economic policies.

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
PSO1	Y	Y	Y	Y	Y	Y	Y	Y
PSO2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO 4	Y	Y	Y	Y	Y	Y	Y	Y
PSO 5	Y	Y	Y	Y	Y	Y	Y	Y

3 – Strong, 2- Medium, 1- Low

Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the _Training for Competitive Examinations‘ course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest – Cyber Security.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I	**Foundation Course** To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical concepts to real world.	• Instil confidence among students • Create interest for the subject
I, II, III, IV	**Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial)	• Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable
		• Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects
		• Data analytical skills will enable students gain internships, apprentice ships, field work involving data collection, compilation, analysis etc.
		• Entrepreneurial skill training will provide an opportunity for independent lively hood • Generates self – employment • Create small scale entrepreneurs • Training to girls leads to women empowerment
		• Discipline centric skill will improve the Technical knowhowof solving real life problems using ICT tools
III, IV, V & VI	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	• Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi- disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • Emerging topics in higher education/ industry / communication network/ health

		sector etc. are introduced with hands-on-training, facilitates designing of mathematical models in the respective sectors
IV	Industrial Statistics	• Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
IV	Internship / Industrial Training	• Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.
V	Project with Viva – voce	• Self-learning is enhanced • Application of the concept to real situation is conceived resulting intangible outcome
VI	Introduction of Professional Competency component	• Curriculum design accommodates all category of learners; Mathematics for Advanced Explain component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers; • Training for Competitive Examinations– caters to the needs of the aspirants towards most sought- after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
Extra Credits: For Advanced Learners / Honors degree		• To cater to the needs of peer learners / research aspirants

Credit Distribution for UG Programme

Sem I	Credit	Hours	Sem II	Credit	Hours	Sem III	Credit	Hours	Sem IV	Credit	Hours	Sem V	Credit	Hours	Sem VI	Credit	Hours
1.1. Language - Tamil	3	6	2.1. Language - Tamil	3	6	3.1. Language - Tamil	3	6	4.1. Language - Tamil	3	6	5.1 Core Course – \CC IX	4	5	6.1 Core Course – CC XIII	4	6
1.2 English	3	6	2.2 English	3	6	3.2 English	3	6	4.2 English	3	6	5.2 Core Course – CC X	4	5	6.2 Core Course – CC XIV	4	6
1.3 Core Course –CC I	5	5	2.3 Core Course – CC III	5	5	3.3 Core Course –CC V	5	5	4.3 Core Course –CC VII Core Industry Module	5	5	5. 3.Core CourseCC - XI	4	5	6.3 Core Course –CC XV	4	6
1.4 Core Course –CC II	5	5	2.4 Core Course – CC IV	5	5	3.4 Core Course –CC VI	5	5	4.4 Core Course –CC VIII	5	5	5. 3.Core Course –/ Project with viva- voce CC -XII	4	5	6.4 Elective - VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	4	2.5 Elective IIGeneric/ Discipline Specific	3	4	3.5 Elective III Generic/ Discipline Specific	3	4	4.5 Elective IVGeneric/ Discipline Specific	3	3	5.4 Elective V Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement CourseSEC-1 (NME)	2	2	2.6 Skill Enhancement Course SEC-2 (NME)	2	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course SEC-6	2	2	5.5 Elective VI Generic/ Discipline Specific	3	4	6.6 Extension Activity	1	-
1.7 Foundation Course	2	2	2.7 Skill Enhancement Course – SEC-3	2	2	3.7 Skill Enhancement Course SEC-5	2	2	4.7 Skill Enhancement Course SEC-7	2	2	5.6 Value Education	2	2	6.7 Professional Competency Skill	2	2
						3.8 E.V.S	-	1	4.8 E.V.S	2	1	5.5 Summer Internship /Industrial Training	2				
	23	30		**23**	**30**		**22**	**30**		**25**	**30**		**26**	**30**		**21**	**30**
Total Credit Point :140																	

B.Sc., Computer Science (Cyber Security)

3 – Year UG Programme in (B.Sc. Computer Science (Cyber Security) Credits Distribution			
		No. of Papers	**Credits**
Part I	Tamil(3 Credits)	4	12
Part II	English(3 Credits)	4	12
Part III	Core Courses (5 Credits)	8	40
	Core Courses (4 Credits)	7	52
	Elective Courses :Generic / Discipline Specific (3 Credits)	8	
Total			**116**
Part IV	SEC1,SEC2(NME)(2 Credits)	2	4
	Skill Enhancement Courses 3,4,6,7(2 Credits)	4	8
	(SEC 5)EntrepreneurialSkill-1(1Credit)	1	1
	Professional Competency Skill(2 Credits)	1	2
	EVS (2 Credits)	1	2
	Value Education (2 Credits)	1	2
	Foundation Course(2 Credits)	1	2
	Summer Internship(2 Credits)	1	2
Part IV Credits			**23**
Part V	Extension Activity (NSS / NCC / Physical Education/ Outside College Hour)		1
Total Credits for the UG Programme in B.Sc. Computer Sciencewith Cyber Security			**140**

Choice Based Credit System (CBCS),
Learning Outcomes Based Curriculum Framework (LOCF)
Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

First Year
Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses [in Total]	13	14
Part-4	Skill Enhancement Course SEC-1	2	2
	Foundation Course	2	2
Total		**23**	**30**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
Total		**23**	**30**

Second Year

Semester-III

Part	List of Courses	Credit	No. of Hours
Part-1	Language - Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
Total		**22**	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-1	Language - Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	13
Part-4	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
Total		**25**	**30**

Third Year

Semester-V

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based	22	26
Part-4	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	2
Total		**26**	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based & LAB	18	28
Part-4	Extension Activity	1	-
	Professional Competency Skill	2	2
Total		**21**	**30**

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	96
Part IV	4	4	3	6	4	2	31
Part V	-	-	-	-	-	1	1
Total	23	23	22	25	26	21	**140**

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

B.Sc. Computer Science (Cyber Security)

Semester I				
Part	**Paper Code**	**List of Courses**	**Credit**	**Hours per week (L/T/P)**
Part I		Language – Tamil	3	6
Part II		English	3	6
Part-III	23UCYSCC01	CC1-Programming in C	5	5
	23UCYSCCP01	CC2-Practical: Programming in C Lab	3	3
		Elective Course -EC1 (Generic / Discipline Specific) –Choose from Annexure I	5	6
Part- IV		Skill Enhancement Course- SEC1 (Non Major Elective)	2	2
		Foundation Course FC – Problem Solving Techniques	2	2
Total			**23**	**30**

Semester II				
Part	**Paper Code**	**List of Courses**	**Credit**	**Hours per week (L/T/P)**
Part I		Language – Tamil	3	6
Part II		English	3	4
PartIV	**NMSDC**	**Overview of English Language Communication**	**2**	**2**
Part III	23UCYSCC02	CC3-Data Structures and Algorithms	5	5
	23UCYSCCP02	CC4-practical:Data Structures and Algorithms Lab	3	3
		Elective Course - EC2 (Generic / Discipline Specific) –Choose from Annexure I	5	6
Part IV		Skill Enhancement Course -SEC2 (Non Major Elective)	2	2
		Skill Enhancement Course - SEC3 Choose from Annexure II	2	2
Total			**25**	**30**

Semester – III				
Part	**Paper Code**	**List of Courses**	**Credit**	**Hours per week (L/T/P)**
Part I		Language – Tamil	3	6
Part II		English	3	6
Part-III	23UCYSCC03	CC5-Object Oriented Programming with Java	5	4
	23UCYSCCP03	CC6-Practical:Object Oriented Programming with Java Lab	3	3
		Elective Course- EC3 (Generic / Discipline Specific) -Choose from Annexure I	5	6
Part-IV		NMSDC-Digital Skills for Employability-Digital Skills	2	2
		Skill Enhancement Course -SEC5 Choose from Annexure II	2	2
		Environmental Studies	-	1
		Health and Wellness	**1**	
Total			**24**	**30**

Semester – IV				
Part	**Paper Code**	**List of Courses**	**Credit**	**Hours per week (L/T/P)**
Part I		Language – Tamil	3	6
Part II		English	3	6
Part III	23UCYSCC04	CC7-Tools & Techniques for Cyber Security	4	4
	23UCYSCCP04	CC8-Practical:Cyber Security Lab	3	3
		Elective Course - EC4 (Generic / Discipline Specific) Choose from Annexure I	5	6
Part IV		Skill Enhancement Course - SEC6 Choose from Annexure II	2	2
	NMADC	**UI / UX Design**	**2**	**2**
		Environmental Studies	2	1
Total			**25**	**30**

Semester – V				
Part	**Paper Code**	**List of Courses**	**Credit**	**Hours per week (L/T/P)**
Part-III	23UCYSCC05	CC9-Relational Database Management System	4	5
	23UCYSCCP05	CC10-Practical: RDBMS using ORACLE Lab	4	5
	23UCYSCC06	CC11-Essentials of Cyber Security	4	5
		Elective Course - EC5 (Discipline Specific) Choose from Annexure I	3	4
		Elective Course – EC6 (Discipline Specific) Choose from Annexure I	3	4
	23UCYSCCPR1	CC12 - Project with Viva voce	4	5
Part-IV		Value Education	2	2
		Internship / Industrial Training (Summer vacation at the end of IV semester activity)	2	-
Total			**26**	**30**

Semester – VI				
Part	**Paper Code**	**List of Courses**	**Credit**	**Hours per week (L/T/P)**
Part III	23UCYSCC07	CC13-Ethical Hacking & Cyber Security	4	**6**
	23UCYSCCP06	CC14-Ethical Hacking Lab	4	6
	23UCYSCC08	CC15-Network Security	4	6
		Elective Course – EC7 (Discipline Specific) Choose from Annexure I	3	5
		Elective Course – EC8 (Discipline Specific) Choose from Annexure I	3	5
Part IV		Skill Enhancement Course - SEC8 Choose from Annexure II	2	2
Part V		Extension Activity	1	-
Total			**21**	**30**
Total Credits: 143				

SUGGESTED CORE COMPONENTS

S.No	Paper Code	Paper Title
1	23UCYSCC09	Python Programming
2	23UCYSCCP07	Python Programming lab
3	23UCYSCC10	Data Science
4	23UCYSCCP08	Data Science lab
5	23UCYSCC11	Mobile Application Development
6	23UCYSCCP09	Mobile Application Development Lab
7	23UCYSCC12	Software Project Management
8	23UCYSCCP10	Software Engineering Lab
9	23UCYSCC13	Data Analytics using R
10	23UCYSCCP11	Data Analytics using R Lab

Annexure - I
Elective Course (EC1- EC8) (Generic / Discipline Specific)

Generic Specific

S.No	Paper Title
1	Mathematics-I
2	Mathematics-II
3	Mathematics Practical
4	Discrete Mathematics-I
5	Discrete Mathematics-II
6	Numerical Methods
7	Optimization Techniques
8	Introduction to Linear Algebra
9	Graph Theory and its Application
10	Numerical Methods-I
11	Numerical Methods-II
12	Statistical Methods and its Application-I

13	Statistical Methods and its Application-II
14	Statistical Practical
15	Physics-I
16	Physics Practical-I
17	Physics-II
18	Physics Practical-II
19	Digital Logic Fundamentals
20	Nano Technology
21	Electronics Science
22	Microprocessor & Micro Controller

Discipline Specific

S.No	Paper Code	Paper Title
1	23UCYSSE01	Data Communication and Computer Networks
2	23UCYSSE02	Cryptography
3	23UCYSSE03	Computing Intelligence
4	23UCYSSE04	Operating System
5	23UCYSSE05	Information Security
6	23UCYSSE06	Grid Computing
7	23UCYSSE07	Web Technology
8	23UCYSSE08	Digital Forensics
9	23UCYSSE09	E-Commerce & Digital Payment
10	23UCYSSE10	Mobile Computing
11	23UCYSSE11	Wireless Networks
12	23UCYSSE12	Cyber Crime & Law

[Pl. Note: In Semester-VI - For EC7 and EC8 subjects
Instructional hours may be used as: 5 per cycle]

Annexure II

Skill Enhancement Course (SEC1-SEC8)

S.No	Paper Code	Paper Title
1	23UCYSS01	Fundamentals of Information Technology
2	23UCYSS02	Introduction to HTML
3	23UCYSS03	Web Designing
4	23UCYSS04	PHP Programming
5	23UCYSS05	Software Testing
6	23UCYSS06	Understanding Internet
7	23UCYSS07	Office Automation
8	23UCYSS08	Quantitative Aptitude
9	23UCYSS09	Multimedia Systems
10	23UCYSS10	Advanced Excel
11	23UCYSS11	Biometrics
12	23UCYSS12	Pattern Recognition
13	23UCYSS13	Enterprise Resource Planning
14	23UCYSS14	Simulation and Modeling
15	23UCYSS15	Organization Behavior
16	23UCYSS16	Social Media & Security

Note: For Semester I & II [if other department select our paper as Non Major Elective choose from the above Skill Enhancement Course]

FIRST YEAR –SEMESTER- I

PROGRAMMING IN C

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
CCI	**5**	0	0	**I**	**5**	**5**	**25**	**75**	**100**

Learning Objectives	
LO1	To familiarize the students with the understanding of code organization
LO2	To improve the programming skills
LO3	Learning the basic programming constructs.

Prerequisites:

Unit	Contents	No. of Hours
I	**Studying Concepts of Programming Languages**- Language Evaluation Criteria - Language design - Language Categories - Implementation Methods – Programming Environments - Overview of C: History of C- Importance of C- Basic Structure of C Programs- Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations	**15**
II	**Decision Making and Branching**: Decision Making and Looping - Arrays - Character Arrays and Strings	**15**
III	**User Defined Functions:** Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions- Recursion	**15**
IV	**Structures and Unions:** Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures.	**15**
V	**Pointers:** Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers- Pointers to Functions- **File Management in C**	**15**
TOTAL		**75**

	Course Outcomes
CO1	Outline the fundamental concepts of C programming languages, andits features
CO2	Demonstrate the programming methodology.
CO3	Identify suitable programming constructs for problem solving.
CO4	Select the appropriate data representation, control structures, functions and concepts based on the problem requirement.
CO5	Evaluate the program performance by fixing the errors.
Textbooks	
1	Robert W. Sebesta, (2012), ―Concepts of Programming Languages‖, Fourth Edition, Addison Wesley (Unit I : Chapter – 1)
2	E. Balaguruswamy, (2010), ―Programming in ANSI C‖, Fifth Edition, Tata McGraw Hill Publications
Reference Books	
1.	Ashok Kamthane, (2009), ―Programming with ANSI & Turbo C‖, Pearson Education
2.	Byron Gottfried, (2010), ―Programming with C‖, Schaums Outline Series, Tata McGraw Hill Publications
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1.	http://www.tutorialspoint.com/cprogramming/
2.	http://www.cprogramming.com/
3.	http://www.programmingsimplified.com/c-program-examples
4.	http://www.programiz.com/c-programming
5.	http://www.cs.cf.ac.uk/Dave/C/CE.html
6.	http://fresh2refresh.com/c-programming/c-function/

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**10**	**10**

PROGRAMMING IN C LAB

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
CCII	0	0	3	I	3	**3**	**40**	**60**	**100**

Learning Objectives

LO1	The Course aims to provide exposure to problem-solving through C programming
LO2	It aims to train the student to the basic concepts of the C -Programming language
LO3	Apply different concepts of C language to solve the problem

Prerequisites:

Contents

1. Programs using Input/ Output functions
2. Programs on conditional structures
3. Command Line Arguments
4. Programs using Arrays
5. String Manipulations
6. Programs using Functions
7. Recursive Functions
8. Programs using Pointers
9. Files
10. Programs using Structures & Unions

TOTAL 60

CO	Course Outcomes
CO1	Demonstrate the understanding of syntax and semantics of C programs.
CO2	Identify the problem and solve using C programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of C language to solve the problem in an efficient way.
CO5	Develop a C program for a given problem and test for its correctness.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**2**	**3**	**2**	**2**
CO2	**3**	**3**	**2**	**3**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**2**	**2**
CO4	**3**	**3**	**2**	**3**	**2**	**2**
CO5	**3**	**3**	**2**	**3**	**3**	**2**
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**11**	**10**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PROBLEM SOLVING TECHNIQUES	**FC**	2	-	-	I	2	25	75	100

Learning Objectives		
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.	
LO2	Implement different programming constructs and decomposition of problems into functions.	
LO3	Use data flow diagram, Pseudo codeto implement solutions.	
LO4	Define and use of arrays with simple applications	
LO5	Understand about operating system and their uses	
UNIT	**Contents**	**No. Of. Hours**
I	**Introduction:** History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. **Programming Languages:** Machine language, Assembly language, High-level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	**6**
II	**Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. **Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.	**6**
III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	**6**
IV	**Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	**6**

V	**Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files.	**6**
	TOTAL HOURS	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Studythe basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	**Stewart Venit,** –Introduction to Programming: Concepts and Design‖, Fourth Edition, 2010, Dream Tech Publishers.

Web Resources	
1.	https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2.	http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3.	http://utubersity.com/?page_id=876

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	2	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	14	14	15	15	14

S-Strong-3 M-Medium-2 L-Low-1

FIRST YEAR –SEMESTER- II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	DATA STRUCTURES AND ALGORITHMS	**CCV**	5	-	-	III	5	25	75	100

Learning Objectives	
LO1	Understand the meaning asymptotic time complexity analysis and various data structures
LO2	To enhancing the problem solving skills and thinking skills
LO3	To write efficient algorithms and Programs
LO4	To make the students learn best practices in PYTHON programming
LO5	To understand how to handle the files in Data Structure

UNIT	Contents	No. Of. Hours
I	**Arrays and ordered Lists** Abstract data types – asymptoticnotations – complexity analysis- Linked lists: Singly linked list – doubly linked lists - Circular linked list, General lists- stacks – Queues – Circular Queues – Evaluation of expressions	**15**
II	**Trees and Graphs** Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees - threaded Binary Trees - Application of trees (Sets). Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees – Shortest Path Problems-Application of graphs	**15**
III	**Searching and Sorting** Sorting – Bubble Sort, Insertion Sort, QuickSort, Merge Sort, Selection Sort. Searching – Linear search, Binary search	**15**
IV	**Greedy Method and Dynamic programming** Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. General method – Multistage Graph Forward Method– All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components	**15**
V	**Backtracking** General Method – 8-Queen‟s – Sum Of Subsets – Graph Colouring – Hamiltonian Cycles – Branch And Bound: General Method – Travelling Sales Person Problem	**15**
	TOTAL HOURS	**75**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To understand the asymptotic notations and analysis of time and space complexity To understand the concepts of Linked List, Stack and Queue.	PO1, PO2, PO3, PO4,PO5, PO6
CO2	To understand the Concepts of Trees and Graphs Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.	PO1, PO2,PO3, PO4, PO5, PO6
CO3	To apply searching and sorting techniques	PO1, PO2,PO3, PO4, PO5, PO6
CO4	To understand the concepts of Greedy Method To apply searching techniques.	PO1, PO2, PO3, PO4,PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4,PO5, PO6
Textbooks		
1	Seymour Lipshutz(2011),Schaum‟s Outlines - Data Structures with C, Tata McGrawHill publications.	
2	Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms,Galgotia Publications Pvt., Ltd.	
3	Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and Python Programming(2018)	
Reference Books		
1.	Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore.	
2.	A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication.	
3.	Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of Computer Algorithms, Galgotia Publications Pvt.Ltd.	
Web Resources		
1.	https://www.tutorialspoint.com/data_structures_algorithms/index.htm	
2.	https://www.programiz.com/dsa	
3.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	1	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	2
WeightageofcoursecontributedtoeachPSO	15	15	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	**Category**	L	T	P	S	Credits	Marks		
	DATASTRUCTURES ANDALGORITHMS LAB	**CCIV**	-	-	**3**	II	3	25	75	100

Objectives

To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem

LIST OF PROGRAMS	**Required Hour**
1. Perform stack operations 2. Perform queue operations 3. Perform tree traversal operations 4. Search an element in an array using linear search. 5. Search an element in an array using binary search 6. Sort the given set of elements using Merge Sort. 7. Sort the given set of elements using Quick sort. 8. Search the Kth smallest element using Selection Sort 9. Find the Optimal solution for the given Knapsack Problem using Greedy Method. 10. Find all pairs shortest path for the given Graph using Dynamic Programming method 11. Find the Single source shortest path for the given Travelling Salesman problem using Dynamic Programming method 12. Find all possible solution for an N Queen problem using backtracking method 13. Find all possible Hamiltonian Cycle for the given graph using backtracking method	**60**

Course Outcomes

CO	On completion of this course, students will
CO1	To understand the concepts of Linked List, Stack and Queue.
CO2	Concepts of Trees and Graphs. Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.
CO3	To apply searching and sorting techniques
CO4	To determine the concepts of Greedy Method To apply searching techniques.
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	2	2	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	1	2
Weightageof coursecontributedtoeachPSO	15	15	14	14	13	14

S-Strong-3 M-Medium-2 L-Low-1

SECOND YEAR –SEMESTER- III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
	OBJECT ORIENTED PROGRAMMING WITH JAVA	**CCV**	**4**	-	-	IV	5	25	75	100

Learning Objectives	
LO1	Object Oriented Programming with Java.
LO2	Apply the OOPs concept in JAVA programming.
LO3	Become proficient programmers through the java programming language.
LO4	Give insight into real world applications.
LO5	Get the attentions of users in user interface using graphics

UNIT	Contents	No. of Hours
I	Introduction to OOPS: Paradigms of Programming Languages – Basic concepts of Object Oriented Programming – Differences between Procedure Oriented Programming and Object Oriented programming - Benefits of OOPs – Application of OOPs. Java: History – Java features – Java Environment – JDK – API. Introduction to Java: Types of java program – Creating and Executing a Java program – Java Tokens- Java Virtual Machine (JVM) – Command Line Arguments –Comments in Java program.	**15**
II	Elements: Constants – Variables – Data types - Scope of variables – Type casting – Operators: Special operators – Expressions – Evaluation of Expressions. Decision making and branching statements- Decision making and Looping– break –labeled loop – continue Statement. Arrays: One Dimensional Array – Creating an array – Array processing – Multidimensional Array – Vectors – ArrayList – Advantages of Array List over Array Wrapper classes.	**15**
III	Class and objects: Defining a class – Methods – Creating objects – Accessing class members – Constructors – Method overloading – Static members –Nesting of Methods – this keyword – Command line input. Inheritance: Defining inheritance –types of inheritance– Overriding methods – Final variables and methods – Final classes – Final methods - Abstract methods and classes – Visibility Control- Interfaces: Defining interface – Extending interface - Implementing Interface - Accessing interface variables. Strings: String Array – String Methods – String Buffer Class.	**15**
IV	Packages: Java API Packages – System Packages – Naming Conventions –Creating & Accessing a Package – Adding Class to a Package – Hiding Classes. Exception Handling: Limitations of Error handling – Advantages of Exception Handling - Types of Errors – Basics of Exception Handling – try blocks – throwing an exception – catching an exception – finally statement. Multithreading: Creating Threads – Life of a Thread – Defining & Running Thread – Thread Methods – Thread Priority– Synchronization –Implementing Runnable interface – Thread Scheduling	**15**

V	I/O Streams: File – Streams – Advantages - The stream classes – Byte streams –Character streams. Applets: Introduction – Applet Life cycle – Creating & Executing an Applet –Applet tags in HTML – Parameter tag – Aligning the display - Graphics Class: Drawing and filling lines – Rectangles – Polygon – Circles – Arcs – Line Graphs – Drawing Bar charts AWT Components and Even Handlers: Abstract window tool kit – Event Handlers – Event Listeners – AWT Controls and Event Handling: Labels – Text Component – Action Event – Buttons – Check Boxes – Item Event – Choice– Scrollbars – Layout Managers- Input Events – Menus	**15**
	TOTAL HOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Use the syntax and semantics of java programming language and basic concepts of OOP.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the concepts of Multithreading and Exception handling to Develop efficient and error free codes.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Design event driven GUI and web related applications which mimic the real word scenario	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Build the internet-based dynamic applications using the concept of applets	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1. E. Balagurusamy, –*Programming with Java*‖, TataMc-Graw Hill, 5th Edition.
.

Reference Books

1. Herbert Schildt, –*The complete reference Java*‖, TataMc-Graw Hill, 7th Edition.
2. Sagayaraj, Denis, Karthick and Gajalakshmi, –*Java Programming for Core and advanced learners*‖, Universities Press (INDIA) Private Limited 2018

Web Resources

1. https://www.w3schools.com/java/java_oop.asp#:~:text=OOP%20provides%20a%20clear%20structure,code%20and%20shorter%20development%20time
2. https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/

3.	https://www.javatpoint.com/java-oops-concepts
4.	https://www.coursera.org/learn/object-oriented-java
5.	https://docs.oracle.com/javase/tutorial/java/concepts/index.html
6	NPTEL & MOOC courses titled Java https://nptel.ac.in/courses/106105191/
7	https://www.tutorialspoint.com/java/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	2	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	2	3
Weightage of course contributed to each PSO	15	15	14	15	14	15

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	OBJECT ORIENTED PROGRAMMING WITH JAVA LAB	**CC VI**	-	-	3	IV	3	25	75	100

Learning Objectives:

1. Use an integrated development environment to write, compile, run, and test simpleobject-oriented Java programs.
2. Read and make elementary modifications to Java programs that solve real-world problems.
3. Be able to create an application using string concept.
4. Be able to create a program using files in application.
5. Be able to create an Applet to create an application.

	Required Hour

Lab Exercises: 1. Program using Class and Object. 2. Program using Constructors. 3. Program using Command-Line Arguments. 4. Program using Vectors. 5. Program using Interface. 6. Program using all forms of Inheritance. 7. Program using String class & String Buffer Class 8. Program using Exception Handling. 9. Implementing Thread based applications 10. Program using Packages. 11. Program using Files. **Applets:** 12. Working with Colors and Fonts. 13. Parameter passing technique. 14. Drawing various shapes using Graphical statements.	**60**

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	2	3	3	2
CO 4	3	3	3	3	3	3
CO 5	3	2	3	3	2	3
Weightage of course contributed to each PSO	15	14	14	15	14	14

S-Strong-3 M-Medium-2 L-Low-1

SECOND YEAR SEMESTER – IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
	TOOLS AND TECHNIQUES FOR CYBER SECURITY	**CC VII**	**4**	-	-	IV	4	25	75	100

Learning Objectives	
LO1	Outline the Cyber Issues in Real World.
LO2	Install VMware
LO3	Inspect Kali Linux
LO4	Use Metasploit framework for hacking
LO5	Assess the security in mobile devices

UNIT	Contents	No. of Hours
I	**Cyber Issues** : Window Password Hacking and Cracking – Steganography - Hiding Secret Message – Anonymous Call, Message and Email Header Analysis - Access Darknet or Darkweb Using TOR : Anonymous Browsing - Access Darknet or Darkweb Using TOR : Anonymous Browsing.	**12**
II	**Virtual Lab Set-up** : Installing VMware -Setting Up Kali Linux - Targ Virtual Machines - Creating the Windows XPTarget - Setting Up th Ubuntu 8.10 Target - Creating the Windows 7 Target.	**12**
III	**Kali Linux** : Linux Command Line - The Linux Filesystem - User Privileges - File Permissions - Editing Files- Data Manipulation - Managing Installed Packages - Processes and Services - Managing Networking Netcat: The Swiss Army Knife of TCP/IP Connections - Automating Tasks with cron Jobs	**12**
IV	**Metasploit Framework** : Starting Metasploit - Finding Metasploit Modules - Setting Module Options - Payloads - Types of Shells - Setting a Payload Manually - Msfcli - CreatingStandalone Payloads with Msfvenom – Using an Auxiliary Module	**12**
V	**Mobile Hacking** : Mobile Attack Vectors - The Smartphone Pentest Framework - Remote Attacks - Client-Side Attacks - Malicious Apps - Mobile Post Exploitation	**12**
	TOTAL HOURS	**60**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understanding the basic concepts of cyber issues	PO1,PO2
CO2	Installation of Virtual Lab and it set up	PO2,PO3,PO5
CO3	Implementation of Linux and its packages installation	PO4,PO5
CO4	Understanding its frameworks	PO1,PO2
CO5	Evaluation of Mobile hacking techniques	PO1,PO3

Textbooks	
1	Gautam Kumawat, Ethical Hacking & Cyber Security Course : A Complete Package,Udemy Course, 2017 (First Unit)
2	Georgia Weidman , Penetration testing A Hands-On Introduction to Hacking, no Starch press, 2014 (II-V unit)

Reference Books	
	1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security inComputing, 5th Edition , Pearson Education , 2015 2. Ramon Natase, Introduction to Hacking, 2018.

Web Resources	
1	www.wikipedia.org/wiki/Cybersecurity
2	http://www.freetechbooks.com/introduction-to-cybersecurity-ct240.html

Mapping with Programme Outcomes

CO Number	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**1**	**3**	**1**	**3**	**2**
CO2	**3**	**2**	**1**	**2**	**1**	**3**
CO3	**2**	**3**	**2**	**1**	**3**	**3**
CO4	**3**	**3**	**2**	**2**	**3**	**3**
CO5	**1**	**2**	**2**	**3**	**3**	**1**
Weightage of course contributed to each PSO	**11**	**11**	**10**	**9**	**13**	**12**

* S- Strong , M- Medium , L – Low

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PRACTICAL IV : CYBER SECURITY LAB	**CC VIII**	-	-	3	IV	3	25	75	100

Learning Objectives:

1. Understand the fundamental concepts of cryptography and the different types of encryption techniques
2. Develop an understanding of the different security algorithms and their implementation in open-source tools like GnuPG and Snort.
3. Gain practical experience in using various network security tools
4. Understand the importance of secure data storage and transmission

	Required Hour
1. Implement the following Substitution & Transposition Techniques concepts: a) Caesar Cipher b) Railfence row & Column Transformation 2. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript 3. Implement the following Attack: a) Dictionary Attack b) Brute Force Attack 4. Installation of Wire shark, tcpdump, etc and observe data transferred in client server communicationusing UDP/TCP and identify the UDP/TCP datagram. 5. Installation of rootkits and study about the variety of options. 6. Demonstrate intrusion detection system using any tool (snort or any other s/w). 7. Demonstrate how to provide secure data storage, secure data transmission and for creating digitalsignatures *Software Requirements* C, C++, Java or equivalent Compiler GnuPG, Snort.	**60**

CO	Course Outcomes
CO1	Implement the cipher techniques.
CO2	Develop the various security Algorithms
CO3	Use different open source tools for network security and analysis
CO4	Demonstrate Secured data transmission
CO5	Installation of root kits

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	2	3	3	2
CO 4	3	3	3	3	3	3
CO 5	3	2	3	3	2	3
Weightage of course contributed to each PSO	15	14	14	15	14	14

S-Strong-3 M-Medium-2 L-Low-1

THIRD YEAR –SEMESTER- V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	RELATIONAL DATABASE MANAGEMENT SYSTEM	**CC IX**	5	-	-	V	4	25	75	100

Learning Objectives	
LO1	To understand the different issues involved in the design and implementation of a database system.
LO2	To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
LO3	To understand and use data manipulation language to query, update, and manage a database
LO4	To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency,
LO5	To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

UNIT	Contents	No. of Hours
I	**Introduction:** Database System-Characteristics of Database Management Systems- Architecture of Database Management Systems-Database Models-System Development Life Cycle-Entity Relationship Model.	**18**
II	**Relational Database Model:** Structure of Relational Model-Types of keys. Relational Algebra: Unary operations-Set operations-Join operations. Normalization: Functional Dependency- First Normal form-Second Normal Form-Third Normal form- Boyce-Codd Normal Form-Fourth Normal Form.	**18**
III	**SQL:** Introduction. Data Definition Language: Create, alter, drop, rename and truncate statements. Data Manipulation Language: Insert, Update and Delete Statements. Data Retrieval Language: Select statement. Transaction Control Language: Commit, Rollback and Savepoint statements. Single row functions using dual: Date, Numeric and Character functions. Group/Aggregate functions: count, max, min, avg and sum functions. Set Functions: Union, union all, intersect and minus. Subquery: Scalar, Multiple and Correlated subquery. Joins: Inner and Outer joins.Defining Constraints: Primary Key, Foreign Key, Unique, Check, Not Null.	**18**
IV	**PL/SQL:** Introduction-PL/SQL Basic-Character Set-PL/SQL Structure-SQL Cursor-Subprograms-Functions-Procedures.	**18**

V	**Exception Handling:** Introduction-Predefined Exception-User Defined Exception-Triggers-Implicit and Explicit Cursors-Loops in Explicit Cursor.	**18**
	TOTAL HOURS	**90**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	To demonstrate the characteristics of Database Management Systems. To study about the concepts and models of database. To impart the concepts of System Development Life Cycle and E-R Model.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To classify the keys and the concepts of Relational Algebra. To impart the applications of various Normal Forms Classification of Dependency.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To elaborate the different types of Functions and Joins and their applications. Introduction of Views, Sequence, Index and Procedure.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Representation of PL-SQL Structure. To impart the knowledge of Sub Programs, Functions and Procedures.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Representation of Exception and Pre-Defined Exception. To Point out the Importance of Triggers, Implicit and Explicit Cursors.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	**Pranab Kumar Das Gupta and P. Radha Krishnan,** –Database Management System Oracle SQL and PL/SQL‖, Second Edition, 2013, PHI Learning Private Limited.

Reference Books

1	**RamezElmasri and Shamkant B. Navathe**, –*Fundamentals of Database Systems*‖, Seventh Edition, Pearson Publications.
2	**Abraham Silberschatz, Henry Korth, S. Sudarshan**, –*Database System Concepts*‖, Seventh Edition, TMH.

Web Resources

1	http://www.amazon.in/DATABASE-MANAGEMENT-SYSTEM-ORACLE-SQLebook/dp/B00LPGBWZ0#reader_B00LPGBWZ0

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	3	3	3
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3
WeightageofcoursecontributedtoeachPSO	14	15	15	14	15	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
	RDBMS USING ORACLE LAB	**CCX**	-	-	**5**	V	4	25	75	100

Learning Objectives:

1. To explain basic database concepts, applications, data models, schemasandinstances.
2. To demonstrate the use of constraints and relational algebra operations
3. Describe the basics of SQL and construct queries using SQL.
4. To emphasize the importance of normalization in databases
5. To facilitate students in Database design

LAB EXERCISES:

SQL:

1. DDL commands.
2. Specifying constraints-Primary Key, Foreign Key, Unique, Check, Not Null.
3. DML commands.
4. Set Operations.
5. Joins.
6. Sub-queries.

PL/SQL:

7. Control Constructs.
8. Exception Handlers.
9. Implicit Cursor.
10. Explicit Cursor.
11. Procedures.
12. Functions.
13. Triggers.
14. TCL Commands usage (Commit, Rollback, Savepoint)

TOTAL HOURS: 60

Course Outcomes	
CO	On completion of this course, students will
CO1	To demonstrate the characteristics of Database Management Systems. To study about the concepts and models of database. To impart the concepts of System Development Life Cycle and E-R Model.
CO2	To classify the keys and the concepts of Relational Algebra. To impart the applications of various Normal Forms Classification of Dependency.
CO3	To elaborate the different types of Functions and Joins and their applications. Introduction of Views, Sequence, Index and Procedure.
CO4	Representation of PL-SQL Structure. To impart the knowledge of Sub Programs, Functions and Procedures.
	Representation of Exception and Pre-Defined Exception.
CO5	To Point out the Importance of Triggers, Implicit and Explicit Cursors.

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	3	3	3
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	14	15	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ESSENTIALS OF CYBER SECURITY	**CC XI**	5	-	-	V	4	25	75	100

Learning Objectives	
LO1	Understand the real world security challenges.
LO2	Understand the basic internet security.
LO3	To protect the remote access and local computing devices.
LO4	To Understand the basics of Internet Security
LO5	To apply the tools and utilities for Network threats & Attacks

UNIT	**Contents**	**No. of Hours**
I	Infrastructure Security in the Real World-Security Challenges, Understanding Access-Control and Monitoring Systems - Access Control-Security Policies-Physical Security Controls-Authentication Systems-Remote-Access Monitoring,	**15**
II	Understanding Video Surveillance Systems-Video Surveillance Systems. Understanding Intrusion-Detection and Reporting Systems-Intrusion-Detection and Reporting Systems, Securing Devices The Three Layers of Security.	**15**
III	Protecting Remote Access - Protecting Local Computing Devices-Implementing Local Protection Tools-Using Local Intrusion-Detection Tools-Configuring Browser Security Options-Defending Against Malicious Software-Hardening Operating Systems, Understanding Network Transmission Media Security-The Basics of Network Transmission MEDIA-Transmission Media Vulnerabilities	**15**
IV	Understanding the Environment-The Basics of Internet Security-Understanding the Environment, Protecting the Perimeter-Understanding the Perimeter-Firewalls-Network Appliances-Proxy Servers-Honeypots-Extranets. Protecting Data Moving Through the Internet-Securing Data in Motion	**15**
V	Tools and Utilities-Using Basic Tools-Monitoring Tools and Software-Identifying and Defending Against Vulnerabilities-Zero Day Vulnerabilities-Software Exploits-Network Threats and Attacks-Dictionary Attacks-Denial of Service (DoS) Attacks-Spam	**15**

	TOTAL HOURS	**75**
Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Understanding the basics of Cyber Security access andmonitoring systems.	PO1
CO2	Understanding the concepts of intrusion detection andsecurity challenges.	PO 2
CO3	Implementing the protection tools for local and intrusiondetection.	PO 2, PO 3
CO4	Applying the network protection systems.	PO 3, PO 4
CO5	Appreciate the vulnerabilities, identifying and defendingagainst threats.	PO 5
Textbooks		
1	Cyber security Essentials, Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, Sybex, October 2018	
Reference Books		
1	1. Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, B.B.Gupta, D.P.Agrawal, Haoxiang Wang, CRC Press, 2018 .	
2	Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press	
	Web Resources	
1	. https://www.w3schools.com/cybersecurity/	

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	2	1	3	3	3	2
CO 2	1	3	3	2	1	1
CO 3	3	2	2	3	3	3
CO 4	2	3	3	1	3	2
CO 5	3	3	1	3	2	3
WeightageofcoursecontributedtoeachPSO	11	11	12	12	12	11

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER - VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ETHICAL HACKING & CYBER SECURITY	**CC XIII**	6	-	-	V	4	25	75	100

Learning Objectives	
LO1	To introduce the concepts of security and various kinds of attacks
LO2	Introduction about scanning and enumeration
LO3	To learn about system hacking
LO4	Programming For Security Professionals
LO5	To explain about penetration testing

UNIT	**Contents**	**No. of Hours**
I	Introduction to Hacking – Importance of Security – Elementsof Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Footprinting – Information Gathering Methodology – Footprinting Tools – WHOIS Tools – DNS InformationTools– Locating the Network Range – Meta Search Engines.	**18**
II	Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction toEnumeration – EnumerationTechniques – Enumeration Procedure – Tools	**18**
III	**System Hacking:** Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing –Password Cracking Tools – Password Cracking Countermeasures – Escalating Privileges –Executing Applications – Keyloggersand Spyware.	**18**
IV	**Programming For Security Professionals:** Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Toolsfor Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools forIdentifyingVulnerabilities – Countermeasures	**18**
V	**Penetration Testing:** Introduction – Security Assessments – Types of Penetration Testing- Phases of PenetrationTesting– Tools – Choosing Different Types of Pen-Test Tools – Penetration Testing Tools.	**18**
	TOTAL HOURS	**90**

Course Outcomes		Programme Outcomes
CO	Classify Various hacking techniques and attacks	
CO1	Understand Where information networks are most vulnerable	PO1
CO2	Understand and apply the concepts of system Hacking	PO2
CO3	Understand and apply the programming concepts for hacking	PO2,PO3
CO4	Distinguish and examine the function and phases inpenetration testing	PO4
CO5	Classify Various hacking techniques and attacks	PO3,PO4
	Textbooks	
1	1. EC-Council, ―Ethical Hacking and Countermeasures: Attack Phases, Cengage Learning,2010. 2. Michael.T.Simpson, Kent Backman, James.E.Corley, ―Hands on Ethical Hacking and Network Defense‖, Cengage Learning, 2013	
	Reference Books	
1	Patrick Engebretson, ―The Basics of Hacking and Penetration Testing – Ethical Hackingand Penetration Testing Made Easy, Second Edition, Elsevier, 2013	
2	RafayBoloch, ―Ethical Hacking and Penetration Testing Guide‖, CRC Press,2014	
3	Jon Erickson, ―Hacking, The Art of Exploitation, 2nd Edition:No Starch Press Inc., 2008	
	Web Resources	
1	. https://www.scribd.com/document/538684936/Hands-On-Ethical-Hacking-and- Network-Defense-PDFDrive	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	1	2	2	3	1
CO 2	3	2	2	1	3	2
CO 3	2	3	2	2	2	3
CO 4	3	3	2	2	3	3
CO 5	1	2	2	3	1	2
WeightageofcoursecontributedtoeachPSO	12	11	10	10	12	11

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
	ETHICAL HACKING LAB	**CC XI V**	-	-	**6**	V	4	25	75	100

Learning Objectives:

1. Understanding the basics of computer security and common vulnerabilities.
2. Learning how to conduct a thorough vulnerability assessment and penetration testing.
3. Familiarizing with various tools used for ethical hacking and their usage.
4. Developing an understanding of the laws and regulations governing ethical hacking.
5. Gaining knowledge of how to report and document findings from ethical hacking tests

LAB EXERCISES:

1. Use Google and Whois for REconnaisasance.
2. Use CryptTool to encrypt and decrypt passwords.
3. Using TraceRoute, Ping,ifconfig, netstat command
4. Using Nmap scanner to perform port scanning of various forms ACK,SYN,FIN,NULL, XMAS
5. Use WireShark sniffer to capture network traffic and analyse
6. Simulate persistent cross site scripting attack
7. Session impersonation using Firefox and Tamper data add-on
8. Perform SQL injection attack.
9. Using Metaspoilt to exploit

TOTAL HOURS: 60

Course Outcomes	
CO	On completion of this course, students will
CO1	A comprehensive understanding of the principles and concepts of ethical hacking.
CO2	Proficiency in identifying and exploiting common vulnerabilities in computer systems and networks.
CO3	Knowledge of various tools and techniques used for ethical hacking.
CO4	An understanding of how to conduct a vulnerability assessment and penetration testing.
CO5	Familiarity with the legal and ethical considerations surrounding ethical hacking.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	3	3	3
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	14	15	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Network Security		5	-	-	-	4	6	25	75	100
Course Objectives											
LO1	To familiarize on the model of network security, Encryption techniques										
LO2	To understand the concept of Number Theory, theorems										
LO3	To understand the design concept of cryptography and authentication										
LO4	To develop experiment son algorithm used for security										
LO5	Tounderstandaboutvirusandthreats,firewalls,andimplementationofCryptography										

UNIT	Details	No. of Hours
I	Model of network security – Security attacks, services and attacks – OSI security architecture –Classicalencryptiontechniques–SDES–BlockcipherPrinciplesDES–StrengthofDES–Blockcipherdesignprinciples–Block cipher mode of operation – Evaluation criteria for AES – RC4 - Differential and linear cryptanalysis–Placement of encryption function –traffic confidentiality.	15
II	NumberTheory–Primenumber–Modulararithmetic–Euclid_salgorithm-Fermet_sandEuler_s theorem – Primarily – Chinese remainder theorem– Discrete algorithm–Public key cryptography and RSA –Key distribution –Keymanagement–DiffieHellmankeyexchange–Ellipticcurvecryptography	15
III	Authenticationrequirement–Authenticationfunction–MAC–Hashfunction–Securityofhashfunctionand MAC–SHA-HMAC–CMAC-Digital signature And authentication protocols–DSS.	15

IV	Authentication applications – Kerberos – X.509 Authentications services-E-mail security–IP security -Web security	15
V	Intruder – Intrusion detection system – Virus andrelatedthreats– Countermeasures–Firewallsdesignprinciples–Trustedsystems– Practicalimplementationofcryptographyandsecurity	15
	Total	**75**

Course Outcomes

Course Outcomes	Oncompletionofthiscourse, students will;	
CO1	Analyzeanddesignclassical encryptiontechniquesand block ciphers.	PO1,PO3,PO6,PO8
CO2	Understand and analyze public-key cryptography, RSAandotherpublic-keycryptosystemssuchasDiffie-HellmanKeyExchange,ElGamalCryptosystem,etc	PO1,PO2,PO3,PO6
CO3	Understandkeymanagementanddistributionschemesanddesign User Authentication	PO3,PO5
CO4	AnalyzeanddesignhashandMACalgorithms,anddigitalsignatures.	PO1,PO2,PO3,PO7
CO5	Know about Intruders and Intruder Detection mechanisms,TypesofMalicioussoftware,	P02,PO6,PO7

Reference Text:

1.	WilliamStallings,-Cryptography&NetworkSecurity‖,PearsonEducation, FourthEdition2010.

References:

1.	CharlieKaufman,RadiaPerlman,MikeSpeciner,-NetworkSecurity,Privatecommunicationinpublicworld‖,PHISecondEdition,2002
2.	BruceSchneier,NeilsFerguson,-PracticalCryptography‖,WileyDreamtechIndiaPvt Ltd,FirstEdition,2003.
3.	DouglasRSimson-Cryptography–Theoryandpractice‖,CRCPress,FirstEdition,1995

WebResources	
1.	https://www.javatpoint.com/computer-network-security
2.	https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
3.	https://www.geeksforgeeks.org/network-security/

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**2**	**1**	**1**	**1**
CO2	**2**	**-**	**2**	**2**	**2**	**1**
CO3	**3**	**2**	**2**	**2**	**1**	**-**
CO4	**3**	**2**	**3**	**1**	**1**	**-**
CO5	**3**	**2**	**2**	**1**	**3**	**1**
Weightageofcourse contributedtoeach PSO	14	8	11	7	8	3

S-Strong-3 M-Medium-2L-Low-1

ANNEXURE- I

Elective Course (EC1- EC8)

Discipline Specific

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	DATA COMMUNICATION AND COMPUTER NETWORKS	**Elective**	6	-	-	-	5	25	75	100

Learning Objectives	
LO1	To introduce the fundamental network architecture concepts and their core principle issues in the emerging communication / data networks.
LO2	To have a complete picture of the data and computer networks systematically
LO3	To provide a strong foundation in networking concepts and technology
LO4	To know the significance of various Flow control and Congestion control Mechanisms
LO5	To know the Functioning of various Application layer Protocols.

UNIT	**Contents**	**No. Of. Hours**
I	**Data Communications:** Introduction– Networks – The Internet – Protocols and Standards- Network Models: OSI model – TCP/IP protocol suite – Transmission Media: Guided media – Unguided Media.	**15**
II	**Data Link Layer:** Error Detection and Correction: Introduction- Block coding – Linear block codes – Cyclic Codes – Checksum. Framing – Flow and Error Control: Protocols –Noiseless Channels: Stop- and –Wait – Noisy Channel: Stop-and Wait Automatic Repeat Request-Go-Back –N.	**15**
III	**Medium Access and Network Layer:** Multiple Access: Random Access – Controlled access- Channelization. Network Layer Logical addressing: IPv4 addresses – IPv6 addresses. Transport Layer: Process to Process delivery: UDP – TCP. Congestion Control – Quality of Service	**15**
IV	**Application Layer:** Domain Naming System: Name Space - Domain Name Space - Distribution of Name Space - DNS in the INTERNET - Resolution–Remote logging – E-mail – FTP.	**15**
V	**Wireless Networks:** Wireless Communications– Principles and Fundamentals. WLANs – WPAN- Satellite Networks - Ad-hoc Networks	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	

CO1	Understand the basics of data communication, networking, internet and their importance.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Analyze the services and features of various protocol layers in data networks.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Differentiate wired and wireless computer networks	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze TCP/IP and their protocols.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Recognize the different internet devices and their functions.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Forouzan, A. Behrouz. (2006), Data Communications & Networking, Fourth Edition, Tata McGraw Hill Education	
2	Nicopolitidis, Petros, Mohammad SalamehObaidat, G. L. Papadimitriou(2018), Wireless Networks, John Wiley & Sons.	
Reference Books		
1.	Fred Halsall(1996), Data Communications Computer Networks and Open Systems, Fourth Edition, Addison Wesley.	
Web Resources		
1.	https://www.tutorialspoint.com/data_communication_computer_network/index.htm	
2.	https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	CRYPTOGRAPHY	**Elect**	6	-	-	-	5	25	75	100

Learning Objectives	
LO1	To understand the fundamentals of Cryptography
LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
LO3	To understand the various key distribution and management schemes.
LO4	To understand how to deploy encryption techniques to secure data in transit across data networks
LO5	To design security applications in the field of Information technology

UNIT	**Contents**	**No. Of. Hours**
I	**Introduction:** The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.	**15**
II	**Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography	**15**
III	**Block Cipher and DES:** Block Cipher Principles – DES – The Strength of DES –**RSA:** The RSA algorithm.	**15**
IV	**Network Security Practices**: IP Security overview - IP Security architecture – Authentication Header. **Web Security**: SecureSocketLayer and Transport Layer Security – Secure Electronic Transaction.	**15**
V	Intruders – Malicious software – Firewalls.	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply the different cryptographiccryptographic algorithms Operations of symmetric	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the different cryptographiccryptography Operations of public key	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate different applications.	PO1, PO2, PO3, PO4, PO5, PO6

CO5	Understandstandards various Security practices and System security	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	**William Stallings,** –Cryptography and Network Security Principles andPractices‖.	
Reference Books		
1.	**Behrouz A. Foruzan,** –Cryptography and Network Security‖, Tata McGraw-Hill, 2007.	
2	**AtulKahate**, –*Cryptography and Network Security*‖, Second Edition, 2003,TMH.	
3	**M.V. Arun Kumar**, –*Network Security*‖, 2011, First Edition,USP.	
	Web Resources	
1	https://www.tutorialspoint.com/cryptography/	
2	https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	13	15	12	14	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	COMPUTING INTELLIGENCE	**Elect**	6	-	-	-	5	25	75	100
Learning Objectives										
LO1	To provide strong foundation on fundamental concepts in Computing Intelligence									
LO2	To apply basic principles of Artificial Intelligence and solutions that require problemsolving, influence, perception, knowledge representation and learning									
LO3	To provide knowledge about Neural Networks									
LO4	To give the basics of Artificial Neural Networks									

LO5	To give the knowledge about Genetic Algorithm	
UNIT	**Contents**	**No. Of. Hours**
I	Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing..	**15**
II	Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.	**15**
III	Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP)Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.	**15**
IV	**Artificial Neural Networks:** Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	**15**
V	**Genetic Algorithm:** Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm.	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop the fuzzy logic sets and membership function and defuzzification techniques	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the concepts of Neural Network and analyze and apply the learningtechniques	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Understand the artificial neural networks and its applications	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	S.N. Sivanandam and S.N. Deepa, –Principles of Soft Computing‖, 2nd Edition,Wiley India Pvt. Ltd
	Stuart Russell and Peter Norvig, –Artificial Intelligence - A Modern Approach‖, 2ndEdition, Pearson Education in Asia.
	S. Rajasekaran, G. A. Vijayalakshmi, –Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications‖, PHI.
Reference Books	
1.	F. Martin, Mc neill, and Ellen Thro, –Fuzzy Logic: A Practical approach‖, AP Professional, 2000. Chin Teng Lin, C. S. George Lee,‖ Neuro-Fuzzy Systems‖, PHI.
2	Chin Teng Lin, C. S. George Lee,‖ Neuro-Fuzzy Systems‖, PHI.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	3	3	3	3	2	3
CO 5	3	3	3	2	3	3
Weightageof coursecontributedtoeachPSO	15	14	15	11	14	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	OPERATING SYSTEM	**Elect**	6	- –	-	-	5	25	75	100
Learning Objectives										
LO1	To understand the fundamental concepts and role of Operating System.									
LO2	To learn the Process Management and Scheduling Algorithms.									
LO3	To understand the Memory Management policies.									
LO4	To gain insight on I/O and File management techniques.									
LO5	Analyze resource management techniques									

UNIT	Contents	No. Of. Hours
I	**Introduction**- views and goals – OperatingSystem Services - User and OperatingSystem interface - System Call- Types of System Calls – Operating System Design andImplementation - Operating System Structure. **Process Management**: Processconcept- Process Scheduling - Operations on Processes- InterprocessCommunication.**Threads**: Types of threads	**12**
II	**Process Scheduling**:BasicConcepts-Scheduling Criteria Scheduling Algorithm Multiple Processor Scheduling CPU Scheduling. **Synchronization**: The Critical-SectionProblem Synchronization Hardware – Semaphores- Classic Problem ofSynchronization.	**12**
III	**Deadlocks:** Deadlock Characterization - Methods for Handling Deadlocks-Deadlock Prevention- Deadlock Avoidance - Deadlock Detection- Recovery from Deadlock.	**12**
IV	**Memory**-Management Strategies: Swapping - Contiguous Memory AllocationSegmentation- Paging - Structure of the Page Table. **Virtual-Memory Management**: Demand Paging - Page Replacement - Allocation of Frames -Thrashing.	**12**
V	**Storage Management:** File System- File Concept - Access Methods- Directory andDisk Structure -File Sharing- Protection. Allocation Methods - Free- SpaceManagement - Efficiency and Performance – Recovery.	**12**
TOTAL HOURS		**60**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Define OS with its view and goals and services rented by it Deign of Operating System with itsstructure. Message through Inter process communication.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Describe the allocation of process through scheduling algorithms. Define critical section problems and its usage.Prevention of multiple process executing through the concept of semaphores.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Describe the concept of Mutual exclusion, Deadlock detection and agreement protocols for deadlockprevention and its avoidance.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze the strategies of Memory management schemes and the usage of Virtual memory. Apply Replacement algorithms to avoid thrashing.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Brief study of storage management. Categorize the methods to allocate files for proper protection.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	A. SilberschatzP.B.Galvin, Gange. ‐Operating System Concepts‖, Ninth Edition, 2013, Addison WesleyPublishingCo..
Reference Books	
1.	Anderw S Tanenbaum, Albert S. Woodhull,‖ Operating System Design and Impletation‖, prentice-Hall India Publication.
2.	William Stallings, ‐Operating Systems Internals and Design Principles‖, Pearson, 2018, 9th Edition.
3.	Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
4.	Operating System Concepts (2nd Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley.
5.	Operating Systems Design & implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson.
Web Resources	
1.	https://www.guru99.com/operating-system-tutorial.html
2.	https://www.mygreatlearning.com/blog/what
3.	https://en.wikipedia.org/wiki/Operating_system
4.	https://www.geeksforgeeks.org/what-is-an-operating-system/
5.	http://www.cs.kent.edu/~farrell/osf03/oldnotes/2. th-edition.pdf

Mapping with Programme Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	15	12	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	INFORMATION SECURITY	**Elect**	6	- _	-	-	5	25	75	100
Learning Objectives										
LO1	To know the objectives of information security									
LO2	Understand the importance and application of each of confidentiality, integrity, authentication and availability									
LO3	Understand various cryptographic algorithms									
LO4	Understand the basic categories of threats to computers and networks									
LO5	To know the objectives of information security									

UNIT	Contents	No. Of. Hours
I	Introduction to Information Security : Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.	**12**
II	The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption	**12**
III	Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms .Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos	**12**
IV	File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples.	**12**
V	Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. WebSecurity Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.	**12**
TOTAL HOURS		**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Understand network security threats, security services, and countermeasures	
CO2	Understand vulnerability analysis of network security	
CO3	Acquire background on hash functions; authentication; firewalls; intrusion detectiontechniques	
CO4	Gain hands-on experience with programming and simulation techniques for securityprotocols.	
CO5	Apply methods for authentication, access control, intrusion detection and prevention	

Textbooks	
1	Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2	Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson
Reference Books	
1.	Cryptography and Network Security: C K Shyamala, N Harini, Dr T RPadmanabhan, Wiley India, lst Edition.
2.	. Cryptography and Network Security : ForouzanMukhopadhyay, Mc Graw Hill, 2"d Edition

3.	. Information Security, Principles and Practice: Mark Stamp, Wiley India.
4.	Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	3	3	3	3	2	3
CO 5	3	3	3	2	3	2
Weightageof coursecontributedtoeachPSO	15	14	15	11	14	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	GRID COMPUTING	**Elective**	6	-	-	-	5	25	75	100

Learning Objectives	
LO1	To provide the knowledge on the basic construction and use of Grid computing.
LO2	To know and understand the grid computing applications.
LO3	To assess the efficiency of the grid computing in solving large scale scientific problems
LO4	To provide the knowledge on the basic of Grid Computing Anatomy
LO5	To know the knowledge about Merging the Grid services Architecture with the Web Services Architecture:

UNIT	**Contents**	**No. Of. Hours**
I	Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures.	**15**

II	Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), #Organization Developing Grid Computing Toolkits and Framework#, Organization and building and using grid based solutions to solve computing, commercial organizationbuilding and Grid Based solutions.	**15**
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, # Grid Architecture # and relationship to other distributed technology	**15**
IV	The Grid Computing Road Map: Autonomic computing, Businesson demand and infrastructure virtualization, Service-Oriented Architecture and Grid, #Semantic Grids#.	**15**
V	Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, #XML messages and Enveloping#, Service messagedescription Mechanisms, Relationship between Web Services andGrid Services, Web services Interoperability and the role of the WS-I Organization.	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	To understand the basic elements and concepts related to Grid computing	
CO2	To identify the Grid computing toolkits and Framework.	
CO3	To know about the concepts of Virtualization	
CO4	To analyze the concept of service oriented architecture.	
CO5	To Gain knowledge on grid and web service architecture.	

Textbooks	
1	Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.
Reference Books	
1.	Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	WEB TECHNOLOGY	**Elective**	6	-	-	-	5	25	75	100

Learning Objectives		
LO1	To learn the basic web concepts and to create rich internet applications that use most recent client-side programming technologies.	
LO2	To learn the basics of HTML	
LO3	To know about , DHTMLand XML,.	
LO4	To know about CSS, Java Script	
LO5	To provide the knowledge about Ajax	
UNIT	**Contents**	**No. Of. Hours**
I	HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size,face and color-alignment- links-tables-frames	**15**
II	Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page	**15**
III	XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible	**15**

	markup language (XML).	
IV	JavaScript: Client side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.	**15**
V	Ajax: Introduction, advantages &disadvantages, Purpose of it, ajax based web application, alternatives of ajax Java Script & AJAX: Introduction to array-operators, making statements-date & time-mathematics- strings-Event handling-form properties. AJAX. Introduction to jQuery and AngularJS	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Ability to Develop and publish Web pages using Hypertext Markup Language(HTML).	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Ability to optimize page styles and layout with CascadingStyle Sheets(CSS).	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Ability to Understand, analyze and apply the role of languages to create acapstone	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Website using client-side web programming languages like HTML, DHTML, CSS, XML, JavaScript, and AJAX	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Able to understand the concept of jQuery and AngularJS	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	Pankaj Sharma, –*Web Technology*‖, Sk Kataria &SonsBangalore, 2011.(UNIT I, II, III &IV). 2. Achyut S Godbole & Atul Kahate, –*Web Technologies*‖, 2002, 2nd Edition. (UNIT V:AJAX)

Reference Books

1.	Laura Lemay, Rafe Colburn , Jennifer Kyrnin, –Mastering HTML, CSS & Javascript Web Publishing‖,2016. 2. DT Editorial Services (Author), –HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)‖, Paperback 2016, 2ndEdition

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2

CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Marks**		
								CIA	**External**	**Total**
	DIGITAL FORENSICS	**Elective**	6	-	-	-	5	25	75	100

Learning Objectives	
LO1	To understand the basic digital forensics and techniques for conducting the forensic examination on differentdigital devices.
LO2	To understand the basic digital data acquisition
LO3	To Understanding Computing Investigations
LO4	To provide the knowledge of processing crimes and incident scene
LO5	To understand the Current computer forensics tools

UNIT	**Contents**	**No. Of. Hours**
I	Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.	**15**
II	Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensicsacquisitions tools.	**15**
III	Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.	**15**
IV	Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digitalevidence, obtaining digital hash, reviewing case.	**15**
V	Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool	**15**
TOTAL HOURS		**75**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the Basics of digital forensics	PO1
CO2	Understand the concepts of investigations and procedures	PO 1, PO 2
CO3	Apply the different digital forensic tools	PO 2, PO 3
CO4	Analysing the crime and digital evidence	PO 4
CO5	Understand and apply tools and techniques in digital forensic	PO 3, PO 4
Textbooks		
1	Warren G. Kruse II and Jay G. Heiser, ―Computer Forensics: Incident Response Essentials‖, Addison Wesley, 2002.	
2	Nelson, B, Phillips, A, Enfinger, F, Stuart, C., ―Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.	
Reference Books		
1.	Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, CharlesRiver Media, 2005, ISBN: 1-58450-389.	
Web Resources		
1.	https://www.udemy.com/course/digital-forensics-course/	

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ECOMMERCE & DIGITAL PAYMENT	**Elective**	6	-	-	-	5	25	75	100

Learning Objectives		
LO1	This course provides an introduction to information systems for business and management.	
LO2	It is designedto familiarize students with organizational and managerial and technical foundations of systems.	
LO3	To understand the A systematic Approach	
LO4	To understand the The Internet Audience and Consumer Behaviour	
LO5	Digital transactions are to reduce the costs and risks of handling cash. focuses on learning of newtechnologies	
UNIT	**Contents**	**No. Of. Hours**
I	E-commerce: The revolution is just beginning, Ecommerce : ABrief History, Understanding Ecommerce: organizing Themes.	**15**
II	E-commerce Business Models, Major Business to Consumer (B2C) business models, Major Business to Business (B2B) business models, Business models in emerging E-commerce areas, How the Internet and the web change business: strategy, structure and process, The Internet: Technology Background, TheInternet Today, Internet II- The Future Infrastructure, The World Wide Web, The Internet and the web : features.	**15**
III	A systematic Approach, The e-commerce security environment, Security threats in the e-commerce environment, Technology solution, Management policies, Business procedures, and public law. financial services, Online Travel Services, Online career services	**15**
IV	The Internet Audience and Consumer Behaviour, Basic Marketing Concepts, Internet Marketing Technologies, B2C and B2B E-commerce marketing and business strategies, The Retail sector, Analyzing the viability of online firms, E-commerce in action: E-tailing Business Models, Common Themes in online retailing, The service sector: offline and online, Online financial services, Online Travel Services, Online career services	**15**

V	Introduction to digital payment - different methods for digital payment - benefits of digital payment - Economic Progress -Payment Gateway.	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Determine key terminologies and concepts including IT,marketing, management, economics, accounting, finance in the major areas of business.	PO1
CO2	Design, develop and implement Information Technology solutions for business problems.	PO2,PO3
CO3	Analyze the impact of E-commerce on business models and strategy.	PO2,PO4
CO4	Understand ethical issues that occur in business, evaluatealternative courses of actions and evaluate the implications of those actions .	PO4
CO5	Assess electronic payment systems. Describe Internet trading relationships including Business to Consumer, Business-to- Business, Intra-organizational.	PO4,PO5

Textbooks

1	Kenneth C. Laudon, ―E-Commerce : Business, Technology, Society‖, 5th Edition, Pearson, 2019.
2	. S. J Joseph,‖ E-Commerce: an Indian perspective‖, PHI. 5th Edition, 2010

Reference Books

1.	1 Daniel Minoli & Emma Minoli, -Web Commerce Technology Handbook‖. Tata McGraw Hill – 2017. 2. Jaspal Singh , ― Digital Payments in India -Background, Trends and Opportunities‖.

Web Resources

1.	https://www.tutorialspoint.com/e_commerce/e_commerce_payment_systems.html

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MOBILE COMPUTING	**Elective**	6	-	-	-	5	25	75	100

Learning Objectives

LO1	To make the student to understand the concepts of mobile computing.
LO2	To familiar with the network protocol stack.
LO3	To be exposed to Ad-Hoc networks.
LO4	Basic concepts of MANET
LO5	Gain knowledge about different mobile platforms and application development

UNIT	Contents	No. Of. Hours

I	Introduction-Mobile Computing – Mobile Computing Vswireless Networking – Mobile Computing Applications –Characteristics of Mobile computing – Structure of MobileComputing Application. MAC Protocols – Wireless MAC Issues. Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes	**15**
II	Mobile Internet Protocol and Transport Layer-Overview ofMobile IP – Features of Mobile IP – Key Mechanism inMobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window –Improvement in TCP Performance.	**15**
III	Mobile Telecommunication System-Global System forMobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Tele communication System (UMTS).	**15**
IV	Mobile Ad-Hoc Networks-Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET –Security.	**15**
V	Mobile Platforms and Applications-Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS,Android, BlackBerry, Windows Phone – M-Commerce –Structure– Pros & Cons – Mobile Payment System – Security Issues.	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Remember the basic concepts of mobile computing.	PO1
CO2	Understanding mobile IP.	PO 1, PO 2
CO3	Apply Mobile Telecommunication system.	PO 3
CO4	Evaluate mobile ad hoc system.	PO 4
CO5	Implement mobile operating system.	PO 5

Textbooks

1	Prasant Kumar Pattnaik, Rajib Mall, ‐*Fundamentals of Mobile Computing*‖, PHI Learning Pvt. Ltd, New Delhi 2012.

Reference Books

1.	1. Jochen H. Schller, ―Mobile Communications‖, Pearson Education, New Delhi, 2007, 2nd Edition. 2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd. 2005. 3. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, ―Principles of Mobile Computing‖, Springer 2003
Web Resources	
1.	NPTEL & MOOC courses titled Mobile Computing 1. https://nptel.ac.in/courses/106/106/106106147/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	2	1	2	3
CO 2	3	2	2	1	3	2
CO 3	3	2	2	1	3	2
CO 4	2	3	2	1	2	3
CO 5	3	2	1	1	3	2
Weightageof coursecontributedtoeachPSO	13	12	9	5	13	12

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	WIRELESS NETWORK	**Elect**	6	-	-	-	5	25	75	100

Learning Objectives		
LO1	To understand about Wireless Networks,	
LO2	To familiar with Protocol Stack and Standards.	
LO3	TCP Enhancements For Wireless Protocols	
LO4	To be exposed to 3G/4G Services.	
LO5	Gain knowledge about Its Protocols and Applications	
UNIT	**Contents**	**No. Of. Hours**
I	Introduction-WLAN Technologies: Infrared, UHF Narrowband,Spread Spectrum -IEEE802.11: System Architecture, Protocol Architecture, Physical Layer, MAC Layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Manager Protocol, Security – IEEE802.16-WIMAX: Physical Layer, MAC, Spectrum Allocation For WIMAX.	**15**

II	Introduction – Mobile IP: IP Packet Delivery, Agent Discovery, Tunneling And Encapsulation, IPV6-Network Layer In The Internet-Mobile IP Session Initiation Protocol – Mobile Ad-Hoc Network: Routing, Destination Sequence Distance Vector, Dynamic Source Routing.	**15**
III	TCP Enhancements For Wireless Protocols – Traditional TCP: Congestion Control, Fast Retransmit/Fast Recovery, Implications Of Mobility – Classical TCP Improvements:Indirect TCP, Snooping TCP, Mobile TCP, Time Out Freezing,Selective	**15**
	Retransmission, Transaction Oriented TCP – TCP Over 3G Wireless Networks.	
IV	Overview Of UTMS Terrestrial Radio Access Network-UMTS Core Network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High SpeedDownlink Packet Access (HSDPA) - LTE Network Architecture And Protocol.	**15**
V	4G Introduction – 4G Vision – 4G Features And Challenges – Applications Of 4G – 4G Technologies: MulticarrierModulation, Smart Antenna Techniques, OFDM-MIMO Systems, Adaptive Modulation And Coding With Time Slot Scheduler, Cognitive Radio.	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Remember the basic concepts of WLANtechnologies.	PO 1
CO2	Understanding mobile IP.	PO 2
CO3	Apply TCP enhancements.	PO 3
CO4	Evaluate UTMS.	PO 4
CO5	Implement 4G.	PO 5

Textbooks

1. Jochen Schiller, ‖Mobile Communications‖, Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg , –Wireless Communications And Networking‖, First Edition, Elsevier 2007.(Unit IV,V)

Reference Books

1. Erik Dahlman, Stefan Parkvall, Johan Skold And Per Beming, –3G Evolution HSPA And LTE For Mobile Broadband‖, Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy Kuri, –Wireless Networking‖, First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, –Modern Wireless Communications‖, First Edition, Pearson Education 2013

Web Resources

1. www.tutorialspoint.com/wireless-network
www.iqytechnicalcollege.com www.rejinPaul.com

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	13	15	12	14	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	CYER CRIME AND LAW	**Elect**	6	-	-	-	5	25	75	100

Learning Objectives	
LO1	Understanding the nature of cybercrime
LO2	Legal and ethical considerations
LO3	Cyber security
LO4	Investigation and forensics
LO5	Prevention and response

UNIT	Contents	No. Of. Hours
I	Cyber Crimes Introduction — Computer Crime and Cyber Crimes: Distinction between Cyber Crime and Conventional Crimes; Cyber Forensic; Kinds of Cyber Crimes — Cyber Stalking, Cyber Terrorism, Forgery and Fraud, Crimes Related to IPRs, Computer Vandalism: Privacy of Online Data; Cyber Jurisdiction; Copyright Issues; Domain Name Dispute, etc.	**15**
II	Definition and Terminology (Information Technology Act, 2000) Concept of Internet, Internet Governance, E-contract, E-forms, Encryption, Data Security. Access, Addressee, Adjudicating Officer, Affixing Digital Signatures, Appropriate Government, Certifying Authority, Certification Practice Statement, Computer, Computer Network, Computer Resource, Computer System, Cyber Appellate Tribunal, Data, Digital Signature, Electronic Form, Electronic Record.	**15**

III	Electronic Records Authentication of Electronic Records; Legal Recognition of Electronic Records; Legal Recognition of Digital Signatures; Use of Electronic Records and Digital Signatures in Government and its Agencies; Retention of Electronic Records; Attribution, Acknowledgement and Dispatch of Electronic Records; Secure Electronic Records and Digital Signatures.	**15**
IV	Regulatory Framework Regulation of Certifying Authorities; Appointment and Functions of Controller; License to Issue Digital Signatures Certificate; Renewal of License; Controller's Powers; Procedure to be Followed by Certifying Authority; Issue, Suspension and Revocation of Digital Signatures Certificate, Duties of Subscribers; Penalties and Adjudication; Appellate Tribunal; Offences	**15**
V	Cyber law in India: Need for cyber law in India, History of cyber law in India, Information Technology Act,2000, Overview ofother laws amended by the IT Act 2000, National Policy onInformation Technology 2012.	**15**
TOTAL HOURS		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Remember the basic concepts of Cyber Crimes	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Analyze the concepts of Digitalization	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Implementation of Digitalization	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Functionalities and Authorization of digital transactions	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understanding the laws and its acts	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	Cyber Crimes and Laws, Dr.U.S.Pandey, Dr.Verinder Kumar, Dr.Harman PreetSingh, Himalaya Publishing House,2017 edition.
Reference Books	
1.	Text book on Cyber Law, Pavan Duggal, second Edition, Universal law 2017
	Web Resources
1	https://www.mygreatlearning.com/academy/learn-for-free/courses/introduction-to-cyber-crime

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	13	15	12	14	14

S-Strong-3 M-Medium-2 L-Low-1

ANNEXTURE – II

Skill Enhancement Course (SEC1-SEC8)

Subject Code	Subject Name	Category	L	T	P	S	Inst. hours	Credits	Marks		
									CIA	External	Total
	Fundamentals of Information Technology	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives		
LO1		Understand basic concepts and terminology of information technology.
LO2		Have a basic understanding of personal computers and their operation
LO3		Be able to identify data storage and its usage
LO4		Get great knowledge of software and its functionalities
LO5		Understand about operating system and their uses

UNIT		**Contents**	**No. Of. Hours**
I		**Introduction to Computers:** Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer	**6**
II		**Basic Computer Organization:** Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	**6**
III		**Storage Fundamentals:** Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	**6**
IV		**Software:** Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w	**6**
V		**Operating System:** Functions, Measuring System Performance, Assemblers, Compilers and Interpreters.Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**6**

	TOTAL HOURS	**30**

	Course Outcomes	**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1		Anoop Mathew, S. KavithaMurugeshan (2009), ― Fundamental of Information Technology‖, Majestic Books.
2		Alexis Leon, Mathews Leon,‖ Fundamental of Information Technology‖, 2nd Edition.
3		S. K Bansal, ―Fundamental of Information Technology‖.

Reference Books

1.		BhardwajSushilPuneet Kumar, ―Fundamental of Information Technology‖
2.		GG WILKINSON, ―Fundamentals of Information Technology‖, Wiley-Blackwell
3.		A Ravichandran , ―Fundamentals of Information Technology‖, Khanna Book Publishing

Web Resources

1.		https://testbook.com/learn/computer-fundamentals
2.		https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3.		https://www.javatpoint.com/computer-fundamentals-tutorial
4.		https://www.tutorialspoint.com/computer_fundamentals/index.htm
5.		https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	2	3
CO 5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	15	14	15	14	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	INTRODUCTION TO HTML	SEC	2	-	-		2	25	75	100

Learning Objectives	
LO1	Insert a graphic within a web page.
LO2	Create a link within a web page.
LO3	Create a table within a web page.
LO4	Insert heading levels within a web page.
LO5	Insert ordered and unordered lists within a web page. Create a web page.

UNIT	Contents	No. Of. Hours
I	Introduction :WebBasics: WhatisInternet–Webbrowsers–WhatisWebpage – HTMLBasics:Understandingtags.	**6**
II	TagsforDocumentstructure(HTML,Head,BodyTag).Blockleveltextelements:Headingsparagraph(<p> tag)–Fontstyleelements:(bold,italic,font,small,strong,strike,bigtags)	**6**
III	Lists:Typesoflists:Ordered,Unordered– NestingLists–Othertags:Marquee,HR,BR-UsingImages –CreatingHyperlinks.	**6**
IV	Tables:CreatingbasicTable,Tableelements,Caption–Tableandcellalignment–Rowspan,Colspan–Cellpadding.	**6**
V	Frames:Frameset–TargetedLinks–Noframe–Forms:Input, Textarea,Select,Option.	**6**
	TOTAL HOURS	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Knows the basic concept in HTMLConcept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows Design concept.Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting.Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks		
1	—Mastering HTML5 and CSS3 Made Easy‖, TeachUComp Inc., 2014.	
2	**Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"**	
Web Resources		
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf	
2.	https://www.w3schools.com/html/default.asp	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	WEB DESIGNING	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	Understand the basics of HTML and its components
LO2	To study about the Graphics in HTML
LO3	Understand and apply the concepts of XML and DHTML
LO4	Understand the concept of JavaScript
LO5	To identify and understand the goals and objectives of the Ajax

UNIT	Details	No. of Hours
I	HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames.	6
II	Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.	6
III	XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).	6

IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding. JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,	6
V	Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.	6
	Total	**30**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
CO2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6
CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
CO4	Ability to develop a java script	PO1, PO2, PO3, PO7
CO5	An ability to develop web application using Ajax.	P02, PO6, PO7

Text Book	
1	Pankaj Sharma, -Web Technology‖, SkKataria& Sons Bangalore 2011.
2	Mike Mcgrath, -Java Script‖, Dream Tech Press 2006, 1st Edition.
3	Achyut S Godbole&AtulKahate, -Web Technologies‖, 2002, 2nd Edition.
Reference Books	
1.	Laura Lemay, RafeColburn , Jennifer Kyrnin, -Mastering HTML, CSS &Javascript Web Publishing‖, 2016.
2.	DT Editorial Services (Author), ―HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)‖, Paperback 2016, 2nd Edition.
Web Resources	
1.	NPTEL & MOOC courses titled Web Design and Development.
2.	https://www.geeksforgeeks.org

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**2**	**1**	**2**	**1**	**2**
CO2	**3**	**3**	**2**	**2**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**2**	**2**	**3**
CO5	**3**	**2**	**2**	**2**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**12**	**10**	**11**	**12**	**13**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
	PHP PROGRAMMING	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100
Learn ing Objectives											
LO1	To provide the necessary knowledge on basics of PHP.										
LO2	To design and develop dynamic, database-driven web applications using PHP version.										
LO3	To get an experience on various web application development techniques.										
LO4	To learn the necessary concepts for working with the files using PHP.										
LO5	To get a knowledge on OOPS with PHP.										

UNIT	Contents	No. of Hours
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation	6
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.	6
III	Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.	6
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6
	Total	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.
CO3	Create PHP Program using the concept of array.	PO3,PO4,PO5.
CO4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5
CO5	Manipulate files and directories.	PO3,PO5,PO6.

Text Book

1	Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.
2	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes

Reference Books

1.	PHP: The Complete Reference-Steven Holzner.
2.	DT Editorial Services (Author), -*HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*‖, Paperback 2016, 2nd Edition.

Web Resources

1.	Opensource digital libraries: PHP Programming
2.	https://www.w3schools.com/php/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Software Testing	Skill Enha. Course (SEC)	Y	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	To study fundamental concepts in software testing										
LO2	To discuss various software testing issues and solutions in software unit test, integration and system testing.										
LO3	To study the basic concept of Data flow testing and Domain testing.										
LO4	To Acquire knowledge on path products and path expressions.										
LO5	To learn about Logic based testing and decision tables										

UNIT	Contents	No. of Hours
I	Introduction: Purpose–Productivity and Quality in Software–TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.	6
III	Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing.	6
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.SyntaxTesting– Formats– Test Cases	6
V	Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, StateTesting.	6
	Total	**30**

Course Outcomes		Program Outcomes
CO	On completion of this course, students will	
CO1	Students learn to apply software testing knowledge and engineering methods	PO1
CO2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2
CO3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	PO4, PO6
CO4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6
CO5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8

Text Book

1	B.Beizer,–SoftwareTestingTechniques‖,IIEdn.,DreamTechIndia,NewDelhi,2003.
2	K.V.K.Prasad,–SoftwareTestingTools‖,DreamTech.India,NewDelhi,2005

Reference Books

1.	I.Burnstein,2003,–PracticalSoftwareTesting‖,SpringerInternationalEdn.
2.	E. Kit, 1995, –Software Testing in the Real World: Improving the Process‖, PearsonEducation,Delhi.
3.	R. Rajani,andP.P.Oak,2004,–SoftwareTesting‖,TataMcgrawHill,New Delhi.

Web Resources	
1.	https://www.javatpoint.com/software-testing-tutorial
2.	https://www.guru99.com/software-testing.html

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	UNDERSTANDING INTERNET	Skill Enha. Course (SEC)	2	-	-		2	25	75	100

Learning Objectives	
LO1	Knowledge of Internet medium
LO2	Internet as a mass medium
LO3	Features of Internet Technology,
LO4	Internetas sourceof infotainment
LO5	Studyofinternet audiences andabout cyber crime

UNIT	Contents	No. Of. Hours
I	Theemergenceofinternet asamassmedium–theworld of_worldwideweb_.	**6**
II	Featuresofinternetasatechnology.	**6**
III	Internetas asourceofinfotainment – classificationbasedoncontentandstyle.	**6**
IV	Demographic and psychographic descriptions of internet _audiences_ – effect of internet onthevalues and life-styles.	**6**
V	Presentissuessuchascybercrime andfuturepossibilities.	**6**
	TOTAL HOURS	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows the concept of internet as a technology.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the concept of infotainment and classification based on content and style	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Can be able to know about Demographic and psychographic description of internet	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the concept of cyber crime and future possibilities	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	01. Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.
2	Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.
3	Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.

Reference Book

1	Acharya, R N [1987] Television in India. Manas Publications, New Delhi.
2	Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP
3	Luthra, H R [1986] Indian Broadcasting. Ministry of I& B, New Delhi.
4	Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.

Web Resources

1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	https://www.w3schools.com/html/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC1	**OFFICE AUTOMATION**	Skill Enha. Course (SEC)	**2**	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	Understand the basics of computer systems and its components.
LO2	Understand and apply the basic concepts of a word processing package.
LO3	Understand and apply the basic concepts of electronic spreadsheet software.
LO4	Understand and apply the basic concepts of database management system.
LO5	Understand and create a presentation using PowerPoint tool.

UNIT	Contents	No. of Hours
I	Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages.	6
II	**Word Processing:** Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing–Preview,options,merge.	6

III	**Spreadsheets:**Excel–opening,enteringtextanddata,formatting,navigating;Formulas–entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontodataanalytics.	6
IV	**Database Concepts:** The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching	6
	records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).	
V	**Power point:** Introduction to Power point - Features – Understanding slide typecasting &viewingslides – creating slide shows. Applying special object – including objects & pictures – Slidetransition–Animationeffects,audioinclusion,timers.	6
	Total	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3,PO6,PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3,PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
CO4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5,PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7,PO8

Text Book	
1	PeterNorton,―IntroductiontoComputers‖–TataMcGraw-Hill.
Reference Books	
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, –Microsoft 2003‖, Tata McGrawHill.
Web Resources	
1.	https://www.udemy.com/course/office-automation-certificate-course/
2.	https://www.javatpoint.com/automation-tools

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**2**	**2**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**14**	**14**	**15**	**15**	**15**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
	Quantitative Aptitude	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives			
LO1	To understand the basic concepts of numbers		
LO2	Understand and apply the concept of percentage, profit & loss		
LO3	To study the basic concepts of time and work, interests		
LO4	To learn the concepts of permutation, probability, discounts		
LO5	To study about the concepts of data representation, graphs		
UNIT	**Contents**	**No. of Hours**	
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification-Square root and cube roots - Average-problems on Numbers.	6	

II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chain rule.	6
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surface area -races and Games of skill.	6
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances-Odd man out & Series	6
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Pie charts-Line graphs.	6
	Total	**60**
Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	understand the concepts, application and the problems of numbers	PO1
CO2	To have basic knowledge and understanding about percentage, profit & loss related processings	PO1, PO2
CO3	To understand the concepts of time and work	PO4, PO6
CO4	Speaks about the concepts of probability, discount	PO4, PO5
CO5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3, PO6
Text Book		
1	–QuantitativeAptitude‖,R.S.AGGARWAL.,S.Chand&CompanyLtd.,	
Reference Books		
1.		
Web Resources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.toppr.com/guides/quantitative-aptitude/	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**2**	**1**	**2**	**2**	**2**
CO2	**2**	**3**	**1**	**3**	**2**	**2**
CO3	**1**	**3**	**1**	**1**	**3**	**1**
CO4	**1**	**2**	**1**	**1**	**3**	**1**
CO5	**1**	**2**	**1**	**1**	**3**	**3**
Weightage of course contributed to each PSO	**8**	**12**	**5**	**8**	**13**	**9**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
	Multimedia Systems	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives			
LO1	Understand the definition of Multimedia		
LO2	To study about the Image File Formats, SoundsAudio File Formats		
LO3	Understand the concepts of Animation and Digital Video Containers		
LO4	To study about the Stage of Multimedia Project		
LO5	Understand the concept of Ownership of Content Created for Project Acquiring Talent		
UNIT	**Contents**	**No. of Hours**	**Course Objective**
I	Multimedia Definition-Use Of Multimedia-Delivering Multimedia- Text: About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and Design Tools-Hypermedia and Hypertext.	6	

II	Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound - DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSoundsAudio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project	6
III	Animation: The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays-Digital Video Containers-Obtaining Video Clips -Shooting and Editing Video	6
IV	Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-Multimedia Production Team.	6
V	Planning and Costing: The Process of Making Multimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent	6
	Total	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	understand the concepts, importance, application and the process of developing multimedia	PO1
CO2	to have basic knowledge and understanding about image related processings	PO1, PO2
CO3	To understand the framework of frames and bit images to animations	PO4, PO6
CO4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO6

Text Book

1	TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.

Reference Books

1.	RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012.

Web Resources	
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	3	3	3	2
CO2	2	3	2	3	2	1
CO3	1	2	3	3	3	2
CO4	3	2	2	2	1	2
CO5	2	3	1	3	3	3
Weightage of course contributed to each PSO	10	12	11	14	12	10

Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Advanced Excel	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	Handle large amounts of data
LO2	Aggregate numeric data and summarize into categories and subcategories
LO3	Filtering, sorting, and grouping data or subsets of data
LO4	Create pivot tables to consolidate data from multiple files
LO5	Presenting data in the form of charts and graphs

UNIT	Contents	No. of Hours
I	Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets	6
II	Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data - Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.	6
III	Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.	6
IV	More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager.	6
V	Charts - Formatting Charts- 3D Graphs- Bar and Line	6

	Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.	
	Total	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No-SQL databases and management.	PO3, PO8

Text Book	
1	**Excel 2019 All**
2	**Microsoft Excel 2019 Pivot Table Data Crunching**

Reference Books	
1	Excel 2019 All-in-One for Dummies, Greg Harvey, 1st edition

Web Resources	
1.	https://www.simplilearn.com
2	https://www.javatpoint.com
3	https://www.w3schools.com

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	3	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	2	2	3	3	3
Weightage of course contributed to each PSO	15	12	10	15	15	15

Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Biometrics	Specific Elective	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	Identify the various biometric technologies.
LO2	Design of biometric recognition.
LO3	Develop simple applications for privacy
LO4	Understand the need of biometric in the society
LO5	Understand the scope of biometric techniques

UNIT	contents	No. of Hours
I	**Introduction**: What is Biometrics, History, Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching, Biometric system error and performance measures, Design of biometric system, Applications of biometrics, Biometrics versus traditional authentication methods. **Face Biometrics:** Introduction, Background of Face Recognition, Design of Face Recognition System, Neural Network for Face Recognition, Face Detection in Video Sequences, Challenges in Face Biometrics, .7 Face Recognition Methods, Advantages and Disadvantages.	6
II	**Retina and Iris Biometrics:** Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Iris Segmentation Method , Determination of Iris Region, Determination of Iris Region, Applications of Iris Biometrics, Advantages and Disadvantages **Vein and Fingerprint Biometrics:** Introduction, Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages.	6
III	**Privacy Enhancement Using Biometrics:** Introduction, Privacy Concerns Associated with Biometric Deployments, Identity and Privacy, Privacy Concerns, Biometrics with Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics. **Multimodal Biometrics:** Introduction to Multimodal Biometrics , Basic Architecture of Multimodal Biometrics, Multimodal Biometrics Using Face and Ear, Characteristics and Advantages of Multimodal Biometrics, Characteristics and Advantages of Multimodal Biometrics.	6

IV	**Watermarking Techniques:** Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking, Attacks on Watermarks, Performance Evaluation, Characteristics of Watermarks, General Watermarking Process, Image Watermarking Techniques, Watermarking Algorithm, Experimental Results, Effect of Attacks on Watermarking Techniques, Attacks on Spatial Domain Watermarking.	6
V	**Scope and Future:** Scope and Future Market of Biometrics, Biometric Technologies, Applications of Biometrics, Biometrics and Information Technology Infrastructure, Role of Biometrics in Enterprise Security, Role of Biometrics in Border Security, Smart Card Technology and Biometrics, Radio Frequency Identification (RFID) Biometrics, DNA Biometrics, Comparative Study of Various Biometric Techniques. **Biometric Standards:** Introduction, Standard Development Organizations, Application Programming Interface (API), Information Security and Biometric Standards, Biometric Template Interoperability.	6
	Total	**30**
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	To understand the basic concepts and the functionality of the Biometrics, Face Biometrics, Types, Architecture and Applications.	PO1, PO3, PO6, PO8
CO2	To know the concepts Retina and Iris Biometrics and Vein and Fingerprint Biometrics.	PO1,PO2,PO3,PO6
CO3	To analyse the Privacy Enhancement and Multimodal Biometrics.	PO3, PO5
CO4	To get analyticalidea on Watrmarking Techniques	PO1, PO2, PO3, PO7
CO5	To Gain knowledge on Future scope of Biometrics,and Study of various Biometric Techniques.	PO2, PO6, PO7
Recommended Text		
1.	Biometrics: Concepts and Applications by G.R Sinha and SandeepB.Patil , Wiley, 2013	

References Books	
1.	Guide to Biometrics by Ruud M. Bolle , SharathPankanti, Nalinik.Ratha, Andrew W.Senior, Jonathan H. Connell , Springer 2009
2.	Introduction to Biometrics by Anil k. Jain, Arun A. Ross, KarthikNandakumar
3.	Hand book of Biometrics by Anil K. Jain, Patrick Flynn, ArunA.Ross.
Web Resources	
1.	https://www.tutorialspoint.com/biometrics/index.htm
2.	https://www.javatpoint.com/biometrics-tutorial
3.	https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**1**	**2**	**2**	**2**	**2**
CO2	**2**	**3**	**2**	**3**	**3**	**1**
CO3	**2**	**2**	**2**	**3**	**3**	**2**
CO4	**3**	**2**	**1**	**3**	**3**	**2**
CO5	**3**	**3**	**2**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**13**	**11**	**9**	**14**	**14**	**10**

Strong-3M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Pattern Recognition	Skill Enha. Course (SEC)	2	-	-	-	2	2	75	25	100

Learning Objectives	
LO1	To learn the fundamentals of Pattern Recognition techniques
LO2	To learn the various Statistical Pattern recognition techniques
LO3	To learn the linear discriminant functions and unsupervised learning and clustering
LO4	To learn the various Syntactical Pattern recognition techniques
LO5	To learn the Neural Pattern recognition techniques

UNIT	Contents	No. of Hours	Course Objective
I	**PATTERN RECOGNITION OVERVIEW**: Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches	6	CO1
II	**STATISTICAL PATTERN RECOGNITION**: Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches.	6	CO2
III	**LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING**: Introduction-Discrete and binary Classification Problems-Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised learning and classification	6	CO3
IV	**SYNTACTIC PATTERN RECOGNITION**: Overview of Syntactic Pattern Recognition-Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition-Learning via grammatical inference.	6	CO4
V	**NEURAL PATTERN RECOGNITION**: Introduction to Neural Networks-Feed-forward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR	6	CO5
	Total		

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	understand the concepts, importance, application and the process of developing Pattern recognition over view	PO1
CO2	to have basic knowledge and understanding about parametric and non-parametric related concepts.	PO1, PO2

CO3	To understand the framework of frames and bit images to animations	PO4, PO6
CO4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO8
Text Book		
1	Robert Schalkoff, ―Pattern Recognition: Statistical Structural and Neural Approaches‖, John wiley& sons.	
2	Duda R.O., P.E.Hart& D.G Stork, ― Pattern Classification‖, 2nd Edition, J.Wiley.	
3	Duda R.O.& Hart P.E., ―Pattern Classification and Scene Analysis‖, J.wiley.	
4	Bishop C.M., -Neural Networks for Pattern Recognition‖, Oxford University Press.	
Reference Books		
1.	1. Earl Gose, Richard johnsonbaugh, Steve Jost, ―Pattern Recognition and Image Analysis‖, Prentice Hall of India, Pvt Ltd, New Delhi.	
Web Resources		
1.	https://www.geeksforgeeks.org/pattern-recognition-introduction/	
2.	https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**2**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**2**	**2**
Weightage of course contributed to each PSO	**15**	**15**	**12**	**12**	**13**	**10**

Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Enterprise Resource Planning	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	To understand the basic concepts, Evolution and Benefits of ERP.
LO2	To know the need and Role of ERP in logical and Physical Integration.
LO3	Identify the important business functions provided by typical business software such as enterprise resource planning and customer relationship management
LO4	To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth
LO5	To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills

UNIT	Details	No. of Hours
I	ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP, ERP Vendors; Benefits & Limitations of ERP Packages.	6
II	Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP_s Role in Logical and Physical Integration. Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.	6
III	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. Cloud and Open Source, Quality Management, Material Management, Financial Module, CRM and Case Study.	6
IV	ERP Implementation Basics, , ERP implementation Strategy, ERP Implementation Life Cycle ,Pre-Implementation task,Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.	6

V	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into or-ganizational culture. Using ERP tool: either SAP or ORACLE format to case study.	6
	Total	**30**
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic concepts of ERP.	PO1, PO2, PO6
CO2	Identify different technologies used in ERP	PO2, PO3, PO4
CO3	Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules	PO1, PO3, PO6
CO4	Discuss the benefits of ERP	PO2, PO6
CO5	Apply different tools used in ERP	PO1, PO3, PO5
Reference Text :		
1.	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.	
References :		
1.	Enterprise Resource Planning – Diversified by Alexis Leon, TMH.	
2.	Enterprise Resource Planning – Ravi Shankar & S. Jaiswal , Galgotia	
Web Resources		
1.	1. https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm	
2.	1. https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/	
3.	1. https://www.guru99.com/erp-full-form.html	
4.	2. https://www.oracle.com/in/erp/what-is-erp/	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**3**	**3**	**2**	**2**	**2**
CO2	**3**	**3**	**2**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**2**
CO5	**3**	**3**	**3**	**2**	**2**	**3**

Weightage of course contributed to each PSO	15	15	14	12	13	11

Subject Code	Subject Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
	Simulation and Modeling	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives		
LO1	Generates computer simulation technologies and techniques, lays the groundwork for students to comprehend computer simulation requirements, and implements and tests a variety of simulation and data analysis libraries and programmes. This course focuses on what is required to create simulation software environments rather than just simulations using pre-existing packages	
LO2	Discuss the concepts of modelling layers of critical infrastructure networks in society.	
LO3	Create tools for viewing and controlling simulations and their results.	
LO4	Understand the concept of Entity modelling, Path planning	
LO5	To learn about the Algorithms and Modelling.	
UNIT	**Details**	**No. of Hours**
I	Introduction To Modeling & Simulation – What is Modeling and Simulation – Complexity Types – Model Types – Simulation Types – M&S Terms and Definitions Input Data Analysis – Simulation Input Modeling – Input Data Collection - Data Collection Problems - – Input Modeling Strategy - Histograms -Probability Distributions - Selecting a Probability Distribution.	6

II	Random Variate Generation – Random Numbers – Random Number Generators – General principles – Inverse Transform Method –Acceptance Rejection Method –Composition Method –Relocate and Rescale Method - Specific distributions-Output Data Analysis – Introduction -Types of Simulation With Respect to Output Analysis - Stochastic Process and Sample Path - Sampling and Systematic Errors - Mean, Standard Deviation and Confidence Interval - Analysis of Finite-Horizon Simulations - Single Run - Independent Replications - Sequential Estimation – Analysis of	6
	Steady-State Simulations - Removal of Initialization Bias (Warm-up Interval) - Replication-Deletion Approach - Batch-Means Method .	
III	Comparing Systems via Simulation – Introduction – Comparison Problems - Comparing Two Systems - Screening Problems - Selecting the Best - Comparison with a Standard - Comparison with a Fixed Performance Discrete Event Simulations – Introduction - Next-Event Time Advance - Arithmetic and Logical Relationships - Discrete-Event Modeling Approaches – Event-Scheduling Approach – Process Interaction Approach.	6
IV	Entity Modeling – Entity Body Modeling – Entity Body Visualization – Entity Body Animation – Entity Interaction Modeling – Building Modeling Distributed Simulation – High Level Architecture (HLA) – Federation Development and Execution Process (FEDEP) – SISO RPR FOM Behavior Modeling – General AI Algorithms - Decision Trees - Neural Networks - Finite State Machines - Logic Programming - Production Systems – Path Planning - Off-Line Path Planning - Incremental Path Planning - Real-Time Path Planning – Script Programming -Script Parsing - Script Execution.	6

V	Optimization Algorithms – Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling.	6
	Total	**30**
Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Programme Outcomes**
CO1	Introduction To Modeling & Simulation, Input Data Analysis and Modeling.	PO1
CO2	Random Variate and Number Generation. Analysis of Simulations and methods.	PO1, PO2
CO3	Comparing Systems via Simulation	PO4, PO6
CO4	Entity Body Modeling, Visualization, Animation.	PO4, PO5, PO6
CO5	Algorithms and Sensor Modeling.	PO3, PO5
Text Books		
1.	Jerry Banks, ―Handbook of Simulation: Principles, Methodology, Advances, Applications, and Practice‖, John Wiley & Sons, Inc., 1998.	
2.	George S. Fishman, ―Discrete-Event Simulation: Modeling, Programming and Analysis‖, Springer-Verlag New York, Inc., 2001.	
References Books		
1.	Andrew F. Seila, Vlatko Ceric, PanduTadikamalla, ―Applied Simulation Modeling‖, Thomson Learning Inc., 2003.	
Web Resources		
1.	https://www.tutorialspoint.com/modelling_and_simulation/index.htm	
2.	https://www.javatpoint.com/verilog-simulation-basics	

Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO 1	**3**	**2**	**2**	**3**	**3**	**2**
CO 2	**3**	**3**	**2**	**3**	**3**	**2**
CO 3	**3**	**3**	**3**	**3**	**3**	**2**
CO 4	**3**	**3**	**2**	**3**	**3**	**2**
CO 5	**3**	**3**	**2**	**3**	**3**	**2**
	15	**14**	**11**	**15**	**15**	**10**

Strong-3M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Organizational Behaviour	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives		
LO1	To have extensive knowledge onOB and the scope of OB.	
LO2	To create awareness of Individual Benaviour.	
LO3	To enhance the understanding of Group Behaviour	
LO4	To know the basics of Organisaitonal Culture and Organisational Structure	
LO5	To understand Organisational Change, Conflict and Power	
UNIT	**Contents**	**No. of Hours**
I	**INTRODUCTION** : Concept of Organizational Behavior (OB): Nature, Scope and Role of OB: Disciplines that contribute to OB; Opportunities for OB (Globalization, Indian workforce diversity, customer service, innovation and change, networked organizations, work-life balance, people skills, positive work environment, ethics)	6
II	**INDIVIDUAL BEHAVIOUR:** 1. Learning, attitude and Job satisfaction: Concept of learning, conditioning, shaping and reinforcement. Concept of attitude, components, behavior and attitude. Job satisfaction: causation; impact of satisfied employees on workplace. 2. Motivation : Concept; Theories (Hierarchy of needs, X and Y, Two factor, McClelland, Goal setting, Self-efficacy, Equity theory); Job characteristics model; Redesigning jobs, 3. Personality and Values : Concept of personality; Myers-Briggs Type Indicator (MBTI); Big Five model. Relevance of values; Linking personality and values to the workplace (person-job fit, person-organization fit) 4. Perception, Decision Making : Perception and Judgements; Factors; Linking perception to individual decision making:	6
III	**GROUP BEHAVIOUR** : 1. Groups and Work Teams : Concept : Five Stage model of group development; Group norms, cohesiveness ; Group think and shift ; Teams; types of teams; Creating team players from individuals and team based work(TBW) 2. Leadership : Concept; Trait theories; Behavioral theories (Ohio and Michigan studies); Contingency theories (Fiedler, Hersey and Blanchard, Path-Goal);	6

IV	ORGANISATIONAL CULTURE AND STRUCTURE : Concept of culture; Impact (functions and liability); Creating and sustaining culture: Concept of structure, Prevalent organizational designs: New design options	6
V	ORGANISATIONAL CHANGE, CONFLICT AND POWER: Forces of change; Planned change; Resistance; Approaches (Lewin's model, Organisational development);. Concept of conflict, Conflict process; Types, Functional/ Dysfunctional. Introduction to power and politics.	6
		30
Course Outcomes		
Course Outcomes	On Completion of the course the students will	**Program Outcomes**
CO1	To define OrganisationalBehaviour, Understand the opportunity	PO1, PO2, PO6
	through OB.	
CO2	To apply self-awareness, motivation, leadership and learning theories at workplace.	PO2,PO4. PO5, PO6
CO3	To analyze the complexities and solutions of group behaviour.	PO1, PO2, PO4, PO5, PO6
CO4	To impact and bring positive change in the culture of the organisaiton.	PO2, PO3, PO4 PO5,
CO5	To create a congenial climate in the organization.	PO1, PO2, PO5 PO6,
Text Books		
1.	NeharikaVohra Stephen P. Robbins, Timothy A. Judge , *Organizational Behaviour*, Pearson Education, 18th Edition, 2022.	
2.	Fred Luthans, *Organizational Behaviour*, Tata McGraw Hill, 2017.	
3.	Ray French, Charlotte Rayner, Gary Rees & Sally Rumbles, *Organizational Behaviour*, John Wiley & Sons, 2011	
4.	Louis Bevoc, Allison Shearsett, Rachael Collinson, *Organizational Behaviour Reference*, Nutri Niche System LLC (28 April 2017)	
5.	Dr. Christopher P. Neck, Jeffery D. Houghton and Emma L. Murray, *Organizational Behaviour: A Skill-Building Approach,* SAGE Publications, Inc; 2nd edition (29 November 2018).	
References Books		
1.	Uma Sekaran, Organizational Behaviour Text & cases, 2nd edition, Tata McGraw Hill Publishing CO. Ltd	
2.	GangadharRao, Narayana, V.S.P Rao, Organizational Behaviour 1987, Reprint 2000, Konark Publishers Pvt. Ltd, 1st edition	
3.	S.S. Khanka, Organizational Behaviour, S. Chand & Co, New Delhi.	
4.	J. Jayasankar, Organizational Behaviour, Margham Publications, Chennai, 2017.	

									CIA	External	Total
	SOCIAL MEDIA & SECURITY	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	Understand the important features of social computing
LO2	Learn to analyze the data left behind in social media
LO3	To learn about Good social media campaigns
LO4	To understand about Risks of Social media Introduction Public embarrassment
LO5	Learn about Policies and Privacy Blocking users controlling app privacy

UNIT	**Details**	**No. of Hours**
I	Introduction to Social Media, Understanding Social Media, Different Types and Classifications, The Value of Social Media, Cutting Edge Versus Bleeding Edge, The Problems That Come With Social Media, Is Security Really an Issue? Taking the Good With the Bad.	6
II	Dark side Cybercrime, Social Engineering, Hacked accounts, cyberstalking, cyberbullying, predators phishing, hackers.	6
III	Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, sometimes it‘s better to be overlooked, Social media hoaxes, The human factor, Content management, Promotion of social media.	6
IV	Risks of Social media Introduction Public embarrassment, Once it‘s out there, it‘s out there False information, Information leakage, Retention and archiving, Loss of data and equipment.	6

V	Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing.	6
	Total	**30**

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Programme Outcomes**
CO1	Understanding the concept of Social Media	**PO1, PO 2**
CO2	Analyze and review the hacking methodologies	**PO 3**
CO3	Understanding the good and bad media campaigns	**PO 1, PO 2**
CO4	Evaluating the risks in social media	**PO 1, PO 3, PO 5**
CO5	Understanding Policy and its privacies	**PO 1, PO 4**

Text Books	
1.	1. Interdisciplinary Impact Analysis of Privacy in Social Networks, Recognizing YourDigitalFriends, Encryption for Peer-to-Peer Social Networks Crowd sourcing andEthics, Authors:Altshuler Y, EloviciY, Cremers A.B, Aharony N, Pentland A. (Eds.).
2.	SocialMediasecurity Https://www.sciencedirect.com/science/article/pii/B97815974998660000
References Books	
1.	Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk. 2. Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press.
Web Resources	
1.	https://www.trendmicro.com/en_in/research/21/f/best-practices-for-social-media-security.html
2.	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	3	3	2
CO 2	3	3	2	3	3	2
CO 3	3	3	3	3	3	2
CO 4	3	3	2	3	3	2
CO 5	3	3	2	3	3	2
	15	14	11	15	15	10

Strong-3M-Medium-2 L-Low-1

SUGGESTED CORE COMPONENTS

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PYTHON PROGRAMMING	CC VII	5	-	-	IV	4	25	75	100

Learning Objectives	
LO1	To make students understand the concepts of Python programming.
LO2	To apply the OOPs concept in PYTHON programming.
LO3	To impart knowledge on demand and supply concepts
LO4	To make the students learn best practices in PYTHON programming
LO5	To know the costs and profit maximization

UNIT	Contents	No. of Hours
I	**Basics of Python Programming:** History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	**15**
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**	**15**
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. **Python Strings:** String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	**15**
IV	**Lists:** Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	**15**

V	**Python File Handling:** Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	**15**
	TOTAL HOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	Reema Thareja, ―Python Programming using problem solving approach‖, First Edition, 2017, Oxford University Press.
2	Dr. R. Nageswara Rao, ―Core Python Programming‖, First Edition, 2017, Dream tech Publishers.

Reference Books

1.	VamsiKurama, ―Python Programming: A Modern Approach‖, Pearson Education.
2.	Mark Lutz, ‖Learning Python‖, Orielly.
3.	Adam Stewarts, ―Python Programming‖, Online.
4.	Fabio Nelli, ―Python Data Analytics‖, APress.
5.	Kenneth A. Lambert, ―Fundamentals of Python – First Programs‖, CENGAGE Publication.

Web Resources

1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each	15	14	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PYTHON LAB	**CCVIII**	-	-	4	I	4	25	75	100

Course Objectives:

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python.
4. Be able to build and package Python modules for reusability.
5. Be able to read and write files in Python.

LAB EXERCISES	**Required Hours**
1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	**60**

Course Outcomes

On completion of this course, students will

CO1	Demonstrate the understanding of syntax and semantics of
CO2	Identify the problem and solve using PYTHON programming techniques.
	Identify suitable programming constructs for problem solving.

CO3	
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	DATA SCIENCE	**CC**	5	-	-	-	4	25	75	100

Learning Objectives		
LO1	To understand the basic concepts of Data Science	
LO2	To understand the principles of algorithms, flowchart and source code	
LO3	To acquire a solid foundation in Python.	
LO4	To visualize data using plots in python	
LO5	To understand and handle database and visualize.	
UNIT	**Contents**	**No. Of. Hours**
I	**Introduction to Data Science** Introduction: Data Science - Big Data and Data Science hype – getting past the hype - Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA – Applications of Data Science - Data Science in Business - Business Intelligence vs Data Science – Data Analytics Life Cycle - Machine Learning	**15**
II	**Introduction to Python** Features of Python - How to Run Python – Identifiers- Reserved Keywords- Variables - Comments in Python -	**15**

	Indentation in Python - Multi-Line Statements- Input, Output and Import Functions- Operators. Data Types and Operations: Numbers -Strings -List - Tuple - Set -Dictionary - Mutable and Immutable Objects - Data Type Conversion. Flow Control: Decision Making-Loops-Nested Loops-Control Statements- Types of Loops-List Comprehensions-Set Comprehensions-Dictionary Comprehensions-Nested Dictionaries.	
III	**Functions** Function Definition - Function Calling - Function Arguments - Anonymous Functions (Lambda Functions) - Recursive Functions - Modules and Packages: Built-in Modules - Creating Modules - import Statement- Namespaces and Scope - The dir() function - The reload() function -Packages in Python - Date and Time Modules – Numpy Libraries and Data Manipulation Using Pandas	**15**
IV	**File Handling and Object Oriented Programming** Opening a File- Closing a File - Writing to a File - Reading from a File - File Methods - Renaming a File - Deleting a File - Directories in Python. Regular Expressions. Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python - Encapsulation - Data Hiding – Inheritance-Method Overriding – Polymorphism - Exception Handling	**15**
V	**Database Programming and Visualizations** Connecting to a Database - Creating Tables - INSERT Operation - UPDATE Operation - DELETE Operation - READ Operation - Transaction Control -Disconnecting from a Database - Exception Handling in Databases - GUI Programming - CGI Programming- Data Visualizations using Matplotlib – histograms, bar charts, pie charts.	**15**
	TOTAL HOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	To explain the basic concepts of data science and its application	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To explain the Features of Python To demonstrate Control Statements and Looping Statements	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To understand Python Functions To create and illustrate Numpy Libraries To perform Data Manipulation using Pandas.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	To understand the File Concepts Apply Exception Handling Techniques	PO1, PO2, PO3, PO4, PO5, PO6
CO5	To Create and manipulate Database To create Data Visualization using Mat plot lib	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		

1	Doing Data Science**,** Straight Talk From The Frontline**, Cathy O'Neil and Rachel Schutt, O'Reilly** (2014)
2	Big Data Analytics, paperback 2nd ed., **Seema Acharya, SubhasiniChellappan, Wiley**
3	**Dr. Jeeva Jose (2018) ,**Taming Python By Programming, Khanna Publishers
4	**Jake Vanderplas,** Python Data Science Handbook: Essential Tools for Working with Data 1st Edition.
Reference Books	
1.	LjubomirPerkovic(2012),Introduction to Computing Using Python: An Application DevelopmentFocus, John Wiley & Sons
2.	John V Guttag(2013), Introduction to Computation and Programming Using Python‟, Revised and expanded Edition, MIT Press.
3	Kenneth A. Lambert(2012), Fundamentals of Python: First Programs, C engage Learning

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	2	3	3	3	3	3
Weightage of course contributed to each PSO	14	14	15	15	15	15

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	DATA SCIENCE LAB	**CC**	-	-	4	-	4	25	75	100

OBJECTIVES:

To build websites and software, automate tasks, and conduct data analysis.Open Source and Community Development.

	Required Hours

LIST OF PROGRAMS	**60**
1. Demonstrate the working of ‐id‖ and ‐type‖ functions. 2. Find all prime numbers within a given range. 3. Print n terms of Fibonacci series using iteration. 4. Demonstrate use of slicing in string. 5. Compute the frequency of the words from the input. The output should output after sorting the key alphanumerically. 6. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically. 7. Demonstrate use of list & related functions. 8. Demonstrate use of Dictionary & related functions. 9. Demonstrate use of tuple & related functions. 10. Implement stack using list. 11. Implement queue using list. 12. Read and write from a file. 13. Copy a file. 14. Demonstrate working of classes and objects. 15. Demonstrate class method & static method. 16. Demonstrate constructors. 17. Demonstrate inheritance. 18. Demonstrate aggregation/composition. 19. Create a small GUI application for insert, update and delete in a table. 20. Bar charts, histograms and pie charts	

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	3	2	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	2	3	3	3	3	3
Weightage of course contributed to each PSO	14	14	15	15	15	15

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MOBILE APPLICATION DEVELOPMENT	**CC**	6	-	-	-	4	25	75	100

Learning Objectives	
LO1	Develop in-depth Knowledge about the architecture and features of Android
LO2	Implementing the various options available in views.
LO3	Understand the file handling concepts and thereby enabling to manage data efficiently.
LO4	Able to describe clearly the features of SMS messaging.
LO5	Illustrate the concepts of Location Based Services

UNIT	Contents	No. Of. Hours
I	**Android Fundamentals:** Android overview and Versions –Features of Android – Architecture of Android - Setting up Android Environment (Eclipse/Android Studio, SDK, AVD)- Anatomy of an Android Application - Simple Android Application Development.	**18**
II	**Android User Interface:** Layouts: Linear, Relative, Frame and Scrollview- Managing changes to Screen Orientation. Views: TextView, Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup, ProgressBar, AutoCompleteTextView, ListViews and WebView	**18**
III	**Data Persistence:** Saving and Loading User Preferences. File Handling: File System-Internal and External Storage-Permissions-File Manipulation-Managing Data using Sqlite: Creation of database- Insertion, Retrieval and Updation of records.	**18**
IV	**SMS Messaging:** Sending and Receiving messages - Sending E-mail– Networking: Downloading Binary Data – Downloading Text Files.	**18**
V	**Location Based Services:** Displaying maps- Displaying zoom control- Changing view – Adding Markers- Getting the location – Geo-coding Publishing Android Applications: Preparing for publishing-Deploying APK Files.	**18**
	TOTAL HOURS	**90**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems	PO1, PO2, PO3, PO4, PO5, PO6

CO3	Understand a very broad collection of machine learning algorithms and problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theor	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	**WeiMeng Lee (2012),** –*Beginning Android Application Development*‖, WroxPublications (John Wiley, New York)	
Reference Books		
1.	**Ed Burnette**, –*Hello Android: Introducing Google's Mobile Development Platform*‖, 3rd edition, 2010, The Pragmatic Publishers.	
2	**Reto Meier**, –*Professional Android 4 Application Development*‖, 2012, Wrox Publications (John Wiley, New York).	
Web Resources		
1.	https://www.tutorialspoint.com/mobile_development_tutorials.htm	
2	https://www.tutorialspoint.com › Android › Android - Home	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	2	2	3
CO 3	3	2	3	2	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	14	13	14	15

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MOBILE APPLICATION DEVELOPMENT LAB	**CC**	-	-	5	-	4	25	75	100

Course Objectives:

- To explain user defined functions and the concepts of class.
- To demonstrate the creation cookies and sessions
- To facilitate the creation of Database and validate the user inputs

Lab Exercises	**Required Hours**
1. Develop an application for Simple Counter. 2. Develop an application to display your personal details using GUI Components. 3. Develop a Simple Calculator that uses radio buttons and text view. 4. Develop an application that uses Intent and Activity. 5. Develop an application that uses Dialog Boxes. 6. Develop an application to display a Splash Screen. 7. Develop an application that uses Layout Managers. 8. Develop an application that uses different types of Menus. 9. Develop an application that uses to send messages from one mobile to another mobile. 10. Develop an application that uses to send E-mail. Develop an application that plays Audio and Video. 11. Develop an application that uses Local File Storage. 12. Develop an application for Simple Animation. 13. Develop an application for Login Page using Sqlite. 14. Develop an application for Student Marksheet processing using Sqlite.	**75**

Course Outcomes	
CO	On completion of this course, students will
CO1	To understand the concepts of counters and dialogs.
CO2	Concepts of Layout Managers. Perform sending email on audio and video To enable the applications of audio and video.
CO3	To apply Local File Storage and Development of files.
CO4	To determine the concepts of Simple Animation To apply searching pages.
CO5	Usage of Student mark sheet- preparation in MAD. Concepts of processing Sqlite are implemented.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	15	15	13	15	14

S-Strong-3 M-Medium-2 L-Low-1

SOFTWARE PROJECT MANAGEMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
CC	**5**	**0**	**0**	**-**	**4**	**4**	**25**	**75**	**100**

Learning Objectives

LO1	To define and highlight importance of software project management.
LO2	To formulate and define the software management metrics & strategy in managing projects
LO3	Understand to apply software testing techniques in commercial environment

Unit	Contents	No. of Hours
I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.	**15**
II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	**15**
III	Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	**15**

IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource	**15**
	Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.	
V	Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study	**15**
TOTAL		**75**

CO	**Course Outcomes**
CO1	Understand the principles and concepts of project management
CO2	Knowledge gained to train software project managers
CO3	Apply software project management methodologies.
CO4	Able to create comprehensive project plans
CO5	Evaluate and mitigate risks associated with software development process

Textbooks

□	Robert T. Futrell, Donald F. Shafer, Linda I. Safer, ‒Quality Software Project Management‖, Pearson Education Asia 2002.

Reference Books

1.	Pankaj Jalote, ‒Software Project Management in Practice‖, Addison Wesley 2002.
2.	Hughes, ‒Software Project Management‖, Tata McGraw Hill 2004, 3rd Edition.

NOTE: Latest Edition of Textbooks May be Used

Web Resources

1.	NPTEL & MOOC courses titled Software Project Management
2.	www.smartworld.com/notes/software-project-management

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**2**	**1**	**2**	**2**	**2**
CO2	**3**	**1**	**3**	**2**	**2**	**2**
CO3	**2**	**3**	**2**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**2**
CO5	**2**	**2**	**2**	**3**	**3**	**3**
Weightageof coursecontributed toeachPSO	**13**	**11**	**10**	**13**	**13**	**12**

SOFTWARE ENGINEERING LAB

Subject Code	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
							CIA	**External**	**Total**
CC	**0**	**0**	**5**	**-**	**4**	**5**	**25**	**75**	**100**

Learning Objectives	
LO1	To Impart Practical Training in Software Engineering
LO2	To understand about different Software Testing
LO3	Learn to write test cases using different testing techniques.

List of Exercises

Do the following 8 exercises for any project projects (Eg. Student Portal, Online exam registration)

1) Development of problem statement.

2) Preparation of Software Requirement Specification Document.

3) Preparation of Software Configuration Management and Risk Management related documents.

4) Draw the entity relationship diagram

5) Draw the data flow diagrams at level 0 and level 1

6) Draw use case diagram

7) Draw activity diagram of all use cases.

8) Performing the Design by using any Design phase CASE tools.

9) Develop test cases for unit testing and integration testing

10) Develop test cases for various white box and black box testing techniques

TOTAL	**75**

CO	**Course Outcomes**
CO1	An ability to use the methodology and tools necessary for engineering practice.
CO2	Ability to elicit, analyze and specify software requirements.
CO3	Analyze and translate specifications into a design.
CO4	Ability to derive test cases for different testing.
CO5	Apply software engineering perspective through requirements analysis, software design and construction, verification, and validation to develop solutions to modern problems

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**3**	**2**	**2**	**2**
CO2	**2**	**3**	**3**	**3**	**3**	**2**
CO3	**2**	**2**	**3**	**3**	**3**	**3**
CO4	**3**	**2**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**13**	**12**	**14**	**14**	**14**	**13**

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
	Data analytics using R	Core	5	-	-	-	4	5	25	75	100

Course Objective	
C1	To understand the problem solving approaches
C2	To learn the basic programming constructs in R Programming
C3	To learn the basic programming constructs in R Programming
C4	To use R Programming data structures - lists, tuples, and dictionaries.
C5	To do input/output with files in R Programming.

UNIT	**Contents**	**No. of Hours**
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model	15

II	CONTROL STRUCTURES AND VECTORS -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings,	15
	Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations	
III	LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations	15
IV	FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING .	15

V	OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation	15
	Total	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO5, PO6

Text Book	
1	Roger D. Peng,‖ R Programming for Data Science –, 2012
2	Norman Matloff,‖The Art of R Programming- A Tour of Statistical Software Design‖, 2011
Reference Books	
1.	Garrett Grolemund, Hadley Wickham,‖Hands-On Programming with R: Write Your Own Functions and Simulations‖ , 1st Edition, 2014
2.	Venables ,W.N.,andRipley,‖S programming–, Springer, 2000.
Web Resources	
1.	https://www.simplilearn.com

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	3	3	3
Weightageof coursecontributedtoeach PSO	14	13	14	14	14	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Data analytics using R Lab	Core	-	-	4	-	4	4	25	75	100
Course Objective											
C1	To understand the problem solving approaches										
C2	To learn the basic programming constructs in R Programming										
C3	To practice various computing strategies for R Programming -based solutions to real world problems										
C4	To use R Programming data structures - lists, tuples, and dictionaries.										
C5	To do input/output with files in R Programming.										
Sl. No	**Contents**										
1.	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user_s choice.										
2.	Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.										
3.	Write a program to find list of even numbers from 1 to n using R-Loops.										
4.	Create a function to print squares of numbers in sequence.										

5.	Write a program to join columns and rows in a data frame using cbind() and rbind() in R.	**60**
6.	Implement different String Manipulation functions in R.	
7.	Implement different data structures in R (Vectors, Lists, Data Frames)	
8	Write a program to read a csv file and analyze the data in the file in R.	
9	Create pie chart and bar chart using R.	
10	Create a data set and do statistical analysis on the data using R.	
11	Program to find factorial of the given number using recursive function	
12	Write a R program to count the number of even and odd numbers from array of N numbers.	
	Total	**60**

Course Outcomes		**Programe Outcome**
CO	On completion of this course, students will	
1	Acquire programming skills in core R Programming	PO1,PO4,PO5
2	Acquire Object-oriented programming skills in R Programming.	PO1, PO4,PO6
3	Develop the skill of designing graphical-user interfaces (GUI) in R Programming	PO1,PO3,PO6
4	Acquire R Programming skills to move into specific branches	PO3,PO4
5		PO1,PO5,PO6

Text Book

1	Roger D. Peng,‖ R Programming for Data Science –, 2012
2	Norman Matloff,‖The Art of R Programming- A Tour of Statistical Software Design‖, 2011

Reference Books

1	Garrett Grolemund, Hadley Wickham,‖Hands-On Programming with R: Write Your Own Functions and Simulations‖ , 1st Edition, 2014
2.	Venables ,W.N.,andRipley,‖S programming–, Springer, 2000.

Web Resources

1.	https://www.simplilearn.com