

POST GRADUATE DEGREE PROGRAMME

Master of Computer Applications

Two Years

CURRICULUM & SYLLABUS

REGULATION 2025

Choice Based Credit System (CBCS)

&

Outcome Based Education (OBE)

Effective from the Academic Year

2025 -2026

Department of Computer Applications (PG)

School of Computing Sciences



DEPARTMENT OF COMPUTER APPLICATIONS-PG

Vision of the Department

To be a center of **excellence in IT education**, training and research, aiming towards carrying out advanced research and development in information and software technologies, and in leveraging IT in specific domain areas enabling students to become innovators, Researchers, Developers and entrepreneurs.

Mission of the Department

M1: Nurturing competent professionals with a deep understanding of emerging technologies across the entire spectrum of Information Technology.

M2: Providing quality education that empowers learners to build successful careers in Computer Science and fulfills the dynamic needs of the industry.

M3: Seeking excellence in technical education by preparing skilled and innovative entrepreneurs and researchers

M4: Encouraging the development of successful, ethical and adaptable individuals who are effective problem-solvers and lifelong learners, dedicated to contribute towards society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To apply computing skills to analyze, design and develop innovative software products to meet the industry needs and excel as software professionals.
PEO2	To communicate and function effectively in teams across multidisciplinary fields within the global, societal and environmental contexts.
PEO3	To exhibit professional integrity, ethics and an understanding of responsibility to contribute technical solutions for the sustainable development of society.
PEO4	To pursue lifelong learning and do research in the computing field based on solid technical foundations.

PROGRAMME OUTCOMES (PO)	
PO1	**Computational Knowledge:** Apply knowledge of computing fundamentals, computing specialization, mathematics – Operation Research and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
PO2	**Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching Substantiated conclusions using fundamental principles of mathematics, Statistical Analysis, computing sciences, and relevant domain disciplines.
PO3	**Design /Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Computing Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools like Tally to complex computing activities, with an understanding of the limitations.
PO6	**Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.
PO7	**Life-long Learning:** Recognize the need, and have the ability, to engage in independent learning for continual Development as a computing professional.

PO8	**Project management and finance:** Demonstrate knowledge and understanding of the computing and management Principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO9	**Communication Efficacy:** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
PO10	**Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

PROGRAMME SPECIFIC OUTCOMES (PSO)	
PSO1	Be well versed in the various software and logical skills like Java Programming, Python Programming, Database concepts etc.
PSO2	Be competent in the fundamentals of software and hardware concepts and the emerging technologies in networks, recent trends in computer science field.

BOARD OF STUDIES

List of Members Department of Computer Applications

S. No.	Name & Designation	Address	Role
1.	Dr.P.Magesh Kumar, Director	School of Computing Sciences VISTAS.	Chair Person
2.	Dr.Ananthapadmanaban, Professor & Dean,	Faculty of Science & Humanities, SRM Institute of Science & Technology, Chennai.	Academic Expert (External Member)
3.	Dr.D.Ethiraj Director I/C,	C-DAC,Chennai	External Member (Industry Expert)
4.	Dr.R.Priya Anand Professor& Head	Department of Computer Applications-PG, VISTAS	Internal Member
5.	Dr.S.Prasanna Professor	Department of Computer Applications-PG, VISTAS	Internal Member
6.	Dr.V.Sumalatha Professor	Department of Computer Applications-PG VISTAS	Internal Member
7.	Dr. C.Meenakshi Associate Professor	Department ofComputer Applications-PG VISTAS	Internal Member
8.	Dr.S.Nagasundaram Assistant Professor	Department of Computer Applications-PG VISTAS	Internal Member
9.	Dr.LipsaNayak Assistant Professor	Department of Computer Applications-PG, VISTAS	Internal Member
10.	Mr.Vishnu.P.V Chief Innovation officer	Xerago, Digital Impact Consulting &Services, Chennai.	Alumni, VISTAS

DEGREE OF MASTER OF COMPUTER APPLICATIONS

(M.C.A.) – Two Year Programme

REGULATIONS (w.e.f. 2025-2026)

1. CONDITIONS FOR ADMISSION

Candidate who has passed the under-graduation examinations of any Institution / University provided they have undergone the course under 10+2+3 or 11+1+3 or 11+2+2 pattern or under the Open University System, shall be eligible for admission to the M.C.A. Degree Course.

Passed any graduation degree (e.g.: B.E. / B.Tech. / B.Sc / B.Com. /B.A./ B. Voc./ etc.,) preferably with Mathematics / Statistics / Business Maths / Business Statistics at 10+2 level or at Graduation level Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying examination. (for students having no Mathematics background compulsory bridge course will be framed by the respective University/ Institution and additional bridge courses related to computer subjects as per the norms of the concerned University).

2. DURATION OF THE COURSE

The course duration shall be two years consisting of four semesters. In order to be Eligible for the award of the degree the candidate shall successfully complete the course in a maximum period of five years reckoned from the date of enrolment for the first semester of the course.

3. STRUCTURE OF THE COURSE AND EVALUATION PATTERN

The duration of University examination for theory and practical subjects shall be 3 hours. The maximum mark for each theory is 100 with 40 for Continuous Internal Assessment (CIA) and 60 for University Examination.

Minimum of 1 Swayam NPTEL course per Year is mandatory for all the students towards credit transfer.

Main Project work MUST be transferred to Patent Publication-grant/Conference Proceedings/Jourrnal Publications.

The maximum mark for each practical is 100 with 40 for Continuous Internal Assessment and 60 for University Examination. For project work the mark assigned shall be

Continuous Internal Assessment	50 marks
Dissertation	100 marks
Viva-voice	50 marks

The components for CIA may be tests, seminar, assignment etc.

For the conduct of University Examination in Practical subjects the University will appoint one external examiner one internal examiner who shall normally be the concerned practical in-charge. The University will set the questions and distribute to the department. The examiners will conduct the examinations and award the marks on the same day and forward to the University. The Head of the department will coordinate and provide the laboratory and other facilities for conducting the examination.

Project work can be carried out individually in an R&D section of any Industry or University or in the Institute in which candidate is studying. If he/she fails to submit the project Work/Dissertation within the stipulated date for a particular semester, he/she may be permitted with approval of the Head of the Department to submit the Project Work/Dissertation report during the succeeding semester, within the maximum period of FE years from the date of admission to the first semester. Project/Dissertation evaluation and Viva-Voce shall be conducted by one external examiner and one internal examiner who shall normally be the project guide.

4. CREDIT REQUIRMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

A Candidate shall be eligible for the award of Degree only if he/she has undergone the prescribed course of study in VISTAS for a period of not less than TWO academic years and passed the examinations of all the prescribed courses of FOUR Semesters earning a minimum of 102 credits as per the distribution given in the course structure.

5. COURSE

Each course / subject is to be designed under lectures / tutorials / laboratory or field work / seminar / practical training / Assignments / Term paper or Report writing etc., to meet effective teaching and learning needs.

6. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

6.1. Eligibility*:* Students shall be eligible to go to subsequent semester only if they earn sufficient attendance as prescribed therefore by the Board of Management from time to time.

6.2. Attendance*:* All Students must earn 75% and above of attendance to appear for the University Examination. (Theory/Practical)

6.3. Condonation of shortage of attendance*: If a Student fails to earn the minimum attendance* (Percentage stipulated), the HODs shall condone the shortage of attendance on medical grounds up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) after paying the prescribed fee towards the condonation of shortage of attendance. Students with attendance of less than 65 and more than 50% shall be condoned by VC on the recommendation of HODs on genuine grounds, will be permitted to appear for the regular examination on payment of the prescribed condonation fee.

6.4. Detained students for want of attendance*: Students who have earned less than 50% of attendance* shall be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of final semester of the course, by paying the fee for the break of study as prescribed by the University from time to time.

6.5. Transfer of Students and Credits*:* The strength of the credits system is that it permits inter-Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities.

7. EXAMINATION AND EVALUATION

7.1. EXAMINATION*:*

i) There shall be examinations at the end of each semester, for odd semesters in the month of October / November, for even semesters in April / May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed courses in the subsequent examinations to be held in October / November or April / May.

ii) A candidate should register for the first semester examination. If registration is not possible owing to shortage of attendance beyond condonation limit / regulations prescribed OR belated joining OR on medical grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after completion of the programme.

iii) The results of all the examinations will be published through the University Website. In the case of passed out candidates, their arrear results, will be published through University Website.

7.2 To Register for all subjects*:* Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination, except for the shortage of attendance programs. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

***7.3. Marks for Continuous Internal Assessment (CIA) Examinations and End Semester Examinations** (ESE)*

7.3.1 There shall be no passing minimum for Continuous Internal Assessment (CIA) Examinations.

7.3.2 For the End Semester examination, passing minimum shall be 50% (Fifty Percentage) of the Maximum marks prescribed for the Course/Practical/Project and Viva-Voce.

7.3.3 In the aggregate (CIA and ESE) the passing minimum shall be 50%.

7.3.4. He / She shall be declared to have passed the whole examination, if he/she passes in all the courses wherever prescribed in the curriculum by earning 90 CREDITS.

8. QUESTION PAPER PATTERN FOR END SEMESTER EXAMINATION

Duration : 3 Hours Max. Marks: 100

Part A : 10 questions (10 X 3 = 30)

Part B : 5 out of 7 questions (5 X 8 = 40)

Part C : 2 out of 3 (2 X 15= 30)

Total Marks for each subject 100 Marks

University Exam 60 Marks

Internal Assessment 40 Marks

9. SUPPLEMENTARY EXAMINATION: Supplementary Examinations are conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

9.1. Eligibility: A Student who is having a maximum of two arrear papers is eligible to appear for the Supplementary Examination.

9.2. Non-eligibility for those who completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

10. RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

10.1. Re-totaling*:* All PG Students who appeared for their Semester Examinations are eligible for applying for re-totaling of their answer scripts.

10.2. Revaluation*:* All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

10.3. Photocopy of the answer scripts*:* Students who have applied for revaluation can download their answer scripts from the University Website after fifteen days from the date of publication of the results.

11. The examination and evaluation for MOOCs will be as per the requirements of the regulatory Bodies and will be specified at the beginning of the Semester and notified by the university NPTEL- SWAYAM Coordinator (SPOC).

12. CLASSIFICATION OF SUCCESSFUL STUDENTS

12.1. CORE SUBJECTS, PRACTICAL, ELECTIVES COURSES AND PROJECT: Successful Students passing the Examinations and securing the marks

a) CGPA 9.00 to 10.00 shall be declared to have passed the examination in First class with Outstanding.

b) CGPA 7.50 to 8.99 shall be declared to have passed the examination in First class with distinction.

c) CGPA 6.00 to 7.49 shall be declared to have passed the examination in First Class.

d) CGPA 5.00 to 5.99 in the aggregate shall be declared to have passed the examination in the SECOND Class.

13. MARKS AND GRADES: The following table shows the marks, grade points, letter grades and Classification to indicate the performance of the student:

13.1. Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average (CGPA) and Classification GPA for a Semester: = ∑iCiGi ÷ ∑iCi That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

Where, Ci= Credits earned for course i in any semester,

Gi = Grade Points obtained for course i in any semester

n = Semester in which such courses were credited.

CGPA for the entire programme: = ∑n∑iCniGni ÷∑n∑iCni That is, CGPA is the sum of the Multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entire programme

Grade Conversion Table		
90 - 100	10	**O** Outstanding
85 - 89	9	**A+** Excellent
80 - 84	8	**A** Very Good
75 - 79	7.5	**B+** Good
70 - 74	7	**B** Above Average
60 - 69	6	**C** Average
50 - 59	5	**D** Minimum for pass
0 - 49	0	**RA** Reappear
	AAA	Absent

Overall Performance – PG

Grade Conversion Table		
CGPA	**GRADE**	**CLASS**
5.00 - 5.99	D	Second Class
6.00 - 6.99	C	First Class
7.00 - 7.49	B	First Class
7.50 – 7.99	B+	First Class
8.00 - 8.49	A	First Class with Distinction
8.50 – 8.99	A+	First Class with Distinction
9.00 - 10.00	O	First Class - Outstanding*

13.2. Letter Grade and Class CGPA

The students who have passed in the first appearance and within the prescribed semester of the PG Programme (Major and Elective courses only) are eligible.

14. RANKING

- Students who pass all the examinations prescribed for the Program in the FIRST ATTEMPT ALONE are eligible for Ranking / Distinction.
- In the case of Students who pass all the examinations prescribed for the Program with a break in the First Appearance are only eligible for Classification.
- Students qualifying during the extended period shall not be eligible for RANKING.

15. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMS TO QUALIFY FOR A DEGREE

15.1. A Student who for whatever reasons is not able to complete the programs within the normal period (N) or the Minimum duration prescribed for the programme, may be allowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span = N + 2 years for the completion of programme)

15.2. In exceptional cases like major accidents and childbirth an extension of one year considered beyond maximum span of time (Time Span= N + 2 + 1 years for the completion of programme).

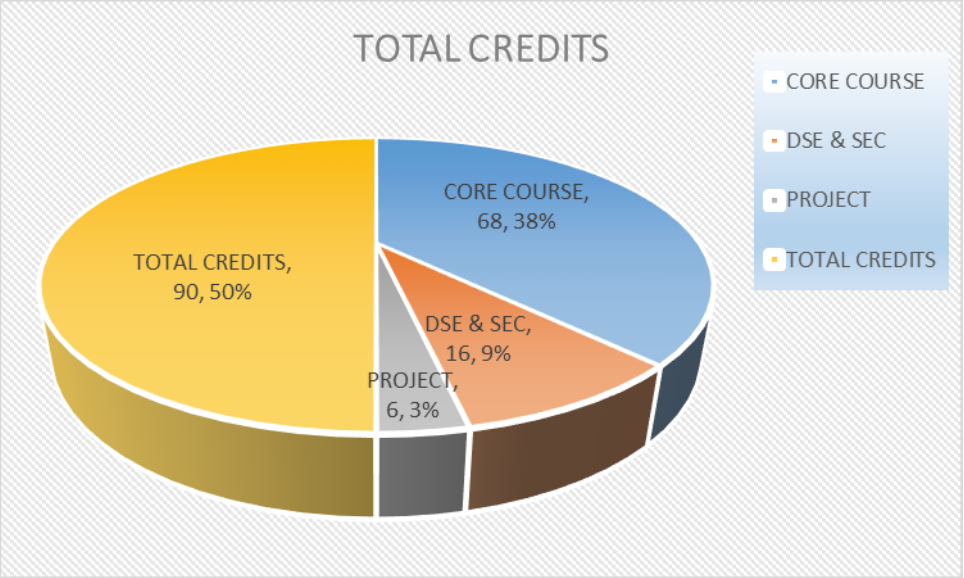
16. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

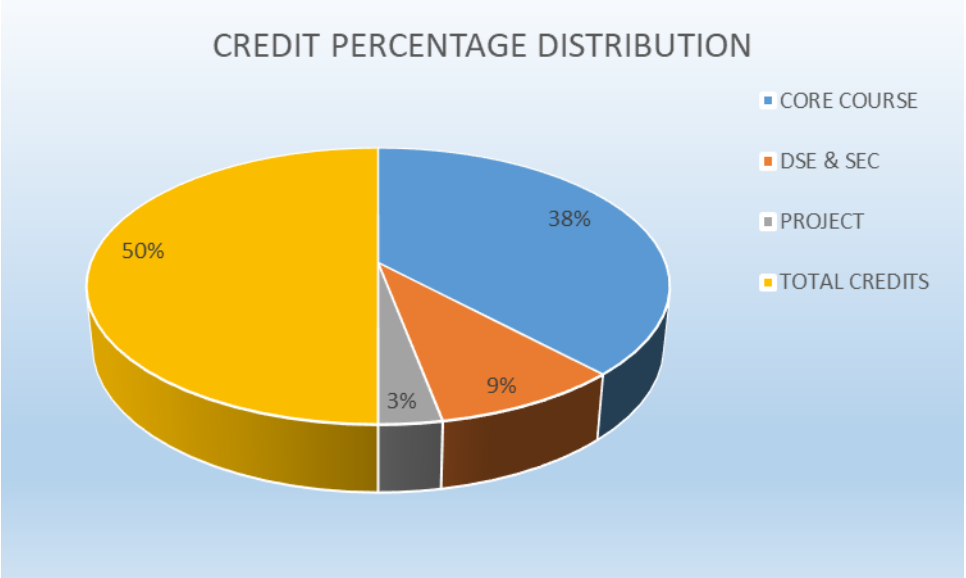
The University may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Academic Council with the approval of the Board of Management.

CREDIT DISTRIBUTION

Master of Computer Applications Minimum credits to be earned: 90

COMPONENT	I Sem	II Sem	III Sem	IV Sem	Total Credits
CORE Courses	24	21	17	6	68
Discipline Specific Elective(DSE)	-	3	6	-	9
Open Elective(OE)	-	2	-	-	2
Skill Enhancement Course (SEC)	2	-	3	-	5
Project	-	-	-	6	6
Total Credits	26	26	26	12	90





ABBREVIATIONS

CC	Core Course
SEC	Skill Enhancement Course
DSE	Disciplinary Specific Elective
VAC	Value Added Course

CURRICULUM STRUCTURE

Master of Computer Applications

Total number of Credits: 90

Master of Computer Applications										
			Hours/Week					Maximum Marks		
SEMESTER 1										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
CC	25CMCA11	Mathematical Foundations of Computer Science	4	0	0	2	4	40	60	100
CC	25CMCA12	Problem Solving Techniques through C Programing	4	0	0	2	4	40	60	100
CC	25CMCA13	Operating System with Unix Architecture & Programming	3	0	0	2	3	40	60	100
CC	25CMCA14	Software Engineering Methodology	3	0	0	2	3	40	60	100
CC	25CMCA15	Advanced Database Systems	3	0	0	2	3	40	60	100
CC	25CMCA16	Data Communication and Computer Networks	3	0	0	2	3	40	60	100
		Audit Course – 1 *	2	0	0	0	0	-	-	-
SEC	25PMCA11	Communication Skill and Personality Development Lab	0	0	2	2	2	40	60	100
CC LAB	25PMCA12	C & Data Structures Laboratory	0	0	4	2	2	40	60	100
CC LAB	25PMCA13	RDBMS Laboratory	0	0	4	2	2	40	60	100
		Total	22	-	10	-	26	-	-	-

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, *O – Outside the class effort / self-study**

Master of Computer Applications										
			Hours/Week					Maximum Marks		
SEMESTER 2										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
CC	25CMCA21	Object Oriented Programming using JAVA	4	0	0	2	4	40	60	100
CC	25CMCA22	Emerging Technologies in Data Processing	4	0	0	2	4	40	60	100
CC	25CMCA23	Artificial Intelligence & Machine Learning	3	0	0	2	3	40	60	100
CC	25DMCA24	Statistics and Operations Research Techniques	3	0	0	2	3	40	60	100
DSE1	25DMCA2-	Discipline Specific Elective – I	3	0	0	2	3	40	60	100
OE	25OMCA21	Open Elective	2	0	0	2	2	40	60	100
CC	25IMCA21	Internship/In plant Training	0	0	1	1	1	40	60	100
		Audit Course – II *	2	0	0	0	0	-	-	-
CC LAB	25PMCA21	Java Programming Lab	0	0	2	2	2	40	60	100
CC LAB	25PMCA22	Statistics & Data Science Lab	0	0	4	2	2	40	60	100
CC LAB	25PMCA23	AI & ML Lab	0	0	4	2	2	40	60	100
		Total	21	-	11	-	26	-	-	-

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, *O – Outside the class effort / self-study**

Master of Computer Applications										
			Hours/Week					Maximum Marks		
SEMESTER 3										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
CC	25CMCA31	Enterprise Computing	4	0	0	2	4	40	60	100
CC	25CMCA32	Full Stack Development	4	0	0	2	4	40	60	100
CC	25CMCA33	Financial Accounting	3	0	0	2	3	40	60	100
DSE	25DMCA3-	Discipline Specific Elective II	3	0	0	2	3	40	60	100
DSE	25DMCA3-	Discipline Specific Elective III	3	0	0	2	3	40	60	100
SEC	25SEMC31	Design Thinking and Innovation Skills	2	0	0	2	2	40	60	100
SEC	25SEMC32	Emotional Intelligence	1	0	2	0	1	40	60	100
CC LAB	25PMCA31	Enterprise Application Development Laboratory	0	0	4	2	2	40	60	100
CC LAB	25PMCA32	Full Stack Development Laboratory	0	0	4	2	2	40	60	100
CC LAB	25PMCA33	Mobile App and IoT Laboratory	0	0	4	2	2	40	60	100
		Total	20	-	14	-	26	-	-	-

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, *O – Outside the class effort / self-study**

Master of Computer Applications										
			Hours/Week					Maximum Marks		
SEMESTER 4										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
CC	25CMCA41	Advanced Computing Technologies	4	0	0	2	4	40	60	100
CC	25PMCA41	Advanced Computing Technologies Lab	0	0	4	2	2	40	60	100
CC	25RMCA41	Main Project	0	0	6	2	6	40	60	100
		Total	4	0	10	-	12	-	-	-

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, *O – Outside the class effort / self-study**

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)

Category	Code	Course	L	T	P	O	C
	SEMESTER – II , DSE – I						
DSE 1	DSE001	Block chain Technologies	3	0	0	2	3
DSE 2	DSE002	Ethical Hacking & Cyber Security	3	0	0	2	3
DSE 3	DSE003	Big Data with R	3	0	0	2	3
DSE 4	DSE004	E-Learning Techniques	3	0	0	2	3
DSE 5	DSE005	Software Testing	3	0	0	2	3
DSE 6	DSE006	Deep Learning Techniques and Applications	3	0	0	2	3
DSE 7	DSE007	Game Programming Techniques	3	0	0	2	3
DSE 8	DSE008	Multimedia Technologies	3	0	0	2	3
DSE 9	DSE009	Data Visualization Techniques	3	0	0	2	3
DSE 10	DSE010	UNIX Programming	3	0	0	2	3
	SEMESTER – III , DSE – II, DSE - III						
DSE 11	DSE011	C# and .NET Programming	3	0	0	2	3
DSE 12	DSE012	Digital Image Processing and Applications	3	0	0	2	3
DSE 13	DSE013	Data Warehousing and Data Mining Techniques	3	0	0	2	3
DSE 14	DSE014	Object Oriented Analysis and Design	3	0	0	2	3
DSE 15	DSE015	Open Source Software	3	0	0	2	3
DSE 16	DSE016	Mobile Computing	3	0	0	2	3
DSE 17	DSE017	IoT & Applications	3	0	0	2	3
DSE 18	DSE018	Computer Graphics	3	0	0	2	3
DSE 19	DSE019	Wireless Sensor Networks & Protocols	3	0	0	2	3
DSE 20	DSE020	Next Generation Networks	3	0	0	2	3

DSE 21	DSE021	Python Web Development	3	0	0	2	3
DSE 22	DSE022	Software Project Management and Quality Assurance	3	0	0	2	3
DSE 23	DSE023	Quantum Computing	3	0	0	2	3
DSE 24	DSE024	Evolutionary Computing	3	0	0	2	3
DSE 25	DSE025	Data Mining and analytics	3	0	0	2	3
DSE 26	DSE026	Multi-dimensional Data Structures	3	0	0	2	3
DSE 27	DSE027	Multicore Programming	3	0	0	2	3
DSE 28	DSE029	SAP in Data Processing – Technical Course	3	0	0	2	3

List of Open Electives

Category	Code	Course
OE	OE01	Energy Conservation and Management in Domestic Sectors
OE	OE02	IoT for Smart Systems
OE	OE03	Machine Learning and Deep Learning
OE	OE04	Renewable Energy Technology
OE	OE05	Smart Grid
OE	OE06	Internet of Things and Cloud
OE	OE07	Medical Robotics
OE	OE08	Embedded Automation
OE	OE09	Environmental Sustainability
OE	OE10	IPR, Biosafety and Entrepreneurship

List of Audit Courses

1. English for Research Paper Writing
2. Disaster Management
3. Constitution of India
4. Water, Sanitation and Health
5. Ethical Management
6. Cyber Law
7. IPR and Copyrights

SEMESTER – I

25CMCA11 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To introduce the essential concepts of discrete mathematics such as sets, relations, functions, and combinatorics, to equip students with knowledge of matrix algebra for solving systems of equations and understanding Eigen concepts. To develop a deep understanding of lattices and Boolean algebra for logical and algebraic reasoning. To build the ability to analyze and construct formal logical arguments using propositional and predicate logic. To provide foundational knowledge of formal languages and automata for applications in computer science and computation theory.

UNIT I BASIC SET THEORY 9

Basic Definitions - Venn Diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion - partitions- Permutation and Combination - Relations- Properties of relations - Matrices of relations - Closure operations on relations - Functions - injective, surjective and bijective functions.

UNIT II MATRIX ALGEBRA 9

Matrices, Rank of Matrix, Solving System of Equations-Eigen Values and Eigen Vectors- Inverse of a Matrix - Cayley Hamilton Theorem

UNIT III LATTICES AND BOOLEAN ALGEBRA 9

Partial ordering – Posets – Lattices as posets – Properties of lattices – Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean Algebra – Sub Boolean Algebra – Boolean Homomorphism.

UNIT IV MATHEMATICAL LOGIC 9

Propositions and logical operators-Truth table- Propositions generated by a set, Equivalence and implication - Basic laws- Some more connectives - Functionally complete set of connectives- Normal forms - Proofs in Propositional calculus - Predicate calculus.

UNIT V FORMAL LANGUAGES AND AUTOMATA 9

Languages and Grammars-Phrase Structure Grammar-Classification of Grammars-Pumping Lemma for Regular Languages-Context Free Languages- Finite State Automata-Deterministic Finite State Automata (DFA), Non Deterministic Finite State Automata (NFA)-Equivalence of DFA and NFA-Equivalence of NFA and Regular Languages.

Total: 45 periods

COURSE OUTCOMES

After successful completion of this course, the students will be able to:

CO1: Understand and apply basic concepts of set theory, including operations, relations, Functions, permutations, and combinations.
CO2: Solve systems of linear equations and perform matrix operations including eigenvalues, Eigenvectors, and apply Cayley-Hamilton Theorem.
CO3: Analyse partially ordered sets and understand the structure and properties of lattices and Boolean algebras.
CO4: Apply principles of propositional and predicate logic for logical reasoning and proofs.
CO5: Understand the formal language theory, design finite automata, and analyze the equivalence Between different forms of automata and regular languages.

TEXT BOOKS:

1. Discrete mathematics and its applications, by Kenneth H.Rosen Tata McGraw Hill,8th Edition, 2021. (Unit 1, 2 & 3).
2. Hopcroft and Ullman, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, Delhi, 2022. (Unit 4,5)

REFERENCES:

1. A. Tamilarasi & A. M. Natarajan, Discrete Mathematics and its Application, Khanna Publishers, 2021, 3rd Edition.
2. M. K. Venkataraman, Engineering Mathematics, National Publishing Company, 2021, 2nd Edition.

E-Resources:

1. https://mrce.in/ebooks/Maths-Discrete%20Mathematics%20&%20its%20Applications%208th%20Ed.pdf
2. https://www-2.dc.uba.ar/staff/becher/Hopcroft-Motwani-Ullman-2001.pdf
3. https://faculty.ksu.edu.sa/sites/default/files/rosen_discrete_mathematics_and_its_applications_7th_edition.pdf
4. https://onlinecourses.swayam2.ac.in/cec25_ma28/preview

25CMCA 12 PROBLEM SOLVING TECHNIQUES THROUGH C PROGRAMMING

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To understand the basics of algorithmic problem solving and learn to solve problems using C conditionals and loops. To define C functions and use function calls to solve problems and use C data structures - lists, tuples, dictionaries to represent complex data. To do input/output with files in C language.

UNIT I - COMPUTATIONAL THINKING AND PROBLEM SOLVING 12

Fundamentals of Computing – Identification of Computational Problems - Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Introduction to Problem Solving through programs, the compilation process, Syntax and Semantic errors, Variables and Data Types, Illustrative problems.

UNIT II - BASICS OF C PROGRAMMING 12

Introduction to programming paradigms – Applications of C Language - Structure of C program–C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process. Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays-String operations.

UNIT III - FUNCTIONS, POINTERS, STRUCTURES AND UNIONS 12

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays-String operations, Modular programming - Function prototype - function definition - function call - Built-in functions (string functions, math functions), Parameter passing: Pass by value - Pass by reference- Recursion, Pointers: Pointer expression, pointer arithmetic, Arrays of pointers, Function returning pointers - Pointer to function, malloc(), calloc(), free(), Structure: Nested structures – Array of structures, Unions.

UNIT IV - OVERVIEW OF DATA STRUCTURES 12

Overview of Data Structure: Need for Data Structure, Execution Time, Algorithm Analysis, Algorithm Complexity, Space Complexity, Time Complexity, Asymptotic Analysis, Asymptotic Notations. Stack and Queue: operations on stack, polish notations-infix, prefix, postfix, evaluation of post and prefix expressions. Operations on queue: Linear queue, circular queue, Enqueue, Dequeue, isfull(), isempty().

UNIT V – UDTs, FILE PROCESSING AND STORAGE CLASSES **12**

UDT: Linked Lists, Graphs – Trees – Traversals – searching and sorting methods – Hashing. Files– Types of file processing: Sequential access - Random access, Command line arguments, Storage classes and Visibility.

Total : 60 Periods

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Explain algorithmic problem solving and represent algorithms using pseudo code/flowcharts.
CO2: Implement control structures, arrays and strings in C to solve computational problems.
CO3: Use functions, pointers, structures and dynamic memory to build modular C programs.
CO4: Analyze simple data structures (stack, queue) and basic algorithm complexity.
CO5: Design and implement user-defined data types, file processing and apply sorting/searching algorithms.

TEXT BOOKS:

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2022.
2. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2021.

REFERENCES:

1. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2021.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2022.
3. Byron S. Gottfried, “Schaum’s Outline of Theory and Problems of Programming with C”, McGraw-Hill Education, 2023.
4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second
5. Edition, Oxford University Press, 2022.
6. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2023.

E-Resources:

1.https://www.w3schools.in/ctutorial.
2.https://nptel.ac.in/courses/programminginbegginers/
3.https://www.wikipedia.org
4.http://ebooks.lpude.in.cprogamming

25CMCA13 - OPERATING SYSTEMS WITH UNIX ARCHITECTURE & PROGRAMMING

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

To provide an understanding of the major operating system components and describe various features of processes including scheduling, creation and termination also present both software solutions of the critical section problems. To describe about memory allocation techniques and virtual memory and explain the UNIX file system architecture and programming

UNIT I INTRODUCTION TO OPERATING SYSTEMS 9

Introduction: Definition -Functions of an operating systems – Types of Operating System –Operating System Services – System calls – Operating System Structure (Monolithic, Layered, Microkernel, etc.,) Introduction to Unix/Linux- UNIX Kernel Architecture: Kernel Mode vs User Mode-System Boot Process- Shell and Shell Scripting Basics.

UNIT II PROCESS MANAGEMENT 9

Process Concept-Process States-Process Control Block (PCB) - Basics of Inter-process Communication (IPC) - Threads and Multithreading Models. Basic Concepts of CPU Scheduling – Scheduling Criteria– Scheduling Algorithms (FCFS, SJF, Round Robin, Priority Scheduling.

UNIT III PROCESS SYNCHRONIZATION 9

Synchronization Tools: Background – Critical Section Problem –Mutex Locks- Semaphores–Semaphores Usage – Semaphores Implementation. Classic Synchronization problems: Dining Philosophers Solutions Using Monitors. Deadlock: System model- Deadlock Characterization-Resource Allocation Graph-Methods for handling Deadlock.

UNIT IV MEMORY MANAGEMENT and I/O MANAGEMENT 9

Background – Contiguous Memory Allocation – Memory Allocation Techniques: Paging – Segmentation. Virtual Memory: Demand Paging – Copy-on-Write – Page Replacement Policies: FIFO, Optimal, LRU– Allocation of Frames – Thrashing. Overview of I/O Management.

UNIT V: UNIX SYSTEM PROGRAMMING 9

Overview-File Systems: Unix File System Architecture- UNIX System Programming: File system hierarchy in Unix- Inodes, file types and permissions-File and Directory Manipulation commands. Basic commands of Shell Programming.

Total: 45 Periods

COURSE OUTCOME

CO1: Describe OS structures, services, and UNIX/Linux architecture and shell basics.
CO2: Explain process management, threads and CPU scheduling algorithms.
CO3: Apply synchronization techniques (locks, semaphores, monitors) and handle deadlocks.
CO4: Explain memory management, virtual memory and page replacement strategies.
CO5: Use UNIX system programming, file system commands and shell scripting for system tasks.

TEXT BOOKS:

1. Silberschatz, Abraham, Greg Gagne and Peter B. Galvin, "Operating System Concepts", Tenth Global Edition, Wiley, 2022.
2. William Stallings, "Operating Systems: Internals and Design Principles", Seventh Edition, Pearson Education, 2021.
3. Andrew S. Tanenbaum, "Modern Operating Systems", 5th edition -Pearson , 2023.

REFERENCES:

1. Russ Cox, Frans Kaashoek and Robert Morris, "xv6: A Simple, Unix – like Teaching Operating System", Revision 11. (https://pdos.csail.mit.edu/6.828/2021/xv6/book- rev11.pdf)
2. B. Molay, "Understanding Unix/Linux Programming: A Guide to Theory and Practice", Third Edition, Prentice Hall, 2022.
3. H. M. Deitel, P. J. Deitel, D. R. Choffnes, "Operating Systems", Third Edition, Pearson Education, 2023.

E-Resources:

1. https://www.w3schools.in/ostutorial.
2. https://nptel.ac.in/courses/106106144/
3. https://www.wikipedia.org
4. http://ebooks.lpude.in.operating system

25CMCA14 SOFTWARE ENGINEERING METHODOLOGIES

L	T	P	O	C
3	**0**	**0**	2	3

COURSE OBJECTIVE

To understand the concepts of software processes, process models and fundamental process activities and understand the fundamental concepts of requirements engineering & requirements specification and documents. To be aware of testing processes, techniques and debugging to solve program defects and to learn how to use software metrics, manage risk, apply basic software quality assurance practices. To ensure that software designs, development, and maintenance meet or exceed applicable standards.

UNIT I: INTRODUCTION **9**

Software Characteristics-Comparison with other Engineering disciplines-Software Crisis and Myths-Software life cycle models-Selection of process models for projects- Agile methods- Software Engineering paradigms-cost estimation techniques

REQUIREMENTS GATHERING: Requirements gathering tasks – Requirements Engineering Process - Qualities of good requirements-Types of Requirements-Requirements elicitation- Requirements documentation- Analysis Documentation.

UNIT II: FUNCTIONAL ORIENTED APPROACH **9**

Functional Decomposition-Context diagram - Data flow diagrams - Data Dictionary- Functional Independence-Modular Design-Coupling-Cohesion- Design tools – Structured Chart, HIPO Diagram, Decision Tree, Decision Table, Pseudo code – User Interface Design - Software Design Documentation.

UNIT III: OBJECT ORIENTED APPROACH **9**

Objects and Classes-Object Identification-Relationship among objects-classification-Use cases-UML Diagrams to support Object Oriented Analysis and Design.

UNIT IV: PROGRAMMING STANDARDS AND CODING: **9**

Structured programming coding standards-Maintainability of code.

SOFTWARE TESTING FUNDAMENTALS: Black-Box and White-Box testing – Basis Path testing – Requirements phase testing - Design phase testing - Program phase testing - Desk debugging and program peer view test tools - Evaluating test results - Installation phase testing - Acceptance testing – Testing GUI – Testing Web Applications.

UNIT V: DEBUGGING: **9**

The art of Debugging – Debugging Process – Debugging Strategies.

MANAGEMENT AND METRICS:

Software Configuration Management – Project management concepts – Process and Project Metrics – Software Cost Estimation – Project scheduling – Risk Management – Software Quality Assurance – Maintenance and Re – engineering – CASE Tools.

Total: 45 Periods

COURSE OUTCOME

CO1: Explain software process models, requirement engineering and elicitation techniques.
CO2: Apply functional decomposition, DFDs and modular design principles to software problems.
CO3: Use OO analysis, UML diagrams and use-cases to model software systems.
CO4: Apply software testing techniques (black/white box) and debugging strategies.
CO5: Use project management, SQA, metrics and risk management in software projects.

REFERENCES:

1. Roger Pressman S and Bruce Maxim “Software Engineering: A Practitioner’s Approach”, Tata McGraw-Hill, 2022
2. Ian Sommerville, “Software Engineering”, Pearson Education, 2021.
3. Pankaj Jalote's “Software Engineering: A Precise Approach”, Wiley, 2022
4. James Rumbaugh, Ivar Jacobson and Grady Booch, “The Unified Modeling Language Reference Manual”, Pearson Education, 2021.

E_Resources:

1.https://www.w3schools.in/setutorial.
2.https://nptel.ac.in/courses/106106144/
3.https://www.wikipedia.org
4.http://ebooks.lpude.in.softwareengineering

25CMCA15 ADVANCED DATABASE SYSTEMS

L	T	P	O	C
3	**0**	**0**	2	3

Course Objective:

To introduce basic concepts of RDBMS, to introduce basic concepts of SQL, to introduce the concept of transaction processing, to implement the database normalization using normal forms

UNIT I - INTRODUCTION TO DATABASE SYSTEMS 9

Overview – Data Models – Database System Architecture – Entity Relationship Model Basic Concepts – Constraints – keys – Design Issues – Entity Relationship Diagram – Weak Entity Sets – Extended E–R Features – Design of an E–R Database Schema – Reduction of E–R Schema to Tables –UML.

UNIT II- RELATIONAL MODEL 9

Relational Algebra – Extended Relational Algebra Operations – Modification of Database – views – SQL fundamentals – Advanced SQL Features – Embedded QL – Dynamic SQL – QBE.

UNIT III - NORMAL FORMS 9

Integrity and Security Domain Constraints – referential Integrity – Assertions – Triggers – Security and Authorization – Authorization in SQL – Encryption and Authentication. Relational – Database Design Pitfalls in relational – Database Design – Function Dependencies– Decomposition – Desirable Properties of Decomposition – Normal Forms – Boyce – Codd Normal Forms.

UNIT IV - FILE ORGANIZATION 9

Storage and File Structures Overview of Physical Storage media – magnetic Disks – RAID – Tertiary Storage – Storage Access – File Organization – Organization of Records in Files – Data – Dictionary Storage – Indexing and hashing.

UNIT V - ORACLE, SQL AND PL/SQL 9

Introduction to Oracle – DDL,DML and DCL – Aggregate functions – sub queries – join Operations – Views – PL/SQL Block – decision making and Control Structures – Procedure – functions – Sequences – Cursors and Triggers – Example Database Programs.

Total : 45 Periods.

Course Outcome:

CO1: Describe core database models, ER modelling and convert ER to relational schema.
CO2: Apply relational algebra and SQL (advanced features, joins, sub queries) to database problems.
CO3: Design normalized relational schemas and identify anomalies; apply normal forms.
CO4: Explain storage, indexing, file organization, and hashing strategies for efficient access.
CO5: Develop PL/SQL programs, triggers, stored procedures and manage database transactions/security.

Text Books:

1. A.Silberchatz, H.Korth, Subarshan, “Database System Concepts”, McGraw – Hill Higher Education, 5th Edition, 2022.
2. Koch and Liney, “Oracle9iThe Complete reference”, McGraw–Hill, 2022.

References:

1. C.J.Date, “An Introduction to Database Systems”, Pearson Education, Seventh Edition, 2023.
2. Elmasri, Navathe, “Fundamentals of Database Systems, Addison Wesley”, 3rd Edition, 2022.
3. Jeffrey D. Ullman, Jenifer Wisdom, “A First Course in Database Systems”, Pearson Education Asia, 2021.
4. Bipin C. Desai, “An Introduction to Database Systems”, Galgotia Publications Pvt. Limited, 2022.
5. Oracle Database Handbook (Oracle Press) 2023.

25CMCA16 DATA COMMUNICATION AND COMPUTER NETWORKS

L	T	P	O	C
3	0	0	2	3

Course Objective:

This course will help to understand the network fundamentals and to explore network layer protocols. This course will explore the various application layer functionalities and the link layer services and data communication fundamentals.

UNIT I NETWORKS FUNDAMENTALS 9

Components -Data Representation –Data Flow - Networks- Distributed Processing- Network Criteria -Physical Structures - Network Models - Categories of Networks, Interconnection of Networks: The OSI Model- TCP/IP Protocol Suite- Addressing

UNIT II NETWORK LAYER 9

Network Layer: Logical addressing, Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6, Tunneling, address mapping, ICMP, IGMP, forwarding, Uni-cast routing protocols, multicast routing protocols.

UNIT III TRANSPORT LAYER 9

Transport Layer: Process to process delivery, UDP and TCP protocols, SCTP, data traffic, congestion, congestion control, QoS, integrated services, differentiated services, QoS in switched networks.

UNIT IV APPLICATION LAYER 9

Application Layer – Domain name space, DNS in Internet, Remote Logging, Telnet, electronic mail, FTP, WWW, HTTP, SNMP, Multi-media, Network security

UNIT V FUNDAMENTALS OF DATA COMMUNICATION 9

Communication Model – Data communications – Data Transmission: Concepts and Terminology, Analog and Digital Transmission, Transmission Impairments – Signal Encoding Techniques: Digital Data and Digital Signals – Multiplexing: FDM, TDM, Multiple Channel Access.

Total No. of Periods: 60 Hrs.

Course Outcomes:

CO1: Describe the fundamentals of networking
CO2: Identify the networking protocol for reliable communications
CO3: Select suitable transport layer protocols for network applications
CO4: Design new application layer protocols for various applications.
CO5: Identify suitable signal encoding techniques for various scenarios

Text Books:

1. Behrouz A. Forouzan , “Data Communications and Networking “, 6th Edition, Aug’ 2022
2. Larry L. Peterson, Bruce S. Davie, Computer Networks A Systems Approach, Elsevier Educate, 6th Edition, 2021
3. Larry L. Peterson, Bruce S. Davie, Computer Networks A Systems Approach, Elsevier Educate, 6th Edition, 2020.
4. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 8th Edition, Pearson Education, 2020.

Reference Books:

1. Larry L. Peterson and Bruce S. Davie, “Computer Networks: A Systems Approach”, 6th Edition, Morgan Kaufmann Publishers, June 2021.
2. Kurose, Ross: Computer Networking - A Top-Down Approach 8th Global edition, Pearson 202.
3. Jacek Rak, “Resilient Routing in Communication Networks, A Systems Perspective”,Springer,2024

25PMCA11 COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT LAB

L	T	P	O	C
0	**0**	**4**	**2**	**2**

Course Objectives

Develop proficiency in English communication through interactive and practice-based modules. Equip students with the necessary skills for effective interpersonal and workplace communication. Enhance self-awareness and personality traits crucial for personal and professional development. Build confidence in public speaking, presentations, and group dynamics. Strengthen leadership, time management, and teamwork abilities.

Unit I: Basics of Communication and Self – Introduction **6**

Principles and Process of Communication
Barriers to communication and overcoming strategies
Effective Self-introduction in personal and professional settings
Verbal and Non-verbal communication cues
Self-introduction - Video recording and Feedback

Unit II: Listening, Speaking and Pronunciation Skills **6**

Active and Empathetic Listening
Voice clarity, Modulation, Pitch, and Articulation
Accent Neutralization and Pronunciation practice
Role plays: Customer handling & Team interactions
Audio-based listening comprehension tasks

Unit III: Public Speaking and Presentation Skills **6**

Techniques of public speaking and speech delivery
Preparing effective PowerPoint presentations
Handling stage fear and anxiety
Elevator pitch and storytelling
Peer-assessed presentations using multimedia tools

Unit IV: Group Dynamics and Professional Interaction **6**

Group Discussion techniques and strategies
Interview skills: HR and technical rounds
Conflict resolution and Negotiation techniques
Leadership and Teamwork
Mock Interviews and Group Discussion

Unit V: Personality Development and Career Readiness **6**

Self-awareness and SWOT analysis
Emotional intelligence and Interpersonal skills
Grooming, Etiquette, and Positive body language
Goal Setting, Time Management, and Stress Management
Resume and E-mail Writing

Total: 30 Periods.

Course Outcomes

Upon completion of this course, students will be able to:

1. Demonstrate improved verbal and non-verbal communication in professional contexts.
2. Apply active listening and speaking techniques in real-life scenarios such as interviews, meetings, and discussions.
3. Exhibit enhanced presentation, group discussion, and public speaking skills.
4. Reflect on and improve their personality traits, including confidence, adaptability, and emotional intelligence.
5. Employ soft skills such as leadership, team coordination, and conflict resolution effectively.

Reference Books

1. Meenakshi Raman & Sangeeta Sharma. *Technical Communication: Principles and Practice*, Oxford University Press, 2023.
2. Barun K. Mitra. *Personality Development and Soft Skills*, Oxford University Press, 2021.
3. Andrews, Sudhir. *How to Succeed at Interviews*, Tata McGraw-Hill, 2022.
4. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*, Pocket Books, 2022.
5. Leena Sen. *Communication Skills*, PHI Learning Pvt. Ltd., 2021.
6. Alex, K. *Soft Skills: Know Yourself and Know the World*, S. Chand Publishing, 2022.

25PMCA11 C PROGRAMMING AND DATA STRUCTURES LABORATORY

L	T	P	O	C
0	**0**	4	**2**	**2**

Course Objective:

This lab provides detailed knowledge of Arrays, Pointers, Stack Operations, Doubly Linked list, Graphs and Recursion. Also provide knowledge in Prefix, Post Fix Expression evaluation and tree Traversal techniques using C programming

Write C program for the followings:

1. Implement PUSH, POP operations of stack using Arrays.
2. Implement PUSH, POP operations of stack using Pointers.
3. Implement add, delete operations of a queue using Arrays.
4. Implement add, delete operations of a queue using Pointers.
5. Conversion of infix to postfix using stack operations
6. Postfix Expression Evaluation. Prefix Expression Evaluation
7. Addition of two polynomials using Arrays and Pointers.
8. Creation, insertion, and deletion in doubly linked list.
9. Binary tree traversals (in-order, pre-order, and post-order) using linked list.
10. Depth First Search for Graphs using Recursion.
11. Breadth first Search for Graphs using Recursion.

Course Outcomes:

CO1: Create basic operations of PUSH, POP of stack using Arrays and pointers.
CO2: Write simple and complex operations of Prefix and postfix in stack.
CO3: To evaluate postfix and prefix operations using C Program.
CO4: Use advanced features such as Binary tree traversals using linked list, stored procedures.
CO5: Create and manipulate Depth First Search and Breadth first search for graphs.

25PMCA12 RELATIONAL DATABASE SYSTEMS LABORATORY

L	T	P	O	C
0	**0**	**4**	**2**	**2**

Course Objective:

This course will help students to learn and implement important commands in SQL, usage of nested and joint queries, procedures and procedural extensions of databases and to understand design and implementation of typical database applications.

EXPERIMENTS

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in database table.
9. Create View and index for database tables with large number of records.
10. Develop a simple GUI based database application and incorporate all the above- mentioned features.

Course Outcome:

CO1: Create databases with different types of key constraints.
CO2: Write simple and complex SQL queries using DML and DCL commands.
CO3: Realize database design using 3NF and BCNF.
CO4: Use advanced features such as stored procedures and triggers and incorporate in GUI Based application development.
CO5: Create and manipulate data using NOSQL data.

SEMESTER - II

25CMCA21 OBJECT ORIENTED PROGRAMMING USING JAVA

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

This subject will help to improve the analytical skills of object oriented programming. It gives formal introduction to Java programming language and helps in learning GUI based application development and network programming.

UNIT-I: INTRODUCTION TO JAVA 12

Introduction to Object Oriented Programming - Process Oriented Vs Object Oriented Programming - OOPs Principles - An Overview of Java - A First Simple Program - Data Types and Variable Operators and Expressions- Control Statements- Type Conversion and casting- Lexical Issues in Java- Arrays: Single Dimension - Multi Dimension - Command Line Arguments..

UNIT-II: INTRODUCING OOPS CONCEPTS 12

Class Fundamentals with Variables and Methods- Declaring objects for accessing variables and methods- Constructors: Default and Parameterized - this keyword, Garbage Collection – Final, finally – finalize - Static keywords - Overloading Methods- Overloading Constructors- objects as Parameters- Returning objects- Inheritance: Basics- Types of Inheritance- Using Super keyword for constructor - Method Overriding – static and dynamic binding.

UNIT-III: PACKAGES, INTERFACES AND EXCEPTION HANDLING 12

Defining a Package - importing a package - Package Example- Access Protection - Abstract classes. Interfaces: Defining and Implementing Interfaces. Exception Handling: Fundamentals- Exception Types- throw- throws and finally - Chained Exceptions

UNIT-IV: MULTITHREADED PROGRAMMING AND DELEGATION EVENT MODEL WITH SWING 12

Java Thread Model - the Main thread- Creating a Thread- Creating Multiple Threads- - Synchronization- Inter Thread Communication. Swing: Features- MVC Connection- Components and Containers- Panes- Simple Swing Application- Delegation Event Model with GUI: Event Classes- Sources and Listeners.

UNIT-V: EXPLORING JAVA PACKAGES 12

Wrapper classes - Object- Math- Runtime - The collection frame work: ArrayList- HashSet and HashMap- String Tokenizer- Calender- Random- Scanner. File class- Streams- Socket- ServerSocket- InetAddress- DatagramSocket- URL- Client-Server Program using Sockets.

Total: 60 Periods

COURSE OUTCOMES:

At the end of the course- student will be able to

CO1: Understand OOP concepts and write Java programs using classes, objects and methods.
CO2: Apply inheritance, polymorphism, interfaces and exception handling in Java applications.
CO3: Develop multithreaded Java applications and GUI programs using Swing and event handling.
CO4: Use Java packages, collections framework and I/O streams for real-world programs.
CO5: Implement network programming (sockets) and basic client-server applications in Java.

TEXT BOOKS:

1. Herbert Schildt- "*Java The complete reference"*- 11th Edition- McGrawHill- 2021
2. Timothy budd- "*An introduction to object-oriented programming"*- 3rd Edition- Pearson Education- 2022.
3. Y. Daniel Liang- "*Introduction to Java Programming Comprehensive Version"*- 10th Edition- Pearson- 2021.

WEB REFERENCE:

https://onlinecourses.nptel.ac.in/noc19_cs84/preview

25CMCA22 **EMERGING TECHNOLOGIES IN DATA PROCESSING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE

To provide a strong foundation for data science and application areas related to it and understand the underlying core concepts and emerging technologies in data science and Processing.

UNIT I - FUNDAMENMTALS OF DATA SCIENCE **12**

Definition –Data, Data Science – Data Scientist – Data Science Process – Data Preparation – Data Exploration – Data Modelling – Big Data characteristics: Volume, Velocity, Variety, Veracity, Value – Data Processing Paradigms –Data warehouse concepts.

UNIT II - APPLICATION AREAS **12**

Definition: Big Data – general Techniques for Big Data – Advantages and Disadvantages of Big data - Applications for Data Science. Artificial Intelligence, Machine Learning: Algorithms– Types of Machine learning algorithms – Deep Learning – Algorithms.

UNIT III - DATA PROCESSING TECHNIQUES AND TOOLS **12**

Definition; Data Processing –Stages of data process – Types and Techniques of data processing – Advantage and Disadvantage of data processing – Statistics in Data Analytics: Descriptive and Inferential Statistics – Tools: Tableau, Python, Hive.

UNIT IV - DATA ANALYSIS WITH PYTHON **12**

Definition; Python-Data Types – Numeric types – Strings – Lists – Tuples – Dictionaries – Sets –Input and output operations. NumPyndarray - Vectorization Operation - Array Indexing and Slicing - Transposing Array and Swapping Axes - Saving and Loading Array. Universal Functions – Averages – Variability.

UNIT V - DATA VISUALIZATION WITH PYTHON **12**

Mathematical and Statistical Functions in Numpy .Data Frames - Indexing, Selection and Filtering in Series and Data Frames -Arithmetic Operations between Data Frames and Series. Basic plotting with matplotlib – creating line plots- scatter plots – subplots – adding annotation and text – Time series Analysis. T Test, Z Test, Anova.

TOTAL: 60 Periods

COURSE OUTCOME

CO1: Understand fundamentals of data science, big data characteristics and data processing paradigms.
CO2: Explain ML/DL concepts and identify suitable algorithms for different application domains.
CO3: Use Python/NumPy for basic data operations, exploratory data analysis and preprocessing.
CO4: Apply data processing tools and frameworks (Tableau, Hive) and demonstrate basic visualization.
CO5:Evaluate data-driven solutions and choose appropriate processing architectures.

TEXT BOOKS:

1. Practical Data Science with R. Nina Zumel, John Mount. Manning, 2022
2. Data Science for business, F. Provost, T Fawcett, 2021
3. R cookbook: proven Receipes for data analysis, statistics and graphics, O'Reilly.

REFERENCES:

1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2022.
3. Introduction to Python ProgrammingDo Your First Steps Into Programming with Python By Greytower Corp , 2024
4. Data Visualization using Python Programming- A Technical Guide For Beginners, Researchers and Data Analyst, By Dr.Abhinav, 2023

E-Resources:

1. https://spark.apache.org/documentation.html
2. https://kafka.apache.org/documentation/
3. https://flink.apache.org/learn/
4. https://cloud.google.com/architecture/data-processing

25CMCA23 **ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

L	T	P	O	C
3	0	0	2	3

Course Objective:

To introduce the fundamental principles, techniques, and applications of Artificial Intelligence and Machine Learning and develop an understanding of problem-solving and search strategies in AI. To familiarize students with key concepts and algorithms in supervised and unsupervised learning. To equip students with skills in designing and implementing basic neural networks and deep learning models. To explore advanced AI topics including NLP, reinforcement learning, and ethical implications of AI technologies. To encourage practical learning through lab exercises and case studies relevant to real-world AI & ML applications.

UNIT 1: INTRODUCTION TO AI & ML **9**

Introduction– History and Evolution of AI - Definition - Future of Artificial Intelligence – Problem Solving Approach to Typical AI problems – Search Strategies- Uninformed- Heuristics- Informed. Introduction to Machine Learning, Types of Learning: Supervised, Unsupervised, Reinforcement, Intelligent Agents & Environment.

UNIT 2: PROBLEM SOLVING AND SEARCH TECHNIQUES IN AI **9**

Problem Formulation, State Space Representation, Local Search Algorithms and Optimization Problems – Constraint Propagation - Backtracking Search - Uninformed Search: BFS, DFS, Depth Limited Search, Informed Search: Greedy Search, A* Algorithm, Constraint Satisfaction Problems (CSP), Game Playing: Minmax, Alpha-Beta Pruning - Stochastic Game

UNIT 3: SUPERVISED & UNSUPERVISED LEARNING **9**

Supervised Learning: Linear & Logistic Regression, SVM, random forest, Decision Trees, k-NN, Naive Bayes, Model E, valuation Techniques: Cross-validation, Confusion Matrix, Classification – ROC measure. Unsupervised Learning: K-Means, Hierarchical Clustering, Dimensionality Reduction: PCA, t-SNE.

UNIT 4: ANN & DEEP LEARNING **9**

Basics of Neural Networks: Perceptron, Activation Functions, Multilayer Perceptron (MLP), Backpropagation & Optimization Algorithms, Types of ANN, Introduction to Deep Learning, Transfer Learning Applications, GenAI.

UNIT 5: ADVANCED TOPICS AND APPLICATIONS **9**

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Applications of AI & ML in real-world scenarios : Industry applications - Healthcare Finance - Law, Chatbots, Overview of Tools & Frameworks: Scikit-learn, Tensor Flow, Keras.

Total: 45 Periods

Course Outcomes:

CO1: Describe AI problem solving, search strategies and agent models.
CO2: Apply informed/uninformed search and game-playing algorithms (A*, Minimax).
CO3: Implement supervised and unsupervised learning algorithms and evaluate models.
CO4: Explain neural networks, backpropagation and basics of deep learning and transfer learning.
CO5: Explore advanced AI topics (NLP, reinforcement learning) and ethical implications**.**

Text Books:

1. Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education 2021.
2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly 2022.
3. Tom M. Mitchell, Machine Learning, McGraw-Hill 2021.
4. Ian Goodfellow, Yoshua Bengio & Aaron Courville, Deep Learning, MIT Press 2023.

Reference Books:

1. François Chollet, Deep Learning with Python, Manning 2022.
2. Kevin Knight, Artificial Intelligence, McGraw-Hill 2023.
3. Richard S. Sutton & Andrew G. Barto, Reinforcement Learning: An Introduction, MIT Press 2021.
4. Ethem Alpaydin, Introduction to Machine Learning, MIT Press 2023.

25DMCA24 STATISTICS AND OPERATIONS RESEARCH TECHNIQUES

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES

To introduce the fundamentals of statistics and probability including data classification, visualization, and measures of central tendency and dispersion. To develop skills in regression, correlation, and curve fitting for analyzing data relationships. To apply sampling theory and perform statistical tests for hypothesis evaluation. To understand experimental design methods and analyze variance using appropriate statistical models. To introduce linear programming and optimization techniques to solve real-world resource allocation problems.

UNIT I: BASIC STATISTICS 9

Basic concepts of Statistics Qualitative and quantitative data, classification of data, construction of frequency distribution, diagrammatic representation of data. Measures of Central tendency: Mean, Median and Mode Measure of Dispersion - Range, Mean deviation - Standard Deviation and coefficient of variation. Basic Probability : Sample space and events – Probability – The axioms of probability – Some elementary theorems.

UNIT II: CORRELATION AND REGRESSION 9

Curve fitting- The method of least squares – Inferences based on the least squares estimations - Curvilinear regression — correlation coefficients-Karl persons and Spearman's rank correlation coefficient problems.

UNIT III: SAMPLING THEORY 9

Introduction to small sample- Means and proportions – Hypothesis concerning one and two means – Type I and Type II errors. One tail, two-tail tests. Tests of significance –Z-test, Student's t-test, F-test- chi square –test of goodness of fit and test of independence of attributes.

UNIT IV: DESIGN OF EXPERIMENTS 9

One way and two way classifications - Completely randomized design - Randomized block design - Latin square design - 2^2 factorial design.

UNIT V: LINEAR PROGRAMMING PROBLEM 9

Linear Programming Problem (LPP): Formulating LPPs, Simplex Algorithm; Transportation Problem- Mathematical Formulation of Transportation problem, Methods of selecting initial basic feasible solution: Matrix minima method- North-West Corner Rule, Vogel's Approximation Method, Unbalanced Transportation Problem Assignment problems: Algorithm, Unbalanced Assignment Problem, Hungarian Method.

Total: 45 Periods

COURSE OUTCOMES:

CO1: Explain descriptive statistics, probability and measures of central tendency/dispersion.
CO2: Compute correlation, regression and apply least squares methods for curve fitting.
CO3: Apply sampling theory and perform hypothesis testing (Z, t, F, chi-square).
CO4: Use design of experiments techniques (CRD, RBD, Latin square) for experiment analysis.
CO5: Formulate and solve linear programming, transportation and assignment problems.

TEXT BOOKS:

1. Statistical Inference, George Casella and Roger Berger, Duxbury Advanced Series, 2nd ed., 2024.
2. The Practice of Business Statistics, Manish Sharma, Amit Gupta, Khanna Book Publishing Company, 2010 (AICTE Recommended Textbook)
3. Statistical Methods, Das N. G., Combined Edition, Tata McGraw Hill, 2010.
4. Operations Research: An Introduction, Taha H. A, Pearson Education, 11th ed., 2022.

REFERENCE BOOKS:

1. Operations Research, Swarup, K., Gupta, P. K., & Man Mohan, Sultan Chand & Sons, 20th ed., 2022.
2. Quantitative Techniques in Management, V o h r a , N. D., & Arora, H, McGraw-Hill Education, 6th ed., 2021.
3. Operations Research, Panneerselvam. R, PHI Learning Pvt. Ltd, 3rd ed., 2023.
4. Operations Research: Theory, Methods & Applications, Sharma, S. D, Kedar Nath Ram Nath, , 15th ed., Reprint 2010.

Web Link:

1. https://nptel.ac.in/courses/111106112
2. https://nptel.ac.in/courses/111105041
3. https://nptel.ac.in/courses/111105090
4. https://nptel.ac.in/courses/111105041
5. https://onlinecourses.nptel.ac.in/noc21_ma74/preview

25PMCA21 JAVA PROGRAMMING LABORATORY

L	T	P	O	C
0	0	4	2	2

Course Objective: To understand and apply the fundamentals of core Java and to implement inheritance, polymorphism, interfaces, multithreading, networking. Developing applications using client side and server side programming.

EXPERIMENTS

1. Program to define a structure of a basic JAVA program.
2. Program to define operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects.
5. Program to demonstrate method overloading.
6. Program to define inheritance and show method overriding.
7. Program to demonstrate Packages.
8. Program to demonstrate Exception Handling.
9. Program to demonstrate Multithreading.
10. Program to demonstrate Applet structure
11. Program to demonstrate Network Programming.
12. Java socket programming
13. Implementation of chat client-server application.
14. Implementation of simple http client/server application.
15. Reading websites using URL class

Total: 60 Periods

Course Outcomes:

CO1: Identify classes, objects, members of a class and relationships among them needed for a specific Problem

CO2: Write Java application programs using OOP principles and proper program structuring Demonstrate the concepts of polymorphism and inheritance

CO3: Create Java programs to implement error handling techniques using exception handling

CO4: Design and develop GUI based applications

CO5: Develop chat and file transfer applications

25PMCA22 **STATISTICS AND DATA SCIENCE LAB**

L	T	P	O	C
0	**0**	**4**	**2**	**2**

Course Objective: To understand and apply the fundamentals of data science and to implement various concepts using python programming. Developing applications using python libraries.

EXPERIMENTS

1. Write a program to demonstrate a) Different numeric data types and b) To perform different Arithmetic Operations on numbers in Python
2. Write a program to create, append, and remove lists in Python.
3. Write a program to demonstrate working with tuples and dictionaries in Python.
4. Write a program to compute correlation coefficient using python.
5. Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and boolean array indexing along with their basic operations in NumPy.
6. Write a program to demonstrate Numpy mathematical functions.
7. Write a program to compute weighted averages in python or using Numpy
8. Write a program to create pandas dataframe using a list of elements.
9. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance using pandas.
10. Write a program to perform univariate data analysis.
11. Write a program to perform bivariate data analysis.
12. Write a program to demonstrate basic plots in python using Matplotlib

Course Outcome:

CO1: Demonstrate to use Python in any OS (Windows / Mac / Linux).
CO2: Able to work with Python packages and their installation.
CO3: Demonstrate functions and mathematical built-in function.
CO4: Understand to produce effective plot graph for the given data set.
CO5: Implement and assess relevance and effectiveness of data reports.

25PMCA23 ARTIFICIAL INTELLIGENCE & MACHINE LEARNING LABORATORY

L	T	P	O	C
0	0	4	2	2

COURSE OBJECTIVES:

To equip students with foundational knowledge and practical skills in Artificial Intelligence programming using Prolog, focusing on logic programming, knowledge representation, and problem-solving techniques. To provide students with foundational understanding in machine learning concepts, algorithms, and practical implementation using Python.

LIST OF EXPERIMENTS:

1. Design and implement AI algorithm for path finding in Prolog.
2. Design AI algorithm for simple Natural Language Processing: Parsing a Sentence using Prolog.
3. Design AI algorithm for Family Relationship Expert System using Prolog.
4. Design AI algorithm for Tic-Tac-Toe Move Generator using Prolog.
5. Design AI algorithm for a family relationship checker that determines if two people are siblings Using prolog.
6. Implement Linear Regression in ML using python.
7. Implement Logistic Regression in ML using python.
8. Design K-Nearest Neighbors in ML using python.
9. Decision Tree Classifier in ML using python.
10. Design K-Means Clustering in ML using python.

Total: 60 Periods

COURSE OUTCOMES:

CO1: Write Prolog programs to represent knowledge bases and implement expert systems.
CO2: Develop solutions for search problems using recursion and backtracking in Prolog.
CO3: Design and implement AI algorithms such as path finding and game playing in Prolog.
CO4: Understand key machine learning concepts, including supervised and unsupervised learning.
CO5: Build and deploy simple machine learning models using Python.
CO6: Implement basic machine learning algorithms such as linear regression, logistic Regression

SEMESTER - III

25CMCA31 **ENTERPRISE COMPUTING**

L	T	P	O	C
4	0	0	2	4

Course Objectives:

To describe how systems are used in a range of enterprises and understand enterprise architecture. To apply tools and resources to analyze complex datasets and explore cloud computing to master the data management.

UNIT I: ENTERPRISE FOUNDATIONS **12**

Enterprise software characteristics – options - Enterprise Architectural overview – object oriented software development for enterprise - Component Based software development for enterprise. Multi-tier system – Java Enterprise System. Use of patterns, frameworks, software stacks for Enterprise application development. Enterprise software for Hospital, University and manufacturing firms.

ENTERPRISE DATA ENABLING: Enterprise Data - Basis of JDBC, Distributed transactions. ORM, JPA, Hibernate framework, NOSQL in Enterprise applications – CRUD operations and Query Languages.

ENTERPRISE APPLICATION ENABLING: Enterprise Java Beans, Stateless Session Beans, Stateful Session Beans, Message Driven Beans, Entity beans, Accessing and integrating EJBs.

UNIT II: ENTERPRISE WEB ENABLING **12**

ENTERPRISE-WEB PROGRAMMING: Java Servlets - Java Server pages, State and session management – MVC architecture SPRING frameworks for web tier.

SINGLE PAGE WEB APPLICATIONS Angular JS – Java script, Controllers, pages, components, widgets – Data tables, Switching between pages, AJAX programming.

UNIT III: INTRODUCTION TO CLOUD COMPUTING **12**

Basics of Distributed Systems – Distributed Architectural Models – Parallelization - Cloud Computing Architecture – Deployment models - Infrastructure-as-a-Service (IaaS) – Platform-as-a-Service (PaaS) – Software-as-a-Service (SaaS) - Comparison of Cloud Computing with Grid, Cluster and Utility Computing - Pros and Cons of Cloud Computing.

VIRUTUALIZATION: Virtual Machines - Types of Virtualization - Architecture of VMM - Implementation Levels of Virtualization - Tools for Virtualization – Virtualization for Cloud - Virtualization for Datacenter Automation.

UNIT IV: CLOUD ARCHITECTURE AND PLATFORMS **12**

HDFS Architecture - Google Big Table - Amazon AWS - Amazon EC2, Amazon Simple Storage Service (S3) – Windows Azure - Aneka frame work - IBM blue Cloud - Eucalyptus – Open Stack.

UNIT V: CLOUD PROGRAMMING MODELS **12**

Implementation of Map reduce - Twister and Iterative Map Reduce.

DISTRIBUTED ENTERPRISE COMMUNICATIONS ENABLING: Distributed Enterprise Communications Basis – Java web services using both SOAP and RESTful, Message queues, JSON API and Binding - Micro services for Enterprise applications, Tools.

Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Explain enterprise architecture models, multi-tier and component-based development.
CO2: Use ORM/JPA/Hibernate and NoSQL for enterprise data management.
CO3: Develop Java EE web applications using servlets, JSP, Spring frameworks.
CO4: Describe cloud platforms and enterprise deployment models.
CO5: Implement web services (SOAP/REST), messaging and micro services basics.

REFERENCE BOOKS:

1. Sebatian Daschner, “Architecting modern Java EE applications”, Pack.pub.com, 2021.
2. Kapila Bogahapitiya and Sandeep Nair, “Mastering Java EE 8 Application development”, Packet Publishing, 2022.
3. Prashant padmanaban, “Java EE 8 and Angular”, Packet Publishing, 2021.
4. Kogent Solutions Inc. “Java Server Programming”,Dreamtech Press, 2022.
5. Francesco Marchioni, Practical Enterprise Application Development, Independently published, 2023
6. Peter Späth , Beginning Jakarta EE Enterprise Edition for Java: From Novice to Professional, 2021.

Reference Sites:

1. https://www.ibm.com/community/z/advocacy/wp-content/uploads/Intro-to-Enterprise-Computing
2. https://www.coursera.org/learn/introduction-enterprise-computing
3. https://www.devx.com/terms/enterprise-computing/

25CMCA32 **FULL STACK DEVELOPMENT**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To become knowledgeable about the most recent web development technologies and Idea for creating two tier and three tier architectural web applications. Design and Analyze real time web applications. Constructing suitable client and server side applications. To learn core concept of both front end and back end programming.

UNIT-I INTRODUCTION **12**

Web Development Basics: Full stack development Basics - Definition of full stack development HTML – HTML Tags- Form Designing – Introduction to Web servers – Git & Github HTML-Fundamentals of CSS.

UNIT II JAVASCRIPT **12**

JavaScript - Introduction, Variable, Value, Data type, Operators and Expressions, Arrays, Decision making and Loops, Functions, Variable Scope and Objects, The Browser Environment – BOM & DOM, Events and Event Handling.

UNIT III JQUERY **12**

JQuery - Introduction, Structure, Using JQuery and including .js file to HTML, Type of Selectors, Handling Events with j Query, j Query DOM Traversal, jQuery DOM Manipulation, jQuery Effects, APIs - Geo-location, Local Storage, Session Storage, History.

UNIT IV INTRODUCTION TO MONGODB **12**

JSON and Mongo DB – Adopting a Non-relational Approach – Opting for Performance vs. Features Running the Database Anywhere – Generating or Creating a Key – Using Keys and Values – Implementing Collections

UNIT V DATA MODELS **12**

Understanding Databases – Reviewing the Feature List - Designing the Database – Building Indexes – Inserting Data – Querying for Data – Updating Data – Removing Data – Referencing a Database – GRID FS

Total: 60 periods

COURSE OUTCOMES:

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

CO1: Demonstrate HTML/CSS and client-side basics to build responsive pages.
CO2: Implement JavaScript-based dynamic behaviors and DOM manipulations.
CO3: Use Node.js/Express and databases (MongoDB) to implement server-side APIs.
CO4: Build SPA using React and integrate backend APIs to create full-stack apps.
CO5: Apply security, deployment and optimization techniques for web apps.

Text Books:

1. Eloquent JavaScript: A Modern Introduction to Programming (3rd Edition), Marijn Haverbeke, 2021.
2. Learning jQuery: Interactive Front-End Development (5th Edition), Jonathan Chaffer, Karl Swedberg, 2022.
3. MongoDB: The Definitive Guide (3rd Edition), Shannon Bradshaw, Kristina Chodorow, Eoin Brazil, 2021.

REFERENCES:

1. Jon Duckett," Web Design with HTML, CSS, JavaScript and jQuery Set", 2021.
2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin. "Mastering HTML, CSS & JavaScript Web Publishing", 2022
3. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript " , 2009.DT Editorial Services , "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)" , Second edition, 2021.
4. Brad-Dayley, " NoSQL with MongoDB in 24 Hours, Sams Teach Yourself (Sams Teach Yourself in 24 Hours)" 1st Edition , 2022.
5. Ethan Brown, "Web Development with Node and Express", Oreilly Publishers, First Edition, 2021.

25CMCA33 FINANCIAL ACCOUNTING

L	T	P	O	C
3	**0**	**0**	2	3

Course Objective:

Describe the system of accounting standards and principles, prepare a balance sheet, income statement, and a statement of cash flows using both the indirect and direct method. account for short term investments and receivables, including bad debts, account for the purchase, depreciation, or a premium by the effective interest method, including interest payments for full and partial periods.

Unit I: Principles of Accounting 9

Principle of double entry – assets and liabilities, accounting records and systems – trial balance and preparation of final statements – trading, manufacturing profit and loss accounts – Balance sheet including adjustments (Simple problems only)

Unit II: Analysis and interpreting accounts and financial statements 9

Ratio analysis – use of ratios interpreting the final accounts (trading a/c's and loss a/c & balance sheet) – final accounts to ratios as well as ratios to final accounts.

Unit III: Break-even Analysis and Marginal Costing 9

Meaning of variable cost and fixed cost- Cost Volume Profit (CVP) analysis – calculation of breakeven point, profit planning, sales planning and other decision – making analysis involving break-even analysis – computer accounting and algorithm (Differential cost analysis to be omitted)

Unit IV: Budgeting and Project Appraisal 9

Preparation Budget- characteristics – function of budget- Types of budget- production, sales, purchases, cash and flexible budgets. Method of capital investment decision making: Payback period, ARR method, Discounted Cash Flows (DCF), Net Present Values (NPV), Internal Rate of Return (IRR)

Unit V: Computerized Accounting 9

Introduction to Computerized Accounting- Computerized Accounting Vs. Manual Accounting- Merits of Computerized Accounting- Tally ERP9- Screen Components-Creation of Company- Selecting a Company – Altering/ Modifying Company Creation Details – Deleting a Company – F 11 Features – F 12 Configuration. Accounts and Vouchers– Account Groups —Accounting Vouchers- Entering Transactions in Accounting Vouchers Bank Reconciliation Statement - Creating Budget - Generating Reports - Configuring Reports Balance Sheet – Profit and Loss Account – Trial Balance – Day Books – Account Books –Statement of Accounts – Ratio Analysis - Cash Flow - Fund Flow.

TOTAL : 45 hrs.

Course Outcomes

CO1: Explain double-entry accounting and prepare basic financial statements.
CO2: Analyze financial statements using ratio analysis and interpret results.
CO3: Apply CVP analysis and marginal costing for decision making.
CO4: Prepare budgets and perform project appraisal using NPV/IRR techniques.
CO5: Use computerized accounting tools (Tally) for practical accounting tasks.

Text Books:

1. Advanced Financial Management Accounting – T. S. Reddy and Dr. Y. Hari Prasad Reddy – Margum Publication.
2. "Management Accounting: Principles and Applications" by K. S. Thakur, 2023
3. "Cost Accounting: A Managerial Emphasis" by Charles T. Horngren, Srikant M. Datar, Madhav V. Rajan , 17th Edition, 2022
4. "Management Accounting for Decision Makers" by Peter Atrill and Eddie McLaney, 9th Edition, 2021.
5. "Financial Management and Analysis" by Thomas R. Ittelson, 2023
6. Nadhani, A.K. Implementing Tally ERP 9.
7. “Cost Accounting: Principles and Practice”, by M. N. Arora

25SEMC31 DESIGN THINKING AND INNOVATION SKILLS

L	T	P	O	C
2	0	0	2	2

Course Objectives

- To introduce the principles and process of design thinking as a human-centered problem-solving approach.
- To develop creativity, empathy, and innovation skills for addressing real-world challenges.
- To apply design thinking tools in ideation, prototyping, and testing innovative solutions.
- To foster teamwork, critical thinking, and interdisciplinary collaboration.
- To encourage iterative thinking and continuous improvement in design processes.

Unit 1: **6**

Introduction to Design Thinking – Fundamentals of design thinking, evolution and principles; importance of human - centered and iterative approaches; popular models such as Stanford school and IDEO.

Unit 2: **6**

Empathize – Understanding users through observation, interviews, and immersion; creating empathy maps and customer journey maps; identifying user needs, challenges, and opportunities.

Unit 3: **6**

Define – Synthesizing insights from research; framing problem statements; using "How Might We" questions to define design challenges and scope for innovation.

Unit 4: **6**

Ideate – Techniques for idea generation such as brainstorming, SCAMPER, and mind mapping; divergent and convergent thinking; evaluating and selecting potential solutions.

Unit 5: **6**

Prototype and Test – Building low-fidelity and high-fidelity prototypes; storyboarding and mockups; user testing and feedback collection; iteration and refinement; case studies of real-world applications.

Total No. Periods: 30 Hours

Course Outcomes

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

CO1: Explain design thinking principles and human-centered design approaches.
CO2: Conduct user research and create empathy maps and journey maps.
CO3: Generate and evaluate ideas using ideation techniques and select viable solutions.
CO4: Prototype and test solutions; iterate based on user feedback.

Reference Books:

1. Tim Brown, *Change by Design: How Design Thinking Creates New Alternatives for Business and Society*, Harper Business, 2009.
2. Tom Kelley & David Kelley, *Creative Confidence: Unleashing the Creative Potential Within Us All*, Crown Business, 2013.
3. Jeanne Liedtka & Tim Ogilvie, *Designing for Growth: A Design Thinking Tool Kit for Managers*, Columbia University Press, 2011.
4. Don Norman, *The Design of Everyday Things*, Basic Books, 2013 (Revised Edition).
5. Jeanne Liedtka, Andrew King & Kevin Bennett, *Solving Problems with Design Thinking: Ten Stories of What Works*, Columbia University Press, 2013.
6. Richard Buchanan & Victor Margolin, *Discovering Design: Explorations in Design Studies*, University of Chicago Press, 1995.
7. Roger Martin, *The Design of Business: Why Design Thinking is the Next Competitive Advantage*, Harvard Business Press, 2009.

25SEMC32 **EMOTIONAL INTELLIGENCE**

L	T	P	O	C
1	0	0	1	1

Course Objective:

This course aims to equip learners with the knowledge and skills of Emotional Intelligence to enhance self-awareness, self-regulation, and motivation. It focuses on developing empathy, social awareness, and effective interpersonal communication. The overall objective is to enable learners to apply EI for personal growth, teamwork, and leadership success.

Unit 1: Introduction to Emotional Intelligence **3**

Meaning and importance of Emotional Intelligence (EI), EI vs IQ, Models of EI: Daniel Goleman, Mayer- Salovey - Caruso, Components of EI: Self-awareness, Self-regulation, Motivation, Empathy, Social skills.

Unit 2: Self-Awareness & Self-Regulation **3**

Identifying emotions and emotional triggers, Understanding strengths and weaknesses, Techniques for emotional control: mindfulness, reframing, stress management, Building resilience

Unit 3: Motivation and Positive Mindset **3**

Intrinsic vs extrinsic motivation, Goal setting and optimism, Overcoming procrastination and negative emotions, Building growth mindset

Unit 4: Empathy and Social Awareness **3**

Understanding others' emotions (empathy vs sympathy), Active listening and perspective-taking, Cultural and social sensitivity, EI in teamwork and relationships

Unit 5: Social Skills & Application of EI **3**

Communication and conflict management, Leadership with EI, EI in workplace, education, and personal life, Strategies for long-term EI development

Total No. Periods: 15 Hours

COURSE OUTCOME: On successful completion of the course, learners will be able to:

CO1: Describe components of Emotional Intelligence and models (Goleman, Mayer).
CO2: Apply self-awareness, self-regulation and stress management techniques.
CO3:. Use EI in teamwork, leadership and conflict resolution.

Reference Books:

1. Emotional Intelligence: Why It Can Matter More Than IQ by Daniel Goleman
2. Emotional Intelligence 2.0 by Travis Bradberry
3. Social Intelligence: The New Science of Human Relationships by Daniel Goleman

25PMCA31 **ENTERPRISE APPLICATION DEVELOPMENT LAB**

L	T	P	O	C
0	0	4	2	2

Course Objective

This course gives practical training in HTML to Servlet Communication, JSP Beans used to create JSP program, to create Web Services, Email creation and manipulation, Web applications and Session management is done by students. Also gives practical training in Cloud Computing and used to create the applications development. Cloud concepts are used for storing the information.

1. Handson in the following topics/ concepts:
   i) Primitive data types ii) Containers
   iii) Functions iv) User Interface using open source frameworks
2. Concepts and features of J2EE Technology
   i) Program to demonstrate database handling ii) Servlet Program using HTTPServlet.
   iii) Basic Jsp program, Database Operation in jsp, implement session management, usebean tag
   iv) Program to implement basic hibernate program v) Program to create simple web service
   vi) Program to implement struts application.
3. Install Turbo C in guest OS and execute C program.
4. Test ping command to test the communication between the guest OS and Host OS
5. Install Hadoop single node setup.
6. Develop hadoop application to count no of characters, no of words and each character frequency.
7. Develop hadoop application to count no of characters, no of words and each character frequency.
8. Develop a hadoop application to process given data and produce results such as how many female and male students in both schools the results should be in the following format. GP-F #number , GP-M #numbers , MS-F #number , MS-M #number
9. Establish an AWS account. Use the AWS Management Console to launch an EC2 Instance and connect to it.
10. Design a protocol and use Simple Queue Service(SQS)to implement the barrier Synchronization after the first phase
11. Develop a Hello World application using Google App Engine
12. Develop a Guestbook Application using Google App Engine
13. Develop a Windows Azure Hello World application using.

Total: 60 Periods

Course Outcome (CO):

At the end of this course, the students will be able to

CO1: Designing HTML pages to demonstrate Java Servlets, JSP, Bean and EJB programs.

CO2: Demonstrate JSP (page attributes, action tags and all basic tags) and types of EJB application and learn the fundamentals of connecting to the database.

CO3: Learn to design and code web applications.

CO4: To understand Open source cloud hadoop environment

CO5: To Demonstrate concepts of Virtual machines in the cloud environment.

25PMCA32 **FULL STACK DEVELOPMENT LABORATORY**

L	T	P	O	C
0	0	4	2	2

COURSE OBJECTIVES:

- To implement the client side of the web application using javascript.
- To understand Javascript on the desktop using NodeJS.
- To develop a web application using NodeJS and Express.
- To implement a SPA using React.
- To develop a full stack single page application using React, NodeJS, and Database (MongoDB or SQL).

LIST OF EXPERIMENTS:

1. Create a form and validate the contents of the form using JavaScript.
2. Get data using Fetch API from an open-source end point and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. CreateaNodeJSserverusingExpressthatstoresdatafromaformasaJSONfile and displays it in another page. The redirect page should be prepared using Handlebars.
5. Create a Node JS server using Express that creates, reads, updates and deletes students' details and stores them in Mongo DB database. The information about the user should be obtained from a HTML form.
6. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7. Create a counter using React JS
8. Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
9. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either Mongo DB or My SQL and the server should be built using Node JS and Express Framework.
10. Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11. Create a docker container that wil ldeploy a NodeJS ping server using the NodeJS image.

Total: 60 Periods

25PMCA33 **MOBILE APP AND IOT LAB**

L	T	P	O	C
0	0	4	2	2

Course Objectives

The primary objective of this laboratory course is to equip students with practical skills in designing and developing mobile applications and Internet of Things (IoT) systems. Through hands-on sessions, students will learn to build interactive Android applications using modern development environments, explore fundamental and advanced features of mobile platforms, and integrate them with IoT devices such as sensors and microcontrollers.

Exercises

1. Setup Android Studio and Create “Hello World” App
2. Design a Registration/Login form with validations
3. Create a Calculator App using Layouts and Widgets
4. Develop a To-Do List App using RecyclerView
5. Implement Navigation between Activities
6. Read analog data from sensors (LDR/Temp)
7. Introduction to Arduino/ESP32 and Blinking LED
8. Interface Ultrasonic Sensor to measure distance
9. Send sensor data to a cloud platform (ThingSpeak/Blynk)
10. Mini Project – Design and develop a working mobile app

TOTAL: 60 Periods

Course Outcomes

1. To familiarize students with the fundamentals of mobile application development using Android or Flutte
2. To teach students how to store, retrieve, and manage data using local storage solutions such as SQLite and Shared Preferences.
3. To guide students in developing complete mobile applications that include backend communication, media handling, and cloud-based features.
4. To introduce the basic concepts of IoT, microcontrollers, and sensor interfacing.
5. To develop hands-on skills in programming Arduino/ESP-based boards using various sensors and actuators.
6. To teach students how to acquire and process sensor data in real-time.

SEMESTER - IV

25CMCA41 **ADVANCED COMPUTING TECHNOLOGIES**

L	T	P	O	C
4	0	0	2	4

Course Objectives:

Understand the fundamental principles of software project management and the responsibilities of a software project manager and apply core PHP programming constructs to build dynamic and interactive web applications. Implement web forms, session tracking, and file handling in PHP-based systems. Explain the structure and benefits of NoSQL databases and differentiate between SQL and NoSQL systems. Demonstrate automated testing of PHP applications using testing tools like PHP Unit and BDD frameworks.

Unit I: Introduction to Software Project Management **9**

Definition and importance of project management-Role and responsibilities of a software project manager- Characteristics of software projects-Types of software projects – Software Project Ethics - Software development process frameworks.

Unit – II Introduction to PHP **9**

Overview of PHP and its role in web development- PHP syntax, variables, data types, and operators - Control structures: if-else, switch, loops - Functions and arrays in PHP- Recursion - String Processing and Regular Expressions.

Unit – III Web Forms, Sessions, and Cookies **9**

Handling form data using GET and POST methods -Form validation and sanitization-Managing sessions and cookies for user state -File uploads in PHP.

Unit –IV Introduction to NoSQL Databases **9**

Overview of database types: SQL vs NoSQL - Characteristics of NoSQL databases - Types of NoSQL databases (Document, Key-Value, Column, Graph) – NoSQL Examples - Introduction to MongoDB and its ecosystem, NoSQL real time examples.

Unit - V Software Testing Tools **9**

Overview of software testing and quality assurance- -Types of software testing tools-Criteria for selecting testing tools.-Importance of testing in PHP applications: Manual vs automated testing-Overview of testing types: unit, integration, functional- PHPUnit Framework- Behavior Driven Development (BDD) Tools for PHP.

Total: 45 Periods

Course Outcomes

CO1: Explain advanced computing paradigms including distributed systems, cloud-native and microservices.
CO2. Analyze and apply advanced algorithms/architectures for scalable computing.
CO3. Evaluate contemporary technologies (AI ops, edge computing, serverless) for solution design.
CO4. Apply security, privacy and performance trade-offs in advanced system design.
CO5. Integrate thematic elements into project-level designs and plan deployment.

Text Books

1. Software Project Management – Bob Hughes, Mike Cotterell, Rajib Mall, McGraw-Hill Education
2. Programming PHP – Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, O'Reilly
3. MongoDB: The Definitive Guide – Kristina Chodorow, O'Reilly

Reference Books

1. PHP and MySQL Web Development – Luke Welling and Laura Thomson, Pearson Education
2. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence – Pramod J. Sadalage, Martin Fowler
3. Software Testing: Principles and Practices – Srinivasan Desikan and Gopalaswamy Ramesh, Pearson
4. Test-Driven Development with PHPUnit – Sebastian Bergmann

Web Resources

1. PHP Official Documentation
2. PHPUnit Official Site
3. MongoDB Documentation
4. Behat BDD Tool for PHP
5. W3Schools PHP Tutorial
6. Software Project Management - TutorialsPoint

25PMCA41 **ADVANCED COMPUTING TECHNOLOGIES LAB**

L	T	P	O	C
0	0	4	2	2

Course Objectives

To teach students how to acquire and process sensor data in real-time and familiarize them with the fundamentals of project development using front end and back end tools.

Practical Exercises

1. Write PHP scripts to demonstrate data types, operators, and control structures.
2. Create user-defined functions, recursive functions, and use built-in string functions.
3. Design an HTML form and write PHP to handle form data using GET and POST.
4. Implement form validation and sanitization techniques.
5. Upload a file to the server and manage it using PHP.
6. Use cookies and sessions for user authentication and state management.
7. Create a PHP script to connect to a MongoDB database.
8. Read and display documents from a MongoDB collection using PHP.
9. Write test cases using **PHPUnit** for basic PHP functions.
10. Create a RESTful API using PHP and MongoDB (GET, POST, PUT, DELETE).

Total: 60 Periods

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Designing HTML pages to interact with PHP programs.

CO2: Develop PHP scripts for form validation.

CO3: Learn to design web applications using PHP form handling, sessions, and cookies.

CO4: To write test cases using PHPUnit.

CO5: To work with NoSQL databases.

PROJECT WORK

L	T	P	O	C
0	0	6	2	6

The Project work involves the following:

1. Preparing a brief project proposal including
    a. Problem Identification
    b. Literature Survey
    c. System requirements and specification
    d. Model Development and Design Methodologies
    e. Time Line activities
2. A report highlighting the design finalization based on [functional requirements & standards (if any)].
3. A presentation including the following:
    a. Implementation phase (Hardware/software/both)
    b. Testing & Validation of the system
4. Consolidate report preparation.

Total: 180 Periods

CO1: Formulate a real-world computing problem, perform literature review and specify requirements.
CO2: Design and implement a complete solution using appropriate tools and technologies.
CO3: Test, evaluate, and document the system; demonstrate working prototype and results.
CO4: Exhibit project management, teamwork, ethical practice and present outcomes professionally.

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)

Category	Code	Course	L	T	P	O	C
	SEMESTER – II , DSE – I						
DSE 1	DSE001	Block chain Technologies	3	0	0	2	3
DSE 2	DSE002	Ethical Hacking & Cyber Security	3	0	0	2	3
DSE 3	DSE003	Big Data with R	3	0	0	2	3
DSE 4	DSE004	E-Learning Techniques	3	0	0	2	3
DSE 5	DSE005	Software Testing	3	0	0	2	3
DSE 6	DSE006	Deep Learning Techniques and Applications	3	0	0	2	3
DSE 7	DSE007	Game Programming Techniques	3	0	0	2	3
DSE 8	DSE008	Multimedia Technologies	3	0	0	2	3
DSE 9	DSE009	Data Visualization Techniques	3	0	0	2	3
DSE 10	DSE010	UNIX Programming	3	0	0	2	3
	SEMESTER – III , DSE – II, DSE - III						
DSE 11	DSE011	C# and .NET Programming	3	0	0	2	3
DSE 12	DSE012	Digital Image Processing and Applications	3	0	0	2	3
DSE 13	DSE013	Data Warehousing and Data Mining Techniques	3	0	0	2	3
DSE 14	DSE014	Object Oriented Analysis and Design	3	0	0	2	3
DSE 15	DSE015	Open Source Software	3	0	0	2	3
DSE 16	DSE016	Mobile Computing	3	0	0	2	3
DSE 17	DSE017	IoT & Applications	3	0	0	2	3
DSE 18	DSE018	Computer Graphics	3	0	0	2	3
DSE 19	DSE019	Wireless Sensor Networks & Protocols	3	0	0	2	3
DSE 20	DSE020	Next Generation Networks	3	0	0	2	3

DSE 21	DSE021	Python Web Development	3	0	0	2	3
DSE 22	DSE022	Software Project Management and Quality Assurance	3	0	0	2	3
DSE 23	DSE023	Quantum Computing	3	0	0	2	3
DSE 24	DSE024	Evolutionary Computing	3	0	0	2	3
DSE 25	DSE025	Data Mining and analytics	3	0	0	2	3
DSE 26	DSE026	Multi-dimensional Data Structures	3	0	0	2	3
DSE 27	DSE027	Multicore Programming	3	0	0	2	3
DSE 28	DSE028	SAP in Data Processing – Technical Course	3	0	0	2	3

DSE001 **BLOCK CHAIN TECHNOLOGIES**

L	T	P	O	C
3	0	0	2	3

Course Objectives:

Understand the structure of a block chain and why/when it is better than a simple distributed database, Evaluate the setting where a block chain-based structure may be applied, its potential and its limitations, Understand how block chain systems (mainly Bitcoin and Ethereum) work, Design, build, and deploy smart contracts and distributed applications,

UNIT I - INTRODUCTION **9**

Introduction of block chain- the basic terms about block chain-advent of block chain technology-evolution of block chain technology –block chain mechanism -the advantages introduced by the block chain technology -challenges of block chain adoption -Distinguish different types of block chains.

UNIT II - BITCOIN 9

Transactions, blocks, mining, scripting, attacks on mining-Building blocks: Hash functions, signature schemes, zero-knowledge proofs, consensus algorithms- Proof of work, proof of stake, proof of burn, proof of storage-Distinguish Proof-of-Work and Proof-of-Stake concepts - Byzantine Fault Tolerance-Sharding - Layer 2 approaches

UNIT III SMART CONTRACTS **9**

Basic terms about smart contract -the advent of smart contract - the smart contract mechanism- Restate the advantages introduced by the smart contract -challenges of smart contract - different applications of smart contract -Implement hands-on the smart contract using solidity and Ethereum

UNIT IV PRIVACY ISSUES **9**

Anonymity, mixing techniques, privacy with ZK-Snarks.-Permissioned block chains: Distributed consensus, sharing algorithms, privacy issues.

UNIT V SCALING ISSUES **9**

Sharding - Layer 2 approaches Lightning networks, Payment networks. Platforms and ledgers: Ethereum, Ripple, Hyper ledger, Algorand, etc –Block chain applications Government- Identity management-Auto executing contracts-Three signature escrow- Triple entry account- Elections and voting.

Total :45 Periods.

Course Outcome:

CO1: Blockchain technology landscape
CO2: Understand the block chain technology, its benefits and challenges
CO3: Applications and implementation strategies
CO4: Explain Bit coin security practices
CO5: State-of-the-art, open research challenges, and future directions

TEXTBOOKS

1. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S Goldfeder, J. Clark: Bitcoin and Cryptocurrency Technologies, Princeton University Press. 2021.
2. A. M. Antonopoulos: Mastering Bitcoin: Programming the Open Blockchain, O'Reilly, 2022.
3. Nakamoto, S. (2021). Bitcoin: A Peer-to-Peer Electronic Cash System.
4. Bashir, I. (2021). Mastering Blockchain. Packt Publishing.

REFERENCES

1. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2022.
2. J.A.Garay et al, the Bitcoin backbone protocol - analysis and applications eurocrypt 2021 lncs vol 9057, (volii), pp 281-310.
3. R.Pass et al, Analysis of blockchain protocol in asynchronous networks , eurocrypt 2022,
4. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher
5. Udemy: Ethereum and Solidity: The Complete Developer's Guide.
6. IBM Blockchain Platform Documentation for practical insights.
7. Blockchain Technology for Data Privacy Management, Zibin Zheng, Muhammad Imran, Athman Bouguettaya,2022.

DSE002 ETHICAL HACKING & CYBER SECURITY

L	T	P	O	C
3	0	0	2	3

Course Objectives:

To understand and analyse Information security threats & countermeasures To perform security auditing & testing To understand issues relating to ethical hacking To study & employ network defence measures To understand penetration and security testing issues

UNIT I- ETHICAL HACKING OVERVIEW & VULNERABILITIES 9

Understanding the importance of security, Concept of ethical hacking and essential Terminologies Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.

UNIT II - FOOTPRINTING & PORT SCANNING 9

Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS. Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending

UNIT III - INCIDENT AND INCIDENT RESPONSE 9

Introduction to Security Threats: Introduction, Computer Crimes, Computer Threats and Intrusions, Telecommunication Fraud, Phishing, Identity Theft, Cyber Terrorism and Cyber War – Need for Security: Information Security, OS Security, Database Security, Software Development Security – Security Architecture – Introduction to Incident – Incident Response Methodology – Steps – Activities in Initial Response Phase After Detection of an Incident.

UNIT IV- NETWORK AND EMAIL FORENSICS 9

Network Evidence – Types of Network Monitoring – Setting Up a Network Monitoring System– Network Data Analysis – Email Clients – Email Tracing – Internet Fraud – Spam Investigations Mobile Forensics – Subscriber Identity Module (SIM) Investigations – Wireless Device Investigations – PDA Investigations.

UNIT V -SYSTEM FORENSICS 9

Hacking: Investigating Hacker Tools – Ethical Issues – Cybercrime. Forensic and Investigative Tools – Forensic Equipment for Evidence Collection – Post Exploitation.

Total: 45 Periods.

Course Outcomes:

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

CO1: Understand vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks
CO2: Perform penetration & security testing
CO3: Become a professional ethical hacker
CO4: Implement real-world hacking techniques to test system security Apply
CO5: Employ complex tools to identify and analyze your company's risks and weaknesses

TEXT BOOKS

1. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2022.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Delmar Cengage Learning, 2021.
3. Parker, D. B. (2022). Cybersecurity: Protecting critical infrastructure (1st ed.)Elsevier.
4. Kennes, K., & Möller, S. (2021). Cybersecurity: A practitioner's guide to the fundamentals (1st ed.). Springer.

REFERENCES:

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2021.
2. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner’s Guide (3rd ed.). Packt Publishing, 2022.
3. Stallings, W., & Brown, L. (2021). Computer security: Principles and practice (4th ed.). Pearson.
4. Miller, C. (2022). Cybersecurity for beginners: Safeguarding the digital world (1st ed.). Wiley.

DSE003 **BIG DATA WITH R**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

Be exposed to big data , Learn the different ways of Data Analysis, Be familiar with data streams and Learn the basic understanding of R programming, data structures, functions, how to work with packages, files and know about the data visualization and data management techniques using R tool.

UNIT I: INTRODUCTION TO BIG DATA 9

Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options Team challenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of Big Data -Security, Compliance, auditing and protection - Evolution of Big data – Best Practices for Big data Analytics - Big data characteristics - Volume, Veracity, Velocity, Variety – Data Appliance and Integration tools.

UNIT II: DATA ANALYSIS 9

Evolution of analytic scalability – Convergence – parallel processing systems – Cloud computing –grid computing – map reduce – enterprise analytic sand box – analytic data sets – Analytic methods –analytic tools – Cognos – Microstrategy - Pentaho. Analysis approaches – Statistical significance –business approaches – Analytic innovation – Traditional approaches – Iterative

UNIT III: PREDICTIVE ANALYTICS AND VISUALIZATION 9

Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Kohonen models – Normal – Deviations from normal patterns – Normal behaviours – Expert options – Variable entry - Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory- IBM for Big Data – Map Reduce Framework - Hadoop – Hive - – Sharding – NoSQL Databases - S3 -Hadoop Distributed file systems

UNIT IV: INTRODUCTION TO R 9

Overview of R programming - Evolution of R - Applications of R programming – Basic syntax - Basic Concepts of R, Control flow of R -R packages - Data Reshaping: Joining Columns and Rows in a Data Frame - Merging Data Frames - Melting and Casting.

UNIT V: DATA VISUALIZTION AND DATA MANAGEMENT USING R 9

Data visualization in R and Data Management - Bar Chart, Dot Plot, Scatter Plot (3D), Spinning Scatter Plots, Pie Chart - Histogram (3D) [including colorful ones], Overlapping Histograms – Boxplot, Plotting with Base and Lattice Graphics Missing Value Treatment - Outlier Treatment - Sorting Datasets - Merging Datasets - Binning variables.

Total:45 Periods.

Course Outcome:

CO1: Compare and contrast various soft computing frameworks.
CO2: Design distributed file systems and Apply Stream data model.
CO3: To know how to work with files in R.
CO4: To study about data visualization and data management techniques.
CO5: Use R to create sophisticated figures and graphs.

TEXT BOOKS:

1. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS BusinessSeries, 2022.
2. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis",Elsevier, 2021.
3. Michael Berthold, David J. Hand," Intelligent Data Analysis", Springer, 2021.
4. Norman Matloff , "The Art of R Programming-a tour of statistical software design", William Pollock, 2022.
5. Paul Teetor "R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics", O'Reilly Cookbooks, O'Reilly Media , 2021.
6. *Big Data Analytics with R and Hadoop,* Vignesh Prajapati, 2022.
7. *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data,* Hadley, Wickham, Garrett Grolemund, 2021.

REFERENCES:

1. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge UniversityPress, 2021.
2. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams With Advanced Analytics", Wiley and SAS Business Series, 2022.
3. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for EnterpriseClass Hadoop and Streaming Data", McGraw Hill, 2021.
4. Pete Warden, Big Data Glossary, O'Reilly, 2023.
5. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier,Reprinted 2021.
6. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2021.
7. Practical Data Science with R, Nina Zumel, John Mount, 2022.
8. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data,**:** Hadley Wickham, Garrett Grolemund, 2022.
9. Learning R: A Step-by-Step Function Guide to Data Analysis, Richard Cotton, 2021.

DSE004 **E-LEARNING TECHNIQUES**

L	T	P	O	C
3	0	0	2	3

Course Objective: This course will make the students learn the various E-learning approaches, components and the types of design models of E-Learning. This course will also help to explore the models for E-learning courseware development and E-learning authoring tools.

UNIT I - INTRODUCTION **9**

Need for E-Learning – Approaches of E-Learning – Components of E-Learning – Synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-Learning Content – Basics of Design Thinking**.**

UNIT II - DESIGNING E-LEARNING COURSE CONTENT **9**

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analysing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study.

UNIT III - CREATING INTERACTIVE CONTENT **9**

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests – Adding Additional Resources– Courseware Development – Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool.

UNIT IV LEARNING PLATFORMS **9**

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

UNIT V COURSE DELIVERY AND EVALUATION **9**

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation.

Total: 45 Periods

Course Outcome:

CO1: Distinguish the phases of activities in the models of E-learning.
CO2: Identify appropriate instructional methods and delivery strategies.
CO3: Choose appropriate E-learning authoring tools.
CO4: Create interactive E-Learning courseware.
CO5: Evaluate and manage the E-learning courseware.

TEXT BOOKS:

1. "The E-Learning Handbook: Past Promises, Present Challenges", Michael Simonson, Sharon Smaldino, and Anthony S. Albright, 2020.
2. "E-Learning: Strategies for Delivering Knowledge in the Digital Age", L. K. Sharma, 2021.
3. "The Distance Learning Playbook: Teaching for Engagement and Impact in Any Setting", Douglas Fisher, Nancy Frey, and John Hattie, 2022.

REFERENCE BOOKS:

1. "Creating E-Learning Experiences: A Step-by-Step Guide for Designing and Delivering Effective Training", Geri S. Huser, 2021
2. "Virtual Reality and Augmented Reality in Education", Timothy Jung, M. C. K. Lee, 2021
3. "Design for How People Learn" (4th Edition), Julie Dirksen, 2020

WEB LINKS:

1. The eLearning Guild, https://www.learningguild.com/
2. Association for Talent Development, https://www.td.org/
3. Adobe Captivate, https://www.adobe.com/products/captivate.html

DSE005 **SOFTWARE TESTING**

L	T	P	O	C
3	0	0	2	3

Course objective:

To introduce the basics and necessity of Software testing, to introduce various testing techniques along with software production, and to introduce the concepts of Software bugs and its impact

UNIT I - INTRODUCTION **9**

Software testing background – software bugs- cost of bugs-software testing realities- Testing Axioms – Precision and Accuracy-verification and validation- quality and reliability-testing and quality assurance.

UNIT II - SOFTWARE TESTING METHODOLOGY **9**

Functional testing, Structural testing – Static and Dynamic testing – low level specification test techniques – Equivalence Partitioning – Data testing – State Testing –formal reviews – coding standards and guidelines – code review checklist– data coverage- code coverage.

UNIT III SOFTWARE TESTING TECHNIQUES **9**

Configuration testing –Compatibility tests – foreign language testing – usability testing – testing the documentation - testing for software security – website testing.

UNIT IV AUTOMATED TESTING AND TEST TOOLS **9**

Benefits of automation and tools – viewers and monitors – drivers – stubs – stress and load tools – analysis tools- software test automation – random testing –beta testing

UNIT V TEST DOCUMENTATION **9**

Goal of Test Planning – test phases – test strategy – resource requirements – test schedule – writing and tracking test cases- Bug tracking systems – metrics and statistics- risks and issues

Total: 45 Periods

COURSE OUTCOME

Upon Completion of the course, the students should be able to:

CO1 : Discuss the concepts of software testing
CO2 : Explain the testing techniques
CO3 : Perform automated testing using test tools
CO4 : Document the testing procedures

TEXT BOOKS:

1."Foundations of Software Testing: ISTQB Certification" (5th Edition), Dorothy Graham, Rex Black, Erik van Veenendaa, 2021
2."Software Testing: A Practical Approach", Naresh Chauhan, Sujata Banerjee, 2021.

REFERENCE BOOKS:

1 "Practical Software Testing: A Process-Oriented Approach", Ilene Burnstein, 2022.
2. The Complete Software Testing Guide: Best Practices, Tools, and Techniques", Brian Hambling, 2022.

WEB LINKS:

1. Ministry of Testing, https://www.ministryoftesting.com/
2. Software Testing Help, https://www.softwaretestinghelp.com/
3. Stack Overflow (Testing), https://stackoverflow.com/questions/tagged/software-testing

DSE006 DEEP LEARNING TECHNIQUES AND APPLICATIONS

L	T	P	O	C
3	0	0	2	3

Course Objective:

To understand the basics of machine learning and deep learning and to apply the Machine learning principles. To study the deep learning architectures. Explore and create deep learning applications with tensor flow.

UNIT-I: INTRODUCTION 9

Introduction to different types of learning, Supervised and Unsupervised learning – Reinforcement learning- Basics of Neural Network – Limits of Traditional Computing – Machine Learning – Neuron – FF Neural Networks – Types of Neurons – Softmax output layers

UNIT-II: TENSOR FLOW 9

Tensor flow – Variables – Operations – Placeholders – Sessions – Sharing Variables – Graphs – Visualization

UNIT-III: CONVOLUTION NEURAL NETWORKS 9

Convolution Neural Network – Feature Selection – Max Pooling – Filters and Feature Maps – Convolution Layer –Applications

UNIT-IV: RECURRENT NEURAL NETWORKS 9

Recurrent Neural Network – Memory cells – sequence analysis – word2vec- LSTM - Memory augmented Neural Networks – NTM-– Application

UNIT-V: REINFORCEMENT LEARNING 9

Reinforcement Learning – MDP – Q Learning – Applications

Total: 45 Periods

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

CO1: Interpret the basics of Machine learning.
CO2: Design and develop machine learning applications
CO3: Analyze the various applications of Convolution Neural Networks, Artificial Neural Networks, Recurrent Neural Networks
CO4: Explore, Evaluate different neural networks
CO5: Apply the concepts of deep leaning in real life problems

TEXTBOOKS:

1. "Deep Learning: A Practitioner's Approach" (2nd Edition), Adam Gibson, Josh Patterson, 2022
2. "Deep Learning: From Basics to Practice", Tomaso A. Poggio, Aaron C. Courville, Yoshua Bengio, Geoffrey Hinton, 2022

REFERENCE BOOKS:

1. "Deep Learning with Python" (2nd Edition), François Chollet, 2021
2. "Deep Learning for NLP and Speech Recognition", Uday Kamath, John Liu, James Whitaker, 2021
3. "Deep Learning for Robotics", Peter Corke, David R. Topping, Jenny A. Willis, 2023
4. "Deep Reinforcement Learning Hands-On" (2nd Edition), Maxim Lapan, 2022

WEB LINKS:

1. fast.ai, https://www.fast.ai/
2. Keras, https://keras.io/
3. arXiv (Deep Learning Category), https://arxiv.org/list/cs.LG/recent

DSE007 **GAME PROGRAMMING TECHNIQUES**

L	T	P	O	C
3	0	0	2	3

Course objective:

To understand the concepts of Game design and development, learn the processes, mechanics and issues in Game Design, be exposed to the Core architectures of Game Programming, Know about Game programming platforms, frameworks and engines and Learn to develop games.

UNIT I - 3D GRAPHICS FOR GAME PROGRAMMING **9**

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

UNIT II GAME ENGINE DESIGN **9**

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

UNIT III GAME PROGRAMMING **9**

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

UNIT IV GAMING PLATFORMS AND FRAMEWORKS **9**

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - Unity. DX Studio,

UNIT V GAME DEVELOPMENT **9**

Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

Total: 45 Periods.

COURSE OUTCOME:

Upon completion of the course, students will be able to

CO1 : Discuss the concepts of Game design and development.
CO2 : Design the processes, and use mechanics for game development.
CO3 : Explain the Core architectures of Game Programming.
CO4 : Use Game programming platforms, frameworks and engines.
CO5 : Create interactive Games.

TEXT BOOKS:

1. Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2022.
2. Jason Gregory, “Game Engine Architecture”, 4th Edition,2023.
3. Tomas Akenine-Möller, “Real-Time Rendering, Fourth Edition, 2022
4. Jesse Schell, The Art of Game Design: A book of lenses, 4th Edition, CRC Press, 2021.

REFERENCES:

1. Jesse Schell, The Art of Game Design: A book of lenses, 4th Edition, CRC Press, 2022.
2. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2 nd Edition Prentice Hall / New Riders, 2021.
3. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3rd Edition, Course Technology PTR, 2021.

WEB LINKS:

https://www.gamedev.net/
https://www.codecademy.com/learn/paths/game-development
https://github.com/trekhleb/awesome-game-development

DSE008 **MULTIMEDIA TECHNOLOGIES**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

To understand the concepts of multimedia, Learn the processes, mechanics and issues in multimedia platform, Game Design, be exposed to various tools of multimedia, Know about multimedia audio, video & image formats, Learn to shoot ,edit video and delivering to www.

UNIT I - INTRODUCTION TO MULTIMEDIA **9**

Definitions - CD-ROM and the Multimedia Highway - where to use Multimedia - introduction to Making Multimedia: The stages of a Project - What you need - Macintosh and Windows Production Platforms: The Macintosh Platform - The Windows Multimedia PC platform - Hardware Peripherals Connection - Memory and Storage Devices - Input Devices - Output Hardware - Communication Devices.

UNIT II - BASIC TOOLS **9**

Text Editing and Word Processing Tools - OCR Software - Painting and Drawing Tools - 3- D Modeling and Animation Tools - Image - Editing Tools - Helpful Accessories - Making Instant Multimedia: Linking Multimedia Objects - Office Suites - Word Processors - Spread sheets - Databases - Presentation Tools. Multimedia Authoring Tools.

UNIT III - TEXT **9**

The Power of Meaning - About Fonts and Faces - Using Text in Multimedia - Computers and Text - Font Editing and Design Tools - Hypermedia and Hypertext - Multimedia System Sounds - Digital Audio - Making MIDI Audio - Audio File Formats

UNIT IV - IMAGES **9**

Making Still Images - Color - Image File Formats. Animation: The Power of Motion - Principles of Animation - Making Animations That Work - Video: Using video - How video works - Broadcast Video Standards - Integrating Computers and Television - Shooting and Editing Video - Video Tips - Recording Formats - Digital Video.

UNIT V PLANNING AND COSTING **9**

Disc Technology - Wrapping It Up - Delivering on the World Wide Web. Project planning - Estimating - RFPs and Bid proposals - Designing and producing: Designing - Producing - Content and Talent: Acquiring Content - Using content created by others testing - Preparing for Delivery – Compact.

Total: 45 Periods

COURSE OUTCOME

Upon completion of the course, students will be able to

CO1 Discuss the concepts of multimedia.
CO2 Design the processes, and use mechanics for multimedia platforms.
CO3 Explain the tools of multimedia.
CO4 Know about usage of multimedia audio, video & image formats.
CO5 Know to shoot, edit video and deliver to www.

TEXT BOOKS:

1. Tay Vaughan - Multimedia : Making it work - 8th Edition - Tata McGraw-Hill Edition, 2021.
2. Walterworth John A - Multimedia Technologies and Application - Ellis Horwood Ltd. - London- 2022.
3. Ching- Man Au and Hoi“Understanding Multimedia From Technology to Applications”, First Edition, 2021.

REFERENCE BOOK:

1. J1. John F Koegel Buford - Multimedia Systems - Addison Wesley - First Indian Reprint - 2022.

2. B. K. Tripathy, S. K. Srivastava, and V. K. Agarwal, “"Multimedia Technologies and Applications: A Practical Approach" 1st Edition 2021.

DSE009 DATA VISUALISATION TECHNIQUES

L	T	P	O	C
3	0	0	2	3

Course objective:

To understand the concepts of different types of visualization and how humans perceive information. Learn the processes, mechanics in implementing principles of design and color to make effective visualizations, learn how to visualize graphs, be exposed to visualization dashboards, and to apply techniques from user-interface design to create an effective visualization system.

UNIT I -THE COMPUTER AND THE HUMAN 9

Defining data visualization Visualization workflow-describing data visualization workflow- process in practice

UNIT II -VISUALIZATION OF NUMERICAL DATA 9

Data Representation: chart types: categorical, hierarchical, relational, temporal & spatial; 2- D: bar charts, Clustered bar charts, dot plots, connected dot plots, pictograms, proportional shape charts, bubble charts, radar charts, polar charts, Range chart

UNIT III -VISUALIZATION OF NON-NUMERICAL DATA 9

Range chart, Box-and-whisker plots, univariate scatter plots, histograms word cloud, pie chart, waffle chart, stacked bar chart, back-to-back bar chart.

UNIT IV -VISUALIZATION DASHBOARD 9

Visualization system for large datasets and dashboards, Tools for dashboard, graph data visualization; Annotation

UNIT V - 2-D & 3-D DATA VISUALISATION 9

Relevant 2-D charts. 3-D: surfaces, contours, hidden surfaces, pm3d coloring, 3D mapping; multi-dimensional data visualization

Total : 45 Periods.

COURSE OUTCOME:

Upon completion of the course, students will be able to

CO1 Discuss the concepts of what data visualization is, how it's used, and how Computers display information.
CO2 Implement principles of design and color to make data visualizations more Effective
CO3 Learn how to visualize graphs that depict relationships between data items.
CO4 Use and designing own visualization system for large datasets and dashboards
CO5 To interpret visualization system.

TEXT BOOKS

1. Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications, 2021.
2. Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications, 2022.

REFERENCE BOOKS

1. Information Dashboard Design-Displaying data for at-a-glance monitoring-Stephen Few
2. Practical Data Visualization with Power BI" by M. K. Yadav (2022)
3. Beautiful Visualization, Looking at data through the eyes of experts by Julie steele

DSE010 **UNIX PROGRAMMING**

L	T	P	O	C
3	0	0	2	3

Course Objective:

To study and understand the UNIX architecture, file systems, basic commands. To understand Shell programming and analyze various system calls and processes.

UNIT I: INTRODUCTION TO UNIX **9**

Architecture of UNIX, Features of UNIX , UNIX Commands – man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, env . Environment Variables**:** PATH, LOGNAME, SHELL, USER.

UNIT II: UNIX UTILITIES **9**

Introduction to UNIX file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities ,Networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin Text processing utilities and backup utilities , tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio.

UNIT III: INTRODUCTION TO SHELL **9**

UNIX Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Shell/Environment Customization, Filters, grep, sed, awk, Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk .

UNIT IV: FILE MANAGEMENT **9**

File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask

UNIT V: PROCESS MANAGEMENT **9**

Categories of process, Parent & Child process, Zombie and Orphan process, mechanism of init(), termination of a process, process control mechanism

Total : 45 Periods.

COURSE OUTCOME:

At the end of this course the student will be able to

CO1 : Describe the architecture of multi user OS UNIX and its basic features and commands.
CO2 : Interpret and apply UNIX Commands and utilities in Linux/UNIX systems.
CO3 : Illustrate Shell Programming and to write Shell Scripts
CO4 : Design and develop UNIX File I/O operations.
CO5: Ability to understand and interpret UNIX Processes.

Text Books:

1. UNIX and Shell Programming; Behrouz A. Forouzan, Richard F. Gilberg; Thomson 2022
2. UNIX: Concepts and Applications; Sumitava Das; TMH,2023.

Reference

1. UNIX for Programmers and Users; Graham Glass, King Ables; Pearson Education
2. UNIX Programming Environment; Kernighan and Pike; PHI/Pearson Education
3. The Complete Reference UNIX; Rosen, Host, Klee, Farber, Rosinski; TMH
4. Your UNIX – The Ultimate Guide; Sumitava Das; TMH
5. Design of UNIX Operating System; Maurice Bach; PHI

DSE011 **C# AND .NET PROGRAMMING**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

This course is designed to provide the knowledge of Dot Net Frameworks along with ASP.Net and C# . Understand HTML controls, web server controls and validation controls. Understand session management and cookies. Familiarize with the Connected DO.NET Architecture and Disconnected ADO.NET Architecture.

UNIT -I BASIC CONCEPTS OF .NET TECHNOLOGIES **9**

.NET Framework Architecture - Common Language Runtime -Common type systems - .NET Framework Class Library- Garbage Collection– Globalization - Assemblies - Global Assembly cache (GAC)-Versioning - Introduction to Visual Studio Environment.

UNIT – II C# LANGUAGE FUNDAMENTALS **9**

C# Language Fundamental – Arrays -Object Oriented programming in C# -I/O –Properties- Indexers- Exception Handling –Delegates- Events – Composition

UNIT –III ADVANCED C# **9**

Generics - Generic Delegate and Interfaces –Reflection –Attributes -Class Library –String Multithreading -Collection – Iterator -Asynchronous Callback -Security.

UNIT –IV ADO.NET PROGRAMMING **9**

Fundamentals -ADO.NET- Connection Oriented Architecture -Data Adapter -Connectionless – Datasets – Typed Un typed – Concurrency- Transactions and locks- Data source controls- Data binding – Data grid.

UNIT V – ASP.NET **9**

Web Server concepts - ASP. NET Page - Page Directive – Code Behind – ASP.NET Controls – HTML Controls- Validation Controls- Data Binding Repeater – DataGrid - Web.Configuration File- Request Response Objects Session Management –Cookies – URL Rewriting

Total : 45 Periods.

Course Outcome

CO1 : Learn about developed by MS Microsoft
CO2 : Understand .NET framework and the use of C# basics, Objects and Types, Inheritance
CO3 : Develop, implement and creating Applications with C#.
CO4 : Create a Web form with server controls and Display dynamic data from a data source By using Microsoft ADO.NET and data binding
CO5 : Create distributed data-driven applications using the .NET Framework, C#, SQL Server and ADO.NET

REFERENCES

1. C. Stephen Perry, Stephen Walther, Atul Kahate , Joseph Mayo," Essentials of .Net Related Technologies: With a focus on C# , XML, ASP .NET and ADO.NET", First Edition, Pearson Education 2022.
2. Schildt, Herbert, "C#: The Complete Reference", Second Edition, McGraw-Hill, 2021.
3. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, "Professional C# and .NET 4.5", Wiley, 2022.
4. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", Apress publication, 2021.
5. Ian Gariffiths, Mathew Adams, Jesse Liberty, "Programming C# 4.0", O'Reilly, Sixth Edition, 2021.
6. Templeman, J., & Vitter, D. (2022). Visual Studio. NET: The. NET Framework Black Book. Coriolis.

DSE012 DIGITAL IMAGE PROCESSING AND APPLICATIONS

L	T	P	O	C
3	0	0	2	3

Course Objectives:

To learn the basic concepts of digital image processing and various image transforms. To familiarize the student with the image enhancement techniques. To expose the student to a broad range of image processing techniques and their applications in real-world applications of image processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction – Applications of Image Processing – Steps in Image Processing Applications – Digital Imaging System – Sampling and Quantization – Pixel Connectivity – Distance Measures – Colour Fundamentals and Models – File Formats – Image Operations.

UNIT II IMAGE ENHANCEMENT 9

Image Transforms: Discrete Fourier Transform – Fast Fourier Transform – Discrete Cosine Transform – Image Enhancement in Spatial and Frequency Domain – Grey Level Transformations – Histogram Processing –Spatial Filtering – Smoothing And Sharpening – Frequency Domain: Filtering in Frequency Domain.

UNIT III IMAGE RESTORATION AND MULTI-RESOLUTION ANALYSIS 9

Multi Resolution Analysis: Image Pyramids – Multi Resolution Expansion – Wavelet Transforms – Image Restoration – Image Degradation Model – Noise Modeling – Blur – Order Statistic Filters – Image Restoration Algorithms.

UNIT IV IMAGE SEGMENTATION AND FEATURE EXTRACTION 9

Image Segmentation – Detection of Discontinuities –Edge Operators –Edge Linking and Boundary Detection – Thresholding – Region based Segmentation – Image Features and Extraction – Image Features – Types of Features – Feature Extraction – SIFT, SURF and Texture – Feature Reduction Algorithms.

UNIT V IMAGE PROCESSING APPLICATIONS 9

Image Classifiers – Supervised Learning – Support Vector Machines, Image Clustering – Unsupervised Learning – Hierarchical and Partition based Clustering Algorithms – EM Algorithm.

Total: 45 Periods.

Course Outcomes

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

CO1: Implement basic image processing operations.
CO2: Apply and develop new techniques in the areas of image enhancement and restoration.
CO3: Understand the image segmentation algorithms.
CO4: Apply classifiers and clustering algorithms for image classification and clustering.
CO5: Design and develop an image processing application that uses different concepts of Image processing.

REFERENCES:

1. Rafael Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, Pearson Education, 2021.
2. S. Sridhar, "Digital Image Processing", Second Edition, Oxford University Press, 2022.
3. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 2023.
4. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", Fourth Edition, Cengage India, 2021.

DSE 013 DATA WAREHOUSING AND DATA MINING TECHNIQUES

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

To get exposed to the concepts of data warehousing architecture and implementation. To conceptualize data mining and the need for pre-processing and to analyse the mining techniques for realistic data. To characterize the kinds of patterns that can be discovered by association rule mining. To implement classification and clustering techniques on large datasets and to identify business applications and trends of data mining.

UNIT I -DATA WAREHOUSE 9

Data Warehousing – Operational Database Systems versus Data Warehouses–. Multidimensional Data Model – Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools

UNIT II- DATA MINING & DATA PREPROCESSING 9

Introduction to KDD Process – Knowledge Discovery from Databases – Need for Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT III- ASSOCIATION RULE MINING 9

Introduction – Data Mining Functionalities – Association Rule Mining – Mining Frequent Item sets with and without Candidate Generation – Mining Various Kinds of Association Rules – Constraint – Based Association Mining.

UNIT IV- CLASSIFICATION & PREDICTION 9

Classification versus Prediction – Data Preparation for Classification and Prediction– Classification by Decision Tree – Bayesian Classification – Rule Based Classification– Classification by Back Propagation – Support Vector Machines – Associative Classification– Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures– Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT V- CLUSTERING 9

Cluster Analysis – Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Model Based Clustering Methods – Clustering High-Dimensional Data – Constraint Based Cluster Analysis – Outlier Analysis.

Total: 45 Periods.

COURSE OUTCOME

CO1: Design, create and maintain data warehouses.
CO2: Apply data mining techniques and methods to large data sets.
CO3: Evaluate various mining techniques on complex data objects.
CO4: Evolve multidimensional intelligent model from typical system.
CO5: Discover the knowledge imbibed in the high dimensional system.
CO6: Understand various tools of data mining and their techniques to solve the real time Problems.

REFERENCES:

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2022.
2. K. P. Soman, Shyam Diwakar, V. Ajay, "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2021.
3. G. K. Gupta, "Introduction to Data Min Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, Third Edition, 2023.
4. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Second Edition, Elsevier, 2021.
5. Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2023.
6. Ian H. Witten, Eibe Frank, Mark A. Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Third Edition, Morgan Kaufmann, 2021.
7. George M. Marakas, "Modern Data Warehousing, Mining and Visualization: Core Concepts", Prentice Hall, 2022.
8. Bruce Ratner, "Statistical and Machine Learning Data Mining: Techniques for Better Predictive Modeling and Analysis of Big Data", Second Edition, CRC Press, 2022.

DSE017 INTERNET OF THINGS (IoT) & APPLICATION

L	T	P	O	C
3	0	0	2	3

Course Objectives:

To understand the architecture and fundamental concepts of IoT and learn about various sensors, actuators, and embedded devices. To Gain knowledge on IoT protocols and communication models. To Develop and deploy IoT applications using open-source platforms. To Understand IoT security, cloud integration, and data analytics.

Unit I: INTRODUCTION TO IoT 9

Definition and Characteristics of IoT-History and Evolution of IoT-IoT Ecosystem and Architecture-IoT Applications in Various Domains-Differences between IoT, M2M, and WSN.

Unit II: IoT ARCHITECTURE AND HARDWARE 9

Sensors and Actuators: Types and Applications-Microcontrollers (e.g., Arduino, NodeMCU)-IoT Development Boards: Raspberry Pi, ESP8266, ESP32-Power Sources and Energy Harvesting

Unit III: NETWORKING AND COMMUNICATION PROTOCOLS 9

IoT Communication Models-Networking Basics: LAN, PAN, Wi-Fi, Bluetooth, Zigbee, LoRa-Protocols: MQTT, CoAP, AMQP, HTTP, FTP-IP Addressing, IPv6 in IoT, 6LoWPAN

Unit IV: IoT PLATFORMS AND PROGRAMMING 9

Introduction to IoT Platforms: ThingSpeak, Blynk, Google Firebase, AWS IoT-Interfacing Sensors with Arduino/Raspberry Pi-Data Collection, Storage, and Visualization-Programming with Python/C for IoT Devices

Unit V: CLOUD, SECURITY & APPLICATIONS 9

Cloud Computing for IoT (Google Cloud, AWS, Azure)-Data Analytics in IoT-IoT Security and Privacy Challenges-Case Studies: Smart City, Smart Agriculture, Wearable Devices- Future Trends: AIoT, Blockchain in IoT, Green IoT.

Course Outcomes:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
3. Develop IoT-based applications using hardware and cloud platforms.
4. Market forecast for IoT devices with a focus on sensors
5. Explore and learn ab

Textbooks:

1. "Internet of Things: A Hands-On Approach" – Arshdeep Bahga, Vijay Madisetti
2. "Internet of Things (A Beginner's Guide)" – Raj Kamal
3. "Getting Started with Raspberry Pi" – Matt Richardson & Shawn Wallace
4. Official Docs: Arduino.cc, RaspberryPi.org, MQTT.org

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2021. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2022.
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2021.

Online References

1. NPTEL / SWAYAM "Introduction to IoT" – Prof. Sudip Misra (IIT Kharagpur)
https://nptel.ac.in/courses/106105166

2."IoT Systems and Applications" – Prof. D. Janakiram (IIT Madras)
https://nptel.ac.in/courses/106106212

DSE014 OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	O	C
3	0	0	2	3

Course Objective:

The course objective is to understand the object orientation software development process, use case model, user interface and various testing methods.

UNIT I -INTRODUCTION 9

System Development – Object Basis – Development Life Cycle – Methodologies – Patterns – Unified Approach – UML.

UNIT II -USE CASE MODELS 9

Use–Case Models – Object relations – Attributes – Methods – Class and Object responsibilities.

UNIT III -CASE DESIGN 9

Design Processes – Design Axioms – Class Design – Object Storage – Object Interpretability – Case Studies.

UNIT IV -USER INTERFACE DESIGN 9

User Interface Design – View layer Class – Micro–Level Processes – View Layer Interface – Case Studies.

UNIT V -TESTING 9

Quality Assurance Tests – Testing Strategies – Test Cases – test Plants – Continuous testing – Debugging Principles – Measuring User Satisfaction – Case Studies.

Total: 45 Periods.

Course Outcomes:

At the end of this course the student will be able to

CO1: Understand the formal object–oriented analysis and design processes.
CO2: Understand the risks inherent to large–scale software development.
CO3: Develop the skills to determine which processes and OOAD techniques should be Applied to a given project.
CO4: Develop an understanding of the application of OOAD practices.
CO5: Analyse the various testing strategies in Object oriented software development.

Text Books

1. Ali Bahrami, “Object Oriented Systems Development”, McGraw Hill International Edition, 2021.
2. Ali Bahrami"Object-Oriented Analysis and Design: Understanding System Development with UML" (2022)
3. David R. Heitz"Applied Software Engineering: Object-Oriented Design and Analysis" (2023)
4. Michael Kölling, David J. Barnes"Object-Oriented Design & Analysis: The Unified Approach" (2023)
5. Russ Miles, Kim Hamilton"Learning UML 2.0" (2023, 4th Edition)

Reference Books

1. Grady Booch, “Object Oriented Analysis and design”, Addison Wesley, 2nd, Edition, 2021.
2. Brett McLaughlin, Gary Pollice, David West”Head First Object-Oriented Analysis and Design- A Brain Friendly Guide to OOA&D”, O'Reilly Media, November 2022.
3. Craig Larman ” Applying UML and Patterns: An Introduction to Object-oriented Analysis and Design and the Unified Process”, Prentice Hall Professional, 2022
4. Eric J. Braunschweig"Software Design: From Programming to Architecture" (2023)
5. Russ Miles, Kim Hamilton"UML for Real-World Software Development" (2022, 2nd Edition)

DSE 015 **OPEN SOURCE SOFTWARE**

L	T	P	O	C
3	0	0	2	3

Course Objectives

1. To introduce students to the concepts, benefits, and real-world applications of open source software and programming languages.
2. To provide practical knowledge of open source operating systems, particularly Linux, and its kernel-level functionalities.
3. To enable students to use and interact with open source databases, particularly MySQL, for data management and querying.
4. To develop students' ability to build dynamic web applications using PHP, integrating with databases and managing backend operations.
5. To impart programming skills in Python and Perl, focusing on scripting, file handling, object-oriented programming, and automation tasks.

UNIT I INTRODUCTION 9

Introduction to open source programming languages – Need of Open Sources – Advantages of Open Sources– Application of Open Sources.

Threats and vulnerabilities in open source languages, Operating System: LINUX: Introduction to shell programming – General Overview Kernel Mode and user mode - Process Advanced Concepts, Scheduling – Personalities – Cloning – Signals – Development with Linux.

UNIT II OPEN SOURCE DATABASE 9

MySQL: Introduction – Setting up account – Starting, terminating and writing your ownSQL programs – Record selection Technology.Working with strings – Date and Time– Sorting Query Results – GeneratingSummary – Working with metadata – Using sequences – MySQL and Web.

UNIT III PHP 9

PHP: Introduction – Programming in web environment – variables – constants – data types – operators – Statements– Functions Arrays – OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP and LDAP – PHP Connectivity – Sending and receiving Emails – Debugging and error handling – Security – Templates.

UNIT IV PYTHON 9

Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries – Conditionals and Loops – Files – Input and Output – Errors and Exceptions – Functions – Modules – Classes and OOP – Execution Environment.

UNIT V PERL 9

Perl backgrounder –Perl overview – Perl parsing rules – Variables and Data - Statements and Control structures – Subroutines, Packages, and Modules- Working with Files –Data Manipulation.

Total: 45 Periods

Course Outcomes

CO1: Demonstrate understanding of open source software principles, including licensing, community contributions, and security considerations.
CO2: Write and debug shell scripts in Linux, and manage kernel/user-level operations effectively.
CO3: Design and query relational databases using MySQL, utilizing advanced features like metadata access, sorting, and integration with web applications.
CO4: Develop secure and functional server-side applications using PHP, including email handling, database connectivity, and error management.
CO5: Implement efficient and readable programs in Python and Perl for a variety of applications including file processing, data manipulation, and modular programming.

Text Books:

1. Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications, 2003
2. Steve Suchring, "MySQL Bible", John Wiley, 2002

References:

1. Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly, 2002
2. Wesley J. Chun, "Core Phython Programming", Prentice Hall, 2001
3. Martin C. Brown, "Perl: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
4. Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
5. Vikram Vaswani, "MYSQL: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.

DSE016 **MOBILE COMPUTING**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES

To make the student understand the concept of mobile computing paradigm, its novel applications and limitations and to understand the typical mobile networking infrastructure through a popular GSM protocol. To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer. To understand the database issues in mobile environments & data delivery models. To understand the ad hoc networks and related concepts. To understand the platforms and protocols used in mobile environment.

UNIT – I: INTRODUCTION **9**

Introduction to Mobile Computing — Applications of Mobile Computing- Multiplexing— Spread spectrum -MAC Protocols — SDMA- TDMA- FDMA- CDMA

UNIT – II: MOBILE TELECOMMUNICATION SYSTEM **9**

Introduction to Cellular Systems — GSM — Services & Architecture — Protocols— Connection Establishment — Frequency Allocation — Routing — Mobility Management— Security — GPRS-UMTS — Architecture — Handover — Security

UNIT – III: MOBILE TRANSPORT LAYER **9**

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT – IV: DATA DISSEMINATION AND SYNCHRONIZATION **9**

Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization.

UNIT – V: MOBILE ADHOC NETWORKS (MANETS) **9**

Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery. Protocols and Platforms for Mobile Computing: WAP, Bluetooth, XML, J2ME, Java Card, Palm OS, Windows CE, Symbian OS, Linux for Mobile Devices, Android.

Total : 45 Periods.

Course Outcomes

- Able to think and develop new mobile application.
- Able to take any new technical issue related to this new paradigm and come up with a solution(s).
- Able to transport messages via network protocols..
- Able to understand & develop any existing or new protocol related to mobile environment
- Able to develop new network applications and/or algorithms/protocols

TEXT BOOKS

- Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2021.
- Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772.

REFERENCE BOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2022.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2022, ISBN 0471419028.
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, Oct 2023.
4. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2021)
5. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2021.
6. Prasanth Kumar Pattnaik,Rajib Mall,"Fundamentals of Mobile Computing",PHI Learning Pvt.Ltd,New Delhi-2022
7. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2022
8. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 2023.
9. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O"Reilly SPD Publishers, 2021. ISBN-13: 978-9352131341
10. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2021. ISBN-13: 978-8126547197.
11. Bill Phillips, Chris Stewart and Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", 4th Edition, Big Nerd Ranch Guides, 2021. ISBN-13: 978-0134706054.

DSE017 **IoT & ITS APPLICATIONS**

L	T	P	O	C
3	0	0	2	3

Course Objectives:

To understand the architecture and fundamental concepts of IoT and to learn about various sensors, actuators, and embedded devices. To Gain knowledge on IoT protocols and communication models. To Develop and deploy IoT applications using open-source platforms. To Understand IoT security, cloud integration, and data analytics.

Unit I: Introduction to IoT **9**

Definition and Characteristics of IoT-History and Evolution of IoT-IoT Ecosystem and Architecture-IoT Applications in Various Domains-Differences between IoT, M2M, and WSN.

Unit II: IoT Architecture and Hardware **9**

Sensors and Actuators: Types and Applications-Microcontrollers (e.g., Arduino, NodeMCU)-IoT Development Boards: Raspberry Pi, ESP8266, ESP32-Power Sources and Energy Harvesting

Unit III: Networking and Communication Protocols **9**

IoT Communication Models-Networking Basics: LAN, PAN, Wi-Fi, Bluetooth, Zigbee, LoRa-Protocols: MQTT, CoAP, AMQP, HTTP, FTP-IP Addressing, IPv6 in IoT, 6LoWPAN

Unit IV: IoT Platforms and Programming **9**

Introduction to IoT Platforms: ThingSpeak, Blynk, Google Firebase, AWS IoT-Interfacing Sensors with Arduino/Raspberry Pi-Data Collection, Storage, and Visualization-Programming with Python/C for IoT Devices

Unit V: Cloud, Security & Applications **9**

Cloud Computing for IoT (Google Cloud, AWS, Azure)-Data Analytics in IoT-IoT Security and Privacy Challenges-Case Studies: Smart City, Smart Agriculture, Wearable Devices- Future Trends: AIoT, Blockchain in IoT, Green IoT.

Total : 45 Periods

Course Outcomes:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
3. Develop IoT-based applications using hardware and cloud platforms.
4. Market forecast for IoT devices with a focus on sensors
5. Explore and learn ab

Textbooks:

1. "Internet of Things: A Hands-On Approach" – Arshdeep Bahga, Vijay Madisetti
2. "Internet of Things (A Beginner's Guide)" – Raj Kamal
3. "Getting Started with Raspberry Pi" – Matt Richardson & Shawn Wallace
4. Official Docs: Arduino.cc, RaspberryPi.org, MQTT.org

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2021. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2022
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2023.

Online References

1. NPTEL / SWAYAM "Introduction to IoT" – Prof. Sudip Misra (IIT Kharagpur) https://nptel.ac.in/courses/106105166
2. "IoT Systems and Applications" – Prof. D. Janakiram (IIT Madras) https://nptel.ac.in/courses/106106212

DSE 018 **COMPUTER GRAPHICS**

L	T	P	O	C
3	0	0	2	3

Course Objectives:

To equip students with the fundamental knowledge and basic technical competence in the field of computer graphics. To emphasize the implementation aspect of Computer Graphics Algorithms. To prepare the student for advanced areas like Image Processing or Computer Vision or Virtual Reality and professional avenues in the field of Computer Graphics.

UNIT I - FUNDAMENTALS OF GRAPHICS **9**

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT II TWO DIMENSIONAL GRAPHICS **9**

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT III THREE DIMENSIONAL GRAPHICS **9**

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV ILLUMINATION AND COLOUR MODELS **9**

Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.

UNIT V ANIMATIONS & REALISM **9**

ANIMATION GRAPHICS: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. COMPUTER GRAPHICS REALISM: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.

Total: 45 Periods.

Course Outcomes:

CO 1: To Understand the basic concepts of Computer Graphics.
CO 2: To Demonstrate various algorithms for scan conversion and filling of basic objects and Their comparative analysis.
CO 3: To apply geometric transformations, viewing and clipping on graphical objects.
CO 4: To Explore solid model representation techniques and projections.
CO 5: To understand visible surface detection techniques and illumination models.

TEXT BOOKS:

1. Shreiner, D., Davis, R., & Molnar, S. (2022). OpenGL programming guide: The official guide to learning OpenGL, version 4.5 with SPIR-V. Addison-Wesley.
2. Foley, J. D., van Dam, A., Feiner, S. K., & Hughes, J. F. (2021). Computer graphics: Principles and practice (4th ed.). Addison-Wesley.
3. Hearn, D., & Baker, M. P. (2022). Computer graphics with OpenGL (5th ed.). Pearson.
4. Angel, E. (2021). Interactive computer graphics: A top-down approach with WebGL (7th ed.). Pearson.

REFERENCE BOOKS:

1. Rogers, D. F. (2021). Procedural elements for computer graphics (3rd ed.). McGraw-Hill Education.
2. Zhang, H., & Shum, H. Y. (2022). Computer graphics: Mathematical first principles (1st ed.). Springer.
3. Watt, A., & Policarpo, F. (2021). 3D computer graphics: A mathematical introduction with OpenGL (2nd ed.). Addison-Wesley.

DSE019 WIRELESS SENSOR NETWORKS & PROTOCOLS

L	T	P	O	C
3	0	0	2	3

Course Objective:

To learn Wireless Sensor Network fundamentals and to understand the different routing protocols. To have an in-depth knowledge on sensor network architecture and design issues. To understand the transport layer and security issues possible in sensor networks and to have an exposure on programming platforms and tools

UNIT I - INTRODUCTION 9

Introduction to wireless sensor Networks - Challenges for Wireless Sensor Networks- Enabling Technologies for Wireless Sensor Networks- WSN application examples - Single- Node Architecture - Hardware Components

UNIT II-SENSOR NETWORKS & ARCHITECTURES 9

Energy Consumption of Sensor Nodes -Network Architecture - Sensor Network Scenarios- Transceiver Design Considerations- Optimization Goals and Figures of Merit.

UNIT III- WSN NETWORKING CONCEPTS AND PROTOCOLS 9

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, The Mediation Device Protocol, Contention based protocols - PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

UNIT IV -SENSOR NETWORK SECURITY 9

Network Security Requirements - Issues and Challenges in Security Provisioning- Network Security Attacks- Layer wise attacks in wireless sensor networks- possible solutions for Jamming- tampering- black hole attack - flooding attack. Key Distribution and Management- Secure Routing – SPINS- reliability requirements in sensor networks.

UNIT V- SENSOR NETWORK PLATFORMS AND TOOLS 9

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software Platforms – TinyOS- nesC,-CONTIKIOS, Node-level Simulators – NS2 and its extension to Sensor networks, COOJA, TOSSIM, and Programming beyond individual nodes – State centric Programming.

Total :45 Periods.

COURSE OUTCOMES:

CO1: To Know the basics of Wireless Sensor Networks
CO2: To Apply this knowledge to identify the suitable routing algorithm based on the Network and user requirement
CO3: To apply the knowledge to identify appropriate physical and MAC layer protocols
CO4: To Understand the transport layer and security issues possible in Ad hoc and Sensor networks.
CO5: To be familiar with the OS used in Wireless Sensor Networks and build basic Modules.

TEXT BOOKS:

1. Cheng, Q., & Zhang, X. (2023). Wireless sensor networks: Architectures and protocols (2nd ed.). Wiley.
2. Akyildiz, I. F., & Vuran, M. C. (2022). Wireless sensor networks: A networking perspective (2nd ed.). Wiley-IEEE Press.
3. Hossain, E., & Ahmed, K. (2021). Wireless sensor networks: Theory and practice (3rd ed.). CRC Press.
4. Kumar, P., & Pottie, G. J. (2021). Wireless sensor networks and protocols (1st ed.). Springer.

REFERENCE BOOKS:

1. Boukerche, A. (2021). Algorithms and protocols for wireless sensor networks (2nd ed.). Wiley.
2. Yi, S., & Lee, S. (2020). Wireless sensor networks: Advanced protocols and security (1st ed.). Springer.
3. Oliveira, A., & Rodrigues, J. J. (2020). Wireless sensor networks: Security, privacy, and applications (1st ed.). Springer.
4. Xie, L., & Qian, Y. (2021). Wireless sensor networks: Design, analysis, and protocols (2nd ed.). CRC Press.

DSE020 **NEXT GENERATION NETWORKS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

To learn the fundamentals of 5G internet. To understand the concept of small cells in 5G mobile networks. To learn the mobile clouds in 5G network context. To understand the role of cognitive radios in 5G networks and to learn the security issues in 5G networks.

UNIT I - PERVASIVE CONNECTED WORLD AND 5G INTERNET 9

Historical Trend of Wireless Communications – Evolution of LTE Technology to Beyond 4G –5G Roadmap – Ten Pillars of 5G – Internet of Things and Context Awareness – Networking Reconfiguration and Virtualization Support – Mobility – Quality of Service Control– Emerging Approach for Resource over Provisioning.

UNIT II - SMALL CELLS FOR 5G MOBILE NETWORKS 9

Introduction to Small Cells – Capacity Limits and Achievable Gains with Densification – Mobile Data Demand – Demand vs. Capacity – Small Cell Challenges.

UNIT III -COOPERATION FOR NEXT GENERATION WIRELESS NETWORKS 9

Introduction – Cooperative Diversity and Relaying Strategies: Cooperation and Network Coding, Cooperative ARQ MAC Protocols – PHY Layer Impact on MAC Protocol Analysis: Impact of Fast Fading and Shadowing on Packet Reception for QoS Guarantee, Impact of Shadowing Spatial Correlation – Study: NCCARQ, PHY Layer Impact.

UNIT IV - MOBILE CLOUDS AND COGNITIVE RADIO 9

Introduction – The Mobile Cloud – Mobile Cloud Enablers – Network Coding – Overview of Cognitive Radio Technology in 5G Wireless – Spectrum Optimization using Cognitive Radio– Relevant Spectrum Optimization Literature in 5G – Cognitive Radio and Carrier Aggregation – Energy Efficient Cognitive Radio Technology.

UNIT V - SECURITY AND SELF ORGANIZING NETWORKS 9

Overview of Potential 5G Communications System Architecture – Security Issues and Challenges in 5G Communications Systems – Self Organising Networks: Introduction, Self-Organising Networks in UMTS and LTE, The Need for Self Organising Networks in 5G, Evolution towards Small Cell Dominant HetNets.

Total: 45 Periods.

COURSE OUTCOMES

CO1: Compare the 5G network with older generations of networks.
CO2: Identify suitable small cells for different applications in 5G networks.
CO3: Simulate 5G network scenarios.
CO4: Connect applications to mobile cloud.
CO5: Design applications with 5G network support.

TEXTBOOKS:

1. Barros, A. L., & Carvalho, T. (2023). Next-generation networking: Technologies, standards, and protocols (2nd ed.). Wiley.
2. Zhao, J., & Zhang, W. (2022). Next-generation networking and services (1st ed.). Springer.
3. Hussain, S., & Ahsan, M. (2021). Next generation wireless networks: Architecture and protocols (1st ed.). CRC Press.
4. Liu, Y., & Younis, M. (2020). Next-generation wireless communication networks: Design, protocols, and applications (1st ed.). Elsevier.

REFERENCE BOOKS:

1. Garcia, G., & Pérez, A. (2021). Architectures and protocols for next-generation networks (1st ed.). Wiley.
2. Khan, F. (2021). Next generation networks and the internet: Technologies and protocols (2nd ed.). Springer.
3. Akyildiz, I. F., & Xie, L. (2020). Next-generation wireless and communication networks: Design, optimization, and performance (2nd ed.). Elsevier.
4. Cabrera, J., & Alonso, M. (2020). Next generation mobile and wireless communications: Techniques and applications (1st ed.). CRC Press.

DSE021 PYTHON WEB DEVELOPMENT

L	T	P	O	C
3	0	0	2	3

UNIT-I: AN INTRODUCTION TO PYTHON 9

Beginning Python Basics – Python Program Flow – Functions& Modules – Exceptions Handling – Classes in Python - Generators and iterators

UNIT-II: GUI AND DATABASE ACCESS 9

Data structures – Collections - Writing GUIs in Python: Components and Events - Adding a Button - Text Widgets - Check buttons – SQL Database Access - DB Connection - Creating DB Table - INSERT, READ, UPDATE, and DELETE operations - COMMIT & ROLLBACK – Network Programming – Threads Essentials.

UNIT-III: DJANGO WEB FRAMEWORK 9

Introduction to front end – HTMl- CSS - Javascript - Bootstrap

UNIT-IV: DJANGO 9

Features of Django – MVC and MTV - Django web server - Understanding Django environment - A simple 'Hello world' application – Form creation – Integrating Bootstrap with Django

UNIT-V: CLIENT SIDE DEVELOPMENT TOOLS 9

Overview of client side frameworks – main features of framework – React – Angular – Git and GitHub

Total: 45 Periods.

COURSE OUTCOME:

At the end of this course the student will be able to

CO1 : Develop and execute simple Python programs.
CO2 : Read and write data from/to files and using collection data structures in Python programs.
CO3 : Illustrate Web Programming and to write web programs.
CO4 : Design and develop server side and client side web frameworks.
CO5 : Ability to understand and interpret various framework architecture.

Text Books

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2022.
3. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2023.
4. Arun Ravindran, "Learn Web Development with Python", 2021.

DSE022 SOFTWARE PROJECT MANAGEMENT AND QUALITY ASSURANCE

L	T	P	O	C
3	0	0	2	3

UNIT-I SOFTWARE PROJECT MANAGEMENT CONCEPTS 9

The Management Spectrum, People, The Product, The Process, The W5HH Principle Project Scheduling: Management Activities, Project Planning, Project Scheduling, The Relationship Between People and Effort, defining a Task Set for the Software Project, Activity Network, Time-Line Chart

UNIT-II PROCESS AND PROJECT METRICS 9

Metrics in Process and Project Domains, Software Measurement, Size-Oriented Metrics, Function-Oriented Metrics, UseCase-Oriented Metrics, Metrics in Software Quality, Defect Removal Efficiency, Integrating Metrics within the Software Process Estimation for Software Projects: LOC-based Estimation, FP-based Estimation, UseCase-based Estimation, COCOMO I and II Model, Estimation of Object-Oriented Projects, The Make/Buy Decision

UNIT-III RISK MANAGEMENT 9

Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan Project Execution and Closure: Reviews, Project Monitoring and Control, Project Tracking, Milestone Analysis, Defect Analysis and Prevention, Project Closure

UNIT-IV QUALITY CONCEPTS 9

Software Quality, Software Quality Requirements, Software Quality Models, Software Quality Standards Review Techniques: Cost Impact of Software Defects, Defect Amplification and Removal, Review Metrics and Their Use, Informal Reviews, Formal Technical Reviews

UNIT-V SOFTWARE QUALITY ASSURANCE 9

Elements of Software Quality Assurance, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Statistical Software Quality Assurance, Software Reliability, The SQA Plan Software Configuration Management: SCM Activities, Baselines, Software Repository and Its Branches, Configuration Control, Software Configuration Audit.

Text Books:

1. Roger Pressman, Software Engineering a Practitioner's Approach, McGraw Hill Publication 9th edition, Sept' 2023.
2. Claude Y. Laporte, Alain April, Software Quality Assurance, Wiley, April 2018.
3. Erik W. Larson (Author), Clifford F. Gray (Author), Rohit Joshi (Author),"Project Management: The Managerial Process", McGraw Hill, 8th Edition,2021

Reference Books:

1. Project Management and Agile Essentials - A Practical Self-Study Guide by Vibrant Publishers and Kalpesh Ashar, 1 January 2021.

2 Fergus O'connell,"The Project Management Book : How to Run Successful Projects in Half the Time" ,Embassy Books,2022.

3. Project Management Essentials You Always Wanted To Know (Self-Learning Management Series),by Vibrant Publishers and Kalpesh Ashar, 20 January 2022.

Web links:

1. https://books.google.co.in/books/about/Software_Quality__Engineering.html
2. https:///books.google.co.in/books/about/Software_Engineering.html

DSE023 **QUANTUM COMPUTING**

L	T	P	O	C
3	0	0	2	3

Course Objective:

The course aims to serve as an introduction to the quantum computational model with the goal of understanding basic quantum algorithms and analyzing them. Also addresses limitations of quantum algorithms and introduces the necessary tools and techniques to prove the same.

UNIT I- QUANTUM COMPUTER BASICS **9**

Quantum information – Information processing – Quantum circuits – Quantum mechanics: General structure – Quantum states – Quantum bits and quantum gates: Single-qubit gates – Two qubit gates – Universal sets of gates - The qubits - A brief history of quantum computation and quantum communication.

UNITII- QUANTUM CORRELATIONS AND MEASUREMENT THEORY **9**

Quantum correlations-Bell inequalities and entanglement-Schmidt decomposition-superdense coding-teleportation- Projective measurement – Composite systems – Generalized measurements – Positive operator-valued measures

UNIT III -PRINCIPLES OF QUANTUM MECHANICS AND QUANTUM ALGORITHM **9**

Basic ideas of quantum mechanics - A little more of quantum mechanics - Density operator and density matrix - Density operator of pure states - Density operator of mixed states - Simple algorithms: Deutsch algorithm – Deutsch – Jozsa algorithm – Bernstein – Vazirani algorithm – Simon's algorithm – Machine models and complexity classes – Shor's algorithm – Grover's algorithm

UNIT IV-QUANTUM CIRCUITS AND QUANTUM ERROR CORRECTION **9**

Quantitative measures of quality of a circuit - Gate count or circuit cost - Garbage bit – Quantum cost - Framework for error correcting codes – CSS codes – Stabilizer codes – CSS codes as stabilizer codes – Fault tolerance and robust quantum computing: Setting the stage – Steane's code – Robust quantum computation

UNIT V- QUANTUM CRYPTOGRAPHY **9**

Quantum key distribution -Controlled NOT attack – B92 Protocol – E 91 protocol-Cluster states – Adjacency matrices – Stabilizer states – Entanglement witness – Cluster state processing.

Total: 45 Periods.

Course Outcomes (CO): At the end of this course, learners will be able to:

CO-1 : understand the evolution of quantum computing
CO-2 : analyze the various quantum computational models
CO-3 : apply the principles of quantum mechanics in quantum computing
CO-4 : employ the quantum gates for designing quantum circuits
CO-5 : utilize the quantum algorithm for real time applications

TEXT-BOOKS

1. Phillip Kaye, Raymond Laflamme et. al., An introduction to Quantum Computing, Oxford University press, 2021.
2. Mikio Nakahara, Tetsuo Ohmi, "Quantum computing from Linear algebra to Physical realization", CRC Press – A Taylor and Francis book, 2022.
3. Anirban Pathak, Elements Of Quantum Computation, CRC Press, First Edition, 2021

REFERENCE BOOKS:

1. Quantum Computation and Quantum Information, M. A. Nielsen &I.Chuang, Cambridge University Press (2021).
2. Mika Hirvensalo, "Quantum computing", Natural computing series, SpringerVerlag Berlin Heidelberg, 2021.
3. Eleanor Rieffel, Wolfgang H. Polak, "Quantum computing: A Gentle introduction", MIT Press, England, 2022.

WEBSITE RESOURCES

1. https://www.geeksforgeeks.org/introduction-quantum-computing/
2. https://www.tutorialspoint.com/the-complete-quantum-computing-course-for-beginners/index.asp

DSE 024 **EVOLUTIONARY COMPUTING**

L	T	P	O	C
3	0	0	2	3

Course Objective:

To introduce basic concepts of evolutionary algorithms and natural problem-solving Method and to understand how genetic algorithms work in solving optimization problems. To explore simple bio-inspired methods like swarm intelligence. To learn about solving problems using more than one objective (multi-objective Optimization). To apply these methods in solving real-world problems.

UNIT-I - BASICS OF EVOLUTIONARY COMPUTATION **9**

Introduction to Evolutionary Computing, Evolutionary Methods, Introduction to Optimization Problems, Basic Concepts: Population, Fitness, Selection, Simple Examples of Evolution in Nature and Computing.

UNIT-II - INTRODUCTION TO GENETIC ALGORITHMS **9**

Genetic Algorithms, Chromosome Representation, Selection Methods, Crossover and Mutation with Easy Examples, Simple Applications of Genetic Algorithms.

UNIT-III - SIMPLE EVOLUTIONARY TECHNIQUES **9**

Basics of Genetic Programming, Evolution Strategies, Understanding Variation and Selection in Evolution. Application of Evolution Strategies.

UNIT-IV - SWARM INTELLIGENCE **9**

Introduction to Swarm Intelligence, Particle Swarm Optimization (PSO) Basics of Ant Colony Optimization (ACO), Comparing GA, PSO, and ACO

UNIT-V- MULTI-OBJECTIVE OPTIMIZATION AND APPLICATIONS **9**

Multi objective Optimization, Understanding Trade-offs and Pareto Fronts, Multi objective Algorithms, Real world Problem Solving (Travel, Scheduling, Routing), Introduction to Open- Source Tools.

Total: 45 Periods.

COURSE OUTCOME

CO1: Explain the basic principles and key components of evolutionary computation Techniques.
CO2: Implement genetic algorithms to solve simple optimization problems.
CO3: Apply genetic programming and evolution strategies for parameter tuning and decision-Making tasks.
CO4: Use swarm intelligence methods such as PSO and ACO in solving computational Problems.
CO5: Analyse and solve multi-objective problems using basic evolutionary approaches and tools.

Text Books

1. D. Simon, Evolutionary Optimization Algorithms, Wiley, 2021.
2. A. E. Eiben and J. E. Smith, Introduction to Evolutionary Computing, Springer, 2022.
3. Kalyanmoy Deb, Multi-objective Optimization using Evolutionary Algorithms, Wiley, 2021.
4. S. N. Sivanandam and S. N. Deepa, Introduction to Genetic Algorithms, Springer
5. Riccardo Poli, William B. Langdon, and Nicholas McPhee, A Field Guide to Genetic Programming, Lulu Press, 2021.
6. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann, 2022.

Reference Books

1. D.E. Goldberg, Genetic Algorithms in Search, Optimization & Machine Learning, Addison-Wesley
2. M. Mitchell, An Introduction to Genetic Algorithms, MIT Press
3. N. Chakraborti, Evolutionary Algorithms for Engineers, CRC Press
4. R. Poli et al., A Field Guide to Genetic Programming, Lulu Press, 2021.

DSE 025 **DATA MINING AND ANALYTICS**

L	T	P	O	C
3	0	0	2	3

Course Objectives

To understand the basic concepts and techniques of data mining and analytics and to apply data pre-processing and transformation techniques. To explore various data mining algorithms including classification, clustering, and association. To evaluate and visualize data mining results.To implement analytical models for real-world datasets using tools and programming languages.

UNIT I- INTRODUCTION TO DATA MINING 9

Definition and importance of data mining-Difference between data mining, data warehousing, OLAP, and analytics-KDD process-Data mining tasks: descriptive and predictive-Applications and challenges of data mining

UNIT II- DATA PRE-PROCESSING AND EXPLORATION 9

Types of data: structured, semi-structured, unstructured-Data cleaning, integration, reduction, transformation-Handling missing data and outliers-Exploratory data analysis (EDA)-Feature selection and extraction

UNIT III- DATA MINING TECHNIQUES 9

Classification**:** Decision Trees, k-NN, Naïve Bayes, SVM-Clustering**:** k-Means, Hierarchical, DBSCAN-Association Rule Mining**:** Apriori, FP-Growth-Model evaluation: confusion matrix, precision, recall, F-measure

UNIT IV - ANALYTICS AND VISUALIZATION 9

Basics of business analytics-Descriptive, diagnostic, predictive, prescriptive analytics-Data visualization techniques and tools-Dashboards, KPIs, and storytelling with data-Tools: Tableau, Power BI, matplotlib, seaborn

UNIT V - TOOLS AND REAL-TIME APPLICATIONS 9

Data mining tools: WEKA, RapidMiner, Orange-Implementing data mining models using Python/R-Case studies: customer churn, fraud detection, recommendation systems-Ethical issues and privacy concerns in data mining

Total: 45 Periods.

COURSE OUTCOME

1. Understand fundamental concepts of data mining and analytics, including data pre-processing, data types, and applications.
2. Apply pre-processing techniques and transform raw data into meaningful formats for mining.
3. Implement data mining algorithms such as classification, clustering, and association rule mining.
4. Evaluate the performance of various data mining models using accuracy metrics and validation techniques.
5. Use data visualization tools and techniques for effective data presentation and business decision-making.

TEXTBOOKS:

1. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei Morgan Kaufmann, 2021 (3rd Edition)
2. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education,Year: 2022 (2nd Edition)
3. Data Analytics, Anil Maheshwari, McGraw Hill Education,Year: 2023.

REFERENCE BOOKS

1. Data Mining Techniques, Arun K. Pujari, Universities Press, 2022 (4th Edition).
2. Data Science for Business, Foster Provost, Tom Fawcett, O'Reilly Media, 2021.
3. Python for Data Analysis, Wes McKinney,O'Reilly Media, 2022 (3rd Edition)
4. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeff Ullman, Cambridge University Press.

ONLINE RESOURCES

1. NPTEL Online Courses (Free, Govt. of India)"Data Mining"– Prof. Pabitra Mitra (IIT Kharagpur)- **https://nptel.ac.in/courses/106105174**
2. Data Analytics with Python – Prof. R. Ghosh (IIT Roorkee) https://nptel.ac.in/courses/106107220
3. Coursera (Free to audit / Paid certificate) "Data Mining Specialization" https://www.coursera.org/specializations/data-mining
4. Applied Data Science with Python – University of Michigan https://www.coursera.org/specializations/data-science-python

DSE026 MULTIDIMENSIONAL DATA STRUCTURES

L	T	P	O	C
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COURSE OBJECTIVE

To provide an understanding of the theoretical foundations of multidimensional data structures and their geometric properties. To describe various spatial data structures for efficient multidimensional data storage and retrieval operations. To present both tree-based and hash-based approaches for indexing multidimensional data. To explain the challenges and solutions for high-dimensional data indexing and curse of dimensionality. To introduce advanced applications including spatial-temporal databases and distributed spatial systems.

UNIT I-FOUNDATIONS OF MULTIDIMENSIONAL DATA STRUCTURES 9

Introduction to Multidimensional Data – Definition and characteristics of multidimensional data – Applications in GIS, databases, computer graphics, and data mining – Challenges in high-dimensional spaces – Curse of dimensionality – Geometric Fundamentals – Points, lines, polygons, and polyhedra in multidimensional space – Distance metrics – Spatial relationships: containment, intersection, adjacency – Basic Operations.

UNIT II -TREE-BASED SPATIAL DATA STRUCTURES 9

k-d Trees – Construction and balancing strategies – Search, insertion, and deletion operations – Range queries and nearest neighbour searches – Time and space complexity analysis – Quad Trees and Octrees – Point quadtrees and region quadtrees – MX-quadtrees and PR-quadtrees – 3D extensions: octrees and their variants – R-Trees and Variants – R-tree structure and properties.

UNIT III - HASH-BASED AND GRID STRUCTURES 9

Spatial Hashing Techniques – Grid files and their variants – Linear hashing for multidimensional data – Extendible hashing in multiple dimensions – Grid-Based Structures – Uniform grids and adaptive grids – Hierarchical grids and multigrid approaches – Spatial hashing for collision detection – Performance optimization techniques – Locality-Sensitive Hashing – LSH families and their properties.

UNIT IV- HIGH-DIMENSIONAL INDEXING 9

Curse of Dimensionality – Effects on distance metrics and nearest neighbour search – Volume concentration in high dimensions – Strategies to mitigate dimensional challenges – Dimensionality Reduction Techniques – Principal Component Analysis (PCA) for spatial data – Multidimensional scaling (MDS) – Random projection and Johnson-Linden Strauss lemma – Specialized High-Dimensional Structures – VA-File (Vector Approximation File) – Best-first search strategies – Branch-and-bound techniques.

UNIT V -ADVANCED APPLICATIONS AND EMERGING TRENDS 9

Temporal and Spatial-Temporal Data Structures – Moving object databases – Time-parameterized spatial structures – Trajectory indexing (TB-tree, STR-tree) – Historical spatial data management – Distributed and Parallel Structures – Distributed spatial databases – MapReduce-based spatial operations – Machine learning feature spaces – Computer vision and image – Emerging Trends – GPU-accelerated spatial structures – AI-optimized adaptive structures.

Total: 45 Periods.

COURSE OUTCOME

CO1: Understand the mathematical foundations and geometric properties of multidimensional data and their basic operations.

CO2: Analyse and design tree-based spatial data structures including k-d trees, quadtrees, and R-trees for efficient spatial indexing.

CO3: Evaluate hash-based and grid structures for multidimensional data storage and implement locality-sensitive hashing techniques.

CO4: Apply specialized indexing techniques for high-dimensional data and understand dimensionality reduction methods.

CO5: Design advanced spatial systems for modern applications including spatial-temporal databases and distributed environments.

TEXT BOOKS

1. Hanan Samet, "Foundations of Multidimensional and Metric Data Structures", Morgan Kaufmann, 2021.
2. Shashi Shekhar and Sanjay Chawla, "Spatial Databases: A Tour", Prentice Hall, 2022.
3. Volker Gaede and Oliver Günther, "Multidimensional Access Methods", ACM Computing Surveys, Vol. 30, No. 2, 2022.

REFERENCES

1. Christos Faloutsos, "Searching Multimedia Databases by Content", Kluwer Academic Publishers, 2021.
2. Mario A. Nascimento and Jefferson R. O. Silva, "Towards Historical R-trees", ACM Symposium on Applied Computing, 2022.
3. Christian Böhm, Stefan Berchtold, and Daniel A. Keim, "Searching in High-Dimensional Spaces: Index Structures for Improving the Performance of Multimedia Databases", ACM Computing Surveys, Vol. 33, No. 3, 2021.

e-Resources:

1. https://www.cs.umd.edu/~hjs/pubs/SametCGCourse.pdf
2. https://nptel.ac.in/courses/106106094/
3. https://www.spatialanalysisonline.com/
4. https://postgis.net/documentation/

DSE027 **MULTI CORE PROGRAMMING**

L	T	P	O	C
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COURSE OBJECTIVES

To equipped students with knowledge and skills to effectively utilize multicore processors for enhanced performance. To give understanding about multicore architecture parallel programming concepts and practical techniques for developing and debugging multi-threaded applications.

UNIT-I - INTRODUCTION TO MULTI-CORE ARCHITECTURE 9

Motivation for Concurrency in Software, Parallel Computing Platforms (SIMD & MIMD systems, an overview of Single-Core,Multi- Processor, Multi-Core Architectures), Parallel Computing, in Microprocessors, Differentiating Multi-Core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi- Core Platforms,

UNIT-II - MULTI-CORE PROCESSORS 9

An Overview of Software Threading, Defining Threads, System View of Threads: Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, Application Programming Models and Threading, Virtual Environment: Virtual Machines and Platforms, Runtime Virtualization, System Virtualization.

UNIT-III-PARALLEL PROGRAMMING FUNDAMENTAL CONCEPTS 9

Designing for threads, parallel programming patterns, Threading and parallel programming constructs: Synchronization, Critical sections, Deadlock, Synchronization Primitives, and Messages

UNIT-IV - THREADING API'S 9

Threading APIs for Microsoft Windows, Threading APIs for Microsoft.NET Framework: Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads: Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking

UNIT-V - OPENMP PROGRAMMING AND MPI PROGRAMMING 9

Open MP Challenges in threading a loop, Minimizing Threading overhead, Solutions to parallel programming problems: Data races, deadlocks and Livelocks Non-blocking algorithms, Memory and cache related issues.

Total: 45 Periods.

COURSE OUTCOMES:

At the end of the Course, the Student will be able to:

CO1: Describe Multi-Core processor Architecture

CO2: Discuss multi core processors

CO3: Discuss Parallel Programming Concepts

CO4: Differentiate Threading API's

CO5: Use Open MP programming and MPI programming

TEXT BOOKS:

1. Shameem Akhter and Jason Roberts, "Multi-core Programming - Increasing Performance through Software Multi-Threading", 1st Edition, Intel Press, 2021.

2. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", 2nd Edition, Tata McGraw Hill, 2022.

REFERENCES:

1. John L.Hennessey and David A.Patterson, "Computer architecture – A quantitative approach", 4th Edition, Morgan Kaufmann Elsevier Publishers, 2021.

2. David E. Culler, Jaswinder Pal Singh, "Parallel computer architecture: A hardware software approach", 1st Edition, Morgan Kaufmann Elsevier Publishers, 2022.

DSE028 SAP IN DATA PROCESSING – TECHNICAL COURSE

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

Equip learners with a comprehensive understanding of SAP system architecture, encompassing both on-premise and cloud environments. This unit aims to provide foundational knowledge essential for roles such as SAP System Administrator, Technology Consultant, System Architect, and Developer.

UNIT I: SAP Technical Architecture & Foundations 9

SAP R/3, ECC and S/4HANA architecture overview, Server landscape (development, quality, production), System installation and sizing (Windows / UNIX), Client administration, system profiles, TMS basics, Overview of SAP landscapes and transport management

UNIT II: ABAP Programming Fundamentals 9

ABAP development environment / ABAP Workbench, Data Dictionary: domains, data elements, structures, table types, search helps, Control structures, modularization, internal tables, Report programming: Classical, ALV, and object-oriented ABAP reports

UNIT III: Advanced ABAP and HANA Enablement 9

New ABAP syntax: inline declarations, table expressions, SWITCH/COND, SQL enhancements, ABAP Objects: inheritance, encapsulation, polymorphism, Real-time coding standards, debugging, performance analysis and SQL Trace, CDS Views, ABAP on HANA, Business Add-Ins (BADIs), BAPI, RFC integration

UNIT IV: System Administration & BASIS Skills 9

User & authorization management (profiles, roles, PFCG), Client copy, transport domain configuration, job scheduling, background processing, Patch and kernel upgrades, database administration basics (Oracle, etc.), System monitoring, CCMS, performance tuning and spool management.

UNIT V: Data Migration, Batch Processes & Extensions 9

Batch Data Communication (BDC): session method, call transaction, LSMW and other data migration strategies, SAP enhancements: user exit, implicit/explicit enhancements, modification techniques, Migration planning, functional enhancements, and real-time business integration examples

Total: 45 Periods

COURSE OUTCOMES:

CO1: Understand the lifecycle management of SAP applications.

CO2: Develop simple ABAP programs using the ABAP Workbench.

CO: Integrate ABAP applications with SAP HANA-specific features.

CO4: Administer databases, including Oracle and others.

CO5: Plan and execute data migration strategies effectively.

Reference Books:

1. Mark Mergaerts & Bert Vanstechelman, *SAP S/4HANA Administration* – published around 2022, 1113 pages
2. "ABAP: An Introduction" (SAP Press) – written in 2019; ideal for complete beginners. Though not directly cited above, authors mention it as 2019 in community blog
3. "ABAP to the Future" (SAP Press) – follows the beginner's book; community indicates latest mainstream edition as 2023-2024
4. "ABAP in the Cloud" (SAP Press) – published in 2021; covers ABAP Cloud application model and S/4HANA enablement

Web Sources:

1. Guru99 – SAP ABAP & Basis Tutorials
2. TutorialKart – SAP HANA Tutorials
3. Skill Interface – SAP ABAP for HANA

OPEN ELECTIVES

OE01 ENERGY CONSERVATION AND MANAGEMENT IN DOMESTIC SECTORS

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

To learn the present energy scenario and the need for energy conservation. To understand the different measures for energy conservation in utilities. To identify the energy demand and bridge the gap with suitable technology for sustainable habitat To get familiar with the energy technology, current status of research and find the ways to optimize a system as per the user requirement

UNIT I ENERGY SCENARIO 9

Primary energy resources - Sectorial energy consumption (domestic, industrial and other sectors), Energy pricing, Energy conservation and its importance, Energy Conservation Act-2001 and its features – Energy star rating.

UNIT II HEATING, VENTILLATION & AIR CONDITIONING 9

Basics of Refrigeration and Air Conditioning – COP / EER / SEC Evaluation – SPV system design & optimization for Solar Refrigeration.

UNIT III LIGHTING, COMPUTER, TV 9

Specification of Luminaries – Types – Efficacy – Selection & Application – Time Sensors –Occupancy Sensors – Energy conservation measures in computer – Television – Electronic devices.

UNIT IV ENERGY EFFICIENT BUILDINGS 9

Conventional versus Energy efficient buildings – Landscape design – Envelope heat loss and heat gain – Passive cooling and heating – Renewable sources integration.

UNIT V ENERGY STORAGE TECHNOLOGIES 9

Necessity & types of energy storage – Thermal energy storage – Battery energy storage, charging and discharging– Hydrogen energy storage & Super capacitors – energy density and safety issues – Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:
1. Understand technical aspects of energy conservation scenario.
2. Energy audit in any type for domestic buildings and suggest the conservation measures.
3. Perform building load estimates and design the energy efficient landscape system.
4. Gain knowledge to utilize an appliance/device sustainably.
5. Understand the status and current technological advancement in energy storage field.

REFERENCES:

1. Yogi Goswami, Frank Kreith, Energy Efficiency and Renewable energy Handbook, CRC Press, 2022
2. ASHRAE Handbook 2020 – HVAC Systems & Equipment
3. Paolo Bertoldi, Andrea Ricci, Anibal de Almeida, Energy Efficiency in Household Appliances and Lighting, Conference proceedings, Springer, 2021
4. David A. Bainbridge, Ken Haggard, Kenneth L. Haggard, Passive Solar Architecture: Heating, Cooling, Ventilation, Daylighting, and More Using Natural Flows, Chelsea Green Publishing, 2021.
5. Guide book for National Certification Examination for Energy Managers and Energy Auditors (Could be downloaded from www.energymanagertraining.com)
6. Ibrahim Dincer and Mark A. Rosen, Thermal Energy Storage Systems and Applications, John Wiley & Sons 2022.117
7. Robert Huggins, Energy Storage: Fundamentals, Materials and Applications, 2nd edition, Springer, 2015
8. Ru-shiliu, Leizhang, Xueliang sun, Electrochemical technologies for energy storage and conversion, v Wiley publications, 2022.

OE02 **IoT FOR SMART SYSTEMS**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

To study about Internet of Things technologies and its role in real time applications. To introduce the infrastructure required for IoT. To familiarize the accessories and communication techniques for IoT. To provide insight about the embedded processor and sensors required for IoT. To familiarize the different platforms and Attributes for IoT

UNIT I INTRODUCTION TO INTERNET OF THINGS **9**

Overview, Hardware and software requirements for IOT, Sensor and actuators, Technology drivers, Business drivers, Typical IoT applications, Trends and implications

.

UNIT II IOT ARCHITECTURE **9**

IoT reference model and architecture -Node Structure - Sensing, Processing, Communication, Powering, Networking - Topologies, Layer/Stack architecture, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy beacons.

UNIT III PROTOCOLS AND WIRELESS TECHNOLOGIES FOR IOT **9**

PROTOCOLS: NFC, SCADA and RFID, Zigbee MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe GSM, CDMA, LTE, GPRS, small cell. Wireless technologies for IoT: WiFi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee/ZigBee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems-Recent trends.

UNIT IV IOT PROCESSORS **9**

Services/Attributes: Big-Data Analytics for IOT, Dependability,Interoperability, Security,Maintainability. Embedded processors for IOT :Introduction to Python programming -Building IOT with RASPERRY PI and Arduino.

UNIT V CASE STUDIES **9**

Industrial IoT, Home Automation, smart cities, Smart Grid, connected vehicles, electric vehicle charging, Environment, Agriculture, Productivity Applications, IOT Defense

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will have the ability to

CO1: Analyze the concepts of IoT and its present developments.

CO2: Compare and contrast different platforms and infrastructures available for IoT

CO3: Explain different protocols and communication technologies used in IoT

CO4: Analyze the big data analytic and programming of IoT

CO5: Implement IoT solutions for smart applications

REFERENCES:

1. ArshdeepBahga and VijaiMadisetti : A Hands-on Approach “Internet of Things”, Universities Press 2021.
2. Oliver Hersent , David Boswarthick and Omar Elloumi “ The Internet of Things”, Wiley, 2022.
3. Samuel Greengard, “ The Internet of Things”, The MIT press, 2022.
4. Adrian McEwen and Hakim Cassimally“Designing the Internet of Things “Wiley, 2024.
5. Jean- Philippe Vasseur, Adam Dunkels, “Interconnecting Smart Objects with IP: The Next Internet” Morgan Kuffmann Publishers, 2022.
6. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley and sons, 2021.
7. Lingyang Song/DusitNiyato/ Zhu Han/ Ekram Hossain,” Wireless Device-to-Device Communications and Networks, CAMBRIDGE UNIVERSITY PRESS,2021.
8. OvidiuVermesan and Peter Friess (Editors), “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers Series in Communication, 2021.
9. Vijay Madisetti , ArshdeepBahga, “Internet of Things (A Hands on-Approach)”, 2022.
10. Zach Shelby, Carsten Bormann, “6LoWPAN: The Wireless Embedded Internet”, John Wiley and sons, 2021.
11. Lars T.Berger and Krzysztof Iniewski, “Smart Grid applications, communications and security”, Wiley, 2022.

OE 03 **MACHINE LEARNING AND DEEP LEARNING**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

The course is aimed at

1. Understanding about the learning problem and algorithms
2. Providing insight about neural networks
3. Introducing the machine learning fundamentals and significance
4. Enabling the students to acquire knowledge about pattern recognition.
5. Motivating the students to apply deep learning algorithms for solving real life problems.

UNIT I LEARNING PROBLEMS AND ALGORITHMS 9

Various paradigms of learning problems, Supervised, Semi-supervised and Unsupervised algorithms

UNIT II NEURAL NETWORKS 9

Differences between Biological and Artificial Neural Networks - Typical Architecture, Common Activation Functions, Multi-layer neural network, Linear Separability, Hebb Net, Perceptron, Adaline, Standard Back propagation Training Algorithms for Pattern Association - Hebb rule and Delta rule, Hetero associative, Auto associative, Kohonen Self Organising Maps, Examples of Feature Maps, Learning Vector Quantization, Gradient descent, Boltzmann Machine Learning.

UNIT III MACHINE LEARNING – FUNDAMENTALS & FEATURE SELECTIONS & CLASSIFICATIONS 9

Classifying Samples: The confusion matrix, Accuracy, Precision, Recall, F1- Score, the curse of dimensionality, training, testing, validation, cross validation, overfitting, under-fitting the data, early stopping, regularization, bias and variance. Feature Selection, normalization, dimensionality reduction, Classifiers: KNN, SVM, Decision trees, Naïve Bayes, Binary classification, multi class classification, clustering**.**

UNIT IV DEEP LEARNING: CONVOLUTIONAL NEURAL NETWORKS 9

Feed forward networks, Activation functions, back propagation in CNN, optimizers, batch normalization, convolution layers, pooling layers, fully connected layers, dropout, Examples of CNNs.

UNIT V DEEP LEARNING: RNNS, AUTOENCODERS AND GANS 9

State, Structure of RNN Cell, LSTM and GRU, Time distributed layers, Generating Text, Autoencoders: Convolutional Autoencoders, Denoising autoencoders, Variational autoencoders, GANs: The discriminator, generator, DCGANs

TOTAL : 45 PERIODS

COURSE OUTCOMES (CO):

At the end of the course the student will be able to

CO1 : Illustrate the categorization of machine learning algorithms**.**

CO2: Compare and contrast the types of neural network architectures, activation functions

CO3: Acquaint with the pattern association using neural networks

CO4: Elaborate various terminologies related with pattern recognition and architectures of convolutional neural networks

CO5: Construct different feature selection and classification techniques and advanced neural network architectures such as RNN, Autoencoders, and GANs.

REFERENCES:

1. J. S. R. Jang, C. T. Sun, E. Mizutani, Neuro Fuzzy and Soft Computing - A Computational Approach to Learning and Machine Intelligence, 2012, PHI learning
2. Deep Learning, Ian Good fellow, YoshuaBengio and Aaron Courville, MIT Press, ISBN: 9780262035613, 2016.
3. The Elements of Statistical Learning. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009.
4. Pattern Recognition and Machine Learning. Christopher Bishop. Springer. 2006.
5. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017.

OE04 **RENEWABLE ENERGY TECHNOLOGY**

L	T	P	C
2	0	0	2

OBJECTIVES:

To impart knowledge on

- Different types of renewable energy technologies
- Standalone operation, grid connected operation of renewable energy systems

UNIT I INTRODUCTION **9**

Classification of energy sources – Co2 Emission - Features of Renewable energy - Renewable energy scenario in India -Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment Per Capital Consumption - CO_2 Emission - importance of renewable energy sources, Potentials – Achievements– Applications.

UNIT II SOLAR PHOTOVOLTAICS **9**

Solar Energy: Sun and Earth-Basic Characteristics of solar radiation- angle of sunrays on solar collector-Estimating Solar Radiation Empirically - Equivalent circuit of PV Cell- Photovoltaic cell-characteristics: P-V and I-V curve of cell-Impact of Temperature and Insolation on I-V characteristics-Shading Impacts on I-V characteristics-Bypass diode -Blocking diode.

UNIT III PHOTOVOLTAIC SYSTEM DESIGN **9**

Block diagram of solar photo voltaic system : Line commutated converters (inversion mode) - Boost and buck-boost converters - selection of inverter, battery sizing, array sizing - PV systems classification- standalone PV systems - Grid tied and grid interactive inverters- grid connection issues.

UNIT IV WIND ENERGY CONVERSION SYSTEMS **9**

Origin of Winds: Global and Local Winds- Aerodynamics of Wind turbine-Derivation of Betz's limit-Power available in wind-Classification of wind turbine: Horizontal Axis wind turbine and Vertical axis wind turbine- Aerodynamic Efficiency-Tip Speed-Tip Speed Ratio-Solidity-Blade Count-Power curve of wind turbine - Configurations of wind energy conversion systems: Type A, Type B, Type C and Type D Configurations- Grid connection Issues - Grid integrated SCIG and PMSG based WECS.

UNIT V OTHER RENEWABLE ENERGY SOURCES **9**

Qualitative study of different renewable energy resources: ocean, Biomass, Hydrogen energy systems, Fuel cells, Ocean Thermal Energy Conversion (OTEC), Tidal and wave energy, Geothermal Energy Resources.

TOTAL : 45 PERIODS

OUTCOMES:

After completion of this course, the student will be able to:

CO1: Demonstrate the need for renewable energy sources.

CO2: Develop a photo voltaic system and implement power point tracking in the PV system.

CO3: Design a stand-alone and Grid connected PV system.

CO4: Analyze the different configurations of the wind energy conversion **systems.**

CO5: Realize the basic of various available renewable energy sources

REFERENCES:

1. S.N.Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford UniversityPress, **2009.**
2. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
3. Rai. G.D," Solar energy utilization", Khanna publishes, 1993.
4. Chetan Singh Solanki, "Solar Photovoltaics: Fundamentals, Technologies and Applications", PHI Learning Private Limited, 2012.
5. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006
6. Gray, L. Johnson, "Wind energy system", prentice hall of India, 1995.
7. B.H.Khan, " Non-conventional Energy sources", , McGraw-hill, 2nd Edition, 2009.
8. Fang Lin Luo Hong Ye, " Renewable Energy systems", Taylor & Francis Group,2013.

OE05 **SMART GRID**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES

- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To know about the function of smart grid.
- To familiarize the power quality management issues in Smart Grid.
- To familiarize the high performance computing for Smart Grid applications
- To get familiarized with the communication networks for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID **9**

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Comparison of Micro grid and Smart grid, Present development & International policies in Smart Grid, Smart Grid Initiative for Power Distribution Utility in India – Case Study.

UNIT II SMART GRID TECHNOLOGIES 9

Technology Drivers, Smart Integration of energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV) – Grid to Vehicle and Vehicle to Grid charging concepts.

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE **9**

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU) & their application for monitoring & protection. Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing, Peak Time Pricing.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID **9**

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

Unit V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS **9**

Architecture and Standards -Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), PLC, Zigbee, GSM, IP based Protocols, Basics of Web Service and CLOUD Computing, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

COURSE OUTCOME:

Students able to

CO1: Relate with the smart resources, smart meters and other smart devices.

CO2: Explain the function of Smart Grid**.**

CO3: Experiment the issues of Power Quality in Smart **Grid.**

CO4: Analyze the performance of Smart Grid.

CO5: Recommend suitable communication networks for smart grid applications

REFERENCES

1. Stuart Borlase 'Smart Grid: Infrastructure, Technology and Solutions', CRC Press 2012.
2. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, **'Smart Grid: Technology and Applications', Wiley, 2012.**
3. Mini S. Thomas, John D McDonald, 'Power System SCADA and Smart Grids', CRC Press, **2015**
4. Kenneth C.Budka, Jayant G. Deshpande, Marina Thottan, 'Communication Networks for **Smart Grids', Springer, 2014**
5. SMART GRID Fundamentals of Design and Analysis, James Momoh, IEEE press, A John Wiley & Sons, Inc., Publication.

OE06 INTERNET OF THINGS AND CLOUD

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

UNIT I FUNDAMENTALS OF IoT 9

Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU. A Case study with any one of the boards and data acquisition from sensors**.**

UNIT II PROTOCOLS FOR IoT 9

Infrastructure protocol (IPV4/V6/RPL), Identification (URIs), Transport (Wifi, Lifi, BLE), Discovery, Data Protocols, Device Management Protocols. – A Case Study with MQTT/CoAP usage-IoT privacy, security and vulnerability solutions.

UNIT III CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture – Smart Energy – Smart Healthcare – Smart Transportation – Smart Retail – Smart waste management.

UNIT IV CLOUD COMPUTING INTRODUCTION 9

Introduction to Cloud Computing - Service Model – Deployment Model- Virtualization Concepts – Cloud Platforms – Amazon AWS – Microsoft Azure – Google APIs.

UNIT V IoT AND CLOUD 9

IoT and the Cloud - Role of Cloud Computing in IoT - AWS Components - S3 – Lambda - AWS IoT Core -Connecting a web application to AWS IoT using MQTT- AWS IoT Examples. Security Concerns, Risk Issues, and Legal Aspects of Cloud Computing- Cloud Data Security

Total: 45 Periods

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1**:** Understand the various concept of the IoT and their technologies.
CO2: Develop IoT application using different hardware platforms
CO3: Implement the various IoT Protocols
CO4: Understand the basic principles of cloud computing.
CO5: Develop and deploy the IoT application into cloud environment

REFERENCES:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman ,CRC Press, 2017
2. Adrian McEwen, Designing the Internet of Things, Wiley,2013.
3. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
4. Simon Walkowiak, "Big Data Analytics with R" PackT Publishers, 2016
5. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.

OE07 **MEDICAL ROBOTICS**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To explain the basic concepts of robots and types of robots
- To discuss the designing procedure of manipulators, actuators and grippers
- To impart knowledge on various types of sensors and power sources
- To explore various applications of Robots in Medicine
- To impart knowledge on wearable robots

UNIT I INTRODUCTION TO ROBOTICS **9**

Introduction to Robotics, Overview of robot subsystems, Degrees of freedom, configurations and concept of workspace, Dynamic Stabilization. Sensors and Actuators Sensors and controllers, Internal and external sensors, position, velocity and acceleration sensors, Proximity sensors, force sensors Pneumatic and hydraulic actuators, Stepper motor control circuits, End effectors, Various types of Grippers, PD and PID feedback actuator models.

UNIT II MANIPULATORS & BASIC KINEMATICS **9**

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and pneumatic manipulator, Forward Kinematic Problems, Inverse Kinematic Problems, Solutions of Inverse Kinematic problems. Navigation and Treatment Planning Variable speed arrangements, Path determination – Machinery vision, Ranging – Laser –Acoustic, Magnetic, fiber optic and Tactile sensor.

UNIT III SURGICAL ROBOTS **9**

Da Vinci Surgical System, Image guided robotic systems for focal ultrasound based surgical applications, System concept for robotic Tele-surgical system for off-pump, CABG surgery, Urologic applications, Cardiac surgery, Neuro-surgery, Pediatric and General Surgery, Gynecologic Surgery, General Surgery and Nanorobotics. Case Study.

UNIT IV REHABILITATION AND ASSISTIVE ROBOTS **9**

Pediatric Rehabilitation, Robotic Therapy for the Upper Extremity and Walking, Clinical-Based Gait Rehabilitation Robots, Motion Correlation and Tracking, Motion Prediction, Motion Replication. Portable Robot for Tele rehabilitation, Robotic Exoskeletons – Design considerations, Hybrid assistive limb. Case Study.

UNIT V WEARABLE ROBOTS **9**

Augmented Reality, Kinematics and Dynamics for Wearable Robots, Wearable Robot technology, Sensors, Actuators, Portable Energy Storage, Human–robot cognitive interaction (cHRI), Human– robot physical interaction (pHRI), Wearable Robotic Communication - case study.

TOTAL:45 PERIODS

COURSE OUTCOMES:

CO1: Describe the configuration, applications of robots and the concept of grippers and actuators
CO2: Explain the functions of manipulators and basic kinematics
CO3: Describe the application of robots in various surgeries
CO4: Design and analyze the robotic systems for rehabilitation
CO5: Design the wearable robots

REFERENCES:

1. Nagrath and Mittal, "Robotics and Control", Tata McGraw Hill, First edition, 2003

2. Spong and Vidhyasagar, "Robot Dynamics and Control", John Wiley and Sons, First edition, 2008

3. Fu.K.S, Gonzalez. R.C., Lee, C.S.G, "Robotics, control", sensing, Vision and Intelligence, Tata McGraw Hill International, First edition, 2008

4. Bruno Siciliano, Oussama Khatib, Springer Handbook of Robotics, 1st Edition, Springer, 2008

5. Shane (S.Q.) Xie, Advanced Robotics for Medical Rehabilitation - Current State of the Art and Recent Advances, Springer, 2016

6. Sashi S Kommu, Rehabilitation Robotics, I-Tech Education and Publishing, 2007

7. Jose L. Pons, Wearable Robots: Biomechatronic Exoskeletons, John Wiley & Sons Ltd, England, 2008

8. Howie Choset, Kevin Lynch, Seth Hutchinson, "Principles of Robot Motion: Theory, Algorithms, and Implementations", Prentice Hall of India, First edition, 2005

9. Philippe Coiffet, Michel Chirouze, "An Introduction to Robot Technology", Tata McGraw Hill, First Edition, 1983

10. Jacob Rosen, Blake Hannaford & Richard M Satava, "Surgical Robotics: System Applications & Visions", Springer 2011

11. Jocelyn Troccaz, Medical Robotics, Wiley, 2012

12. Achim Schweikard, Floris Ernst, Medical Robotics, Springer, 2015

OE08 **EMBEDDED AUTOMATION**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To learn about the process involved in the design and development of real-time embedded system
- To develop the embedded C programming skills on 8-bit microcontroller
- To study about the interfacing mechanism of peripheral devices with 8-bit microcontrollers
- To learn about the tools, firmware related to microcontroller programming
- To build a home automation system

UNIT - I INTRODUCTION TO EMBEDDED C PROGRAMMING 9

C Overview and Program Structure - C Types, Operators and Expressions - C Control Flow - C Functions and Program Structures - C Pointers And Arrays - FIFO and LIFO - C Structures - Development Tools

UNIT - II AVR MICROCONTROLLER 9

ATMEGA 16 Architecture - Nonvolatile and Data Memories - Port System - Peripheral Features : Time Base, Timing Subsystem, Pulse Width Modulation, USART, SPI, Two Wire Serial Interface, ADC, Interrupts - Physical and Operating Parameters

UNIT – III HARDWARE AND SOFTWARE INTERFACING WITH 8-BIT SERIES CONTROLLERS 9

Lights and Switches - Stack Operation - Implementing Combinational Logic - Expanding I/O - Interfacing Analog To Digital Convertors - Interfacing Digital To Analog Convertors - LED Displays : Seven Segment Displays, Dot Matrix Displays - LCD Displays - Driving Relays - Stepper Motor Interface - Serial EEPROM - Real Time Clock - Accessing Constants Table - Arbitrary Waveform Generation - Communication Links - System Development Tools

UNIT – IV VISION SYSTEM 9

Fundamentals of Image Processing - Filtering - Morphological Operations - Feature Detection and Matching - Blurring and Sharpening - Segmentation - Thresholding - Contours - Advanced Contour Properties - Gradient - Canny Edge Detector - Object Detection - Background Subtraction

UNIT – V HOME AUTOMATION 9

Home Automation - Requirements - Water Level Notifier - Electric Guard Dog - Tweeting Bird Feeder - Package Delivery Detector - Web Enabled Light Switch - Curtain Automation - Android Door Lock - Voice Controlled Home Automation - Smart Lighting - Smart Mailbox - Electricity Usage Monitor -Proximity Garage Door Opener - Vision Based Authentic Entry System

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, students will be able to

CO1: analyze the 8-bit series microcontroller architecture, features and pin details
CO2: write embedded C programs for embedded system application
CO3: design and develop real time systems using AVR microcontrollers
CO4: design and develop the systems based on vision mechanism
CO5: design and develop a real time home automation system

REFERENCES:

1. Dhananjay V. Gadre, "Programming and Customizing the AVR Microcontroller", McGraw-Hill, 2001.

2. Joe Pardue, "C Programming for Microcontrollers ", Smiley Micros, 2005.

3. Steven F. Barrett, Daniel J. Pack, "ATMEL AVR Microcontroller Primer : Programming and Interfacing", Morgan & Claypool Publishers, 2012

4. Mike Riley, "Programming Your Home - Automate With Arduino, Android and Your Computer", the Pragmatic Programmers, Llc, 2012.

5. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2011.

6. Kevin P. Murphy, "Machine Learning - a Probabilistic Perspective", the MIT Press Cambridge, Massachusetts, London, 2012.

OE09 **ENVIRONMENTAL SUSTAINABILITY**

L	T	P	C
2	0	0	2

UNIT I INTRODUCTION **9**

Valuing the Environment: Concepts, Valuing the Environment: Methods, Property Rights, Externalities, and Environmental Problems

UNIT II CONCEPT OF SUSTAINABILITY **9**

Sustainable Development: Defining the Concept, the Population Problem, Natural Resource Economics: An Overview, Energy, Water, Agriculture

UNIT III SIGNIFICANCE OF BIODIVERSITY **9**

Biodiversity, Forest Habitat, Commercially Valuable Species, Stationary - Source Local Air Pollution, Acid Rain and Atmospheric Modification, Transportation

UNIT IV POLLUTION IMPACTS **9**

Water Pollution, Solid Waste and Recycling, Toxic Substances and Hazardous Wastes, Global Warming.

UNIT V ENVIRONMENTAL ECONOMICS **9**

Development, Poverty, and the Environment, Visions of the Future, Environmental economics and policy by Tom Tietenberg, Environmental Economics

TOTAL : 45 PERIODS

REFERENCES

1. Andrew Hoffman, Competitive Environmental Strategy - A Guide for the Changing Business Landscape, Island Press.
2. Stephen Doven, Environment and Sustainability Policy: Creation, Implementation, Evaluation, the Federation Press, 2005
3. Robert Brinkmann., Introduction to Sustainability, Wiley-Blackwell., 2016
4. Niko Roorda., Fundamentals of Sustainable Development, 3rd Edn, Routledge, 2020
5. Bhavik R Bakshi., Sustainable Engineering: Principles and Practice, Cambridge University Press, 2019

OE10 IPR, BIOSAFETY AND ENTREPRENEURSHIP

L	T	P	C
2	0	0	2

UNIT I IPR 9

Intellectual property rights – Origin of the patent regime – Early patents act & Indian pharmaceutical industry – Types of patents – Patent Requirements – Application preparation filing and prosecution – Patentable subject matter – Industrial design, Protection of GMO's IP as a factor in R&D,IP's of relevance to biotechnology and few case studies.

UNIT II AGREEMENTS, TREATIES AND PATENT FILING PROCEDURES 9

History of GATT Agreement – Madrid Agreement – Hague Agreement – WIPO Treaties – Budapest Treaty – PCT – Ordinary – PCT – Conventional – Divisional and Patent of Addition – Specifications – Provisional and complete – Forms and fees Invention in context of "prior art" – Patent databases – Searching International Databases – Country-wise patent searches (USPTO,espacenet(EPO) – PATENT Scope (WIPO) – IPO, etc National & PCT filing procedure – Time frame and cost – Status of the patent applications filed – Precautions while patenting – disclosure/non-disclosure – Financial assistance for patenting – Introduction to existing schemes Patent licensing and agreement Patent infringement – Meaning, scope, litigation, case studies

UNIT III BIOSAFETY 9

Introduction – Historical Backround – Introduction to Biological Safety Cabinets – Primary Containment for Biohazards – Biosafety Levels – Biosafety Levels of Specific Microorganisms – Recommended Biosafety Levels for Infectious Agents and Infected Animals – Biosafety guidelines – Government of India.

UNIT IV GENETICALLY MODIFIED ORGANISMS 9

Definition of GMOs & LMOs – Roles of Institutional Biosafety Committee – RCGM – GEAC etc. for GMO applications in food and agriculture – Environmental release of GMOs – Risk Analysis – Risk Assessment – Risk management and communication – Overview of National Regulations and relevant International Agreements including Cartegana Protocol.

UNIT V ENTREPRENEURSHIP DEVELOPMENT 9

Introduction – Entrepreneurship Concept – Entrepreneurship as a career – Entrepreneurial personality – Characteristics of successful Entrepreneur – Factors affecting entrepreneurial growth – Entrepreneurial Motivation – Competencies – Mobility – Entrepreneurship Development Programmes (EDP) - Launching Of Small Enterprise - Definition, Characteristics – Relationship between small and large units – Opportunities for an Entrepreneurial career – Role of small enterprise in economic development – Problems of small scale industries – Institutional finance to entrepreneurs - Institutional support to entrepreneurs.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

CO1: Understand the fundamentals and legal framework of **Intellectual Property Rights (IPR)**, including patents, industrial designs, and their relevance to biotechnology.

CO2: Analyze international treaties, agreements, and procedures related to **patent filing and prosecution**, and demonstrate ability to navigate patent databases and understand filing processes.

CO3: Explain the principles of **biosafety**, including biosafety levels, containment practices, and national/international guidelines for handling biological hazards.

CO4: Evaluate the **regulatory frameworks and risk assessment protocols** related to **Genetically Modified Organisms (GMOs)**, including national committees and international protocols like the Cartagena Protocol.

CO5: Demonstrate knowledge of **entrepreneurship development**, including entrepreneurial traits, business launching, small enterprise management, and institutional support mechanisms in India.

REFERENCES

1. Bouchoux, D.E., "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets for the Paralegal", 3rd Edition, Delmar Cengage Learning, 2008.
2. Fleming, D.O. and Hunt, D.L., "Biological Safety: Principles and Practices", 4th Edition, American Society for Microbiology, 2006.
3. Irish, V., "Intellectual Property Rights for Engineers", 2nd Edition, The Institution of Engineering and Technology, 2005.
4. Mueller, M.J., "Patent Law", 3rd Edition, Wolters Kluwer Law & Business, 2009.
5. Young, T., "Genetically Modified Organisms and Biosafety: A Background Paper for Decision- Makers and Others to Assist in Consideration of GMO Issues" 1st Edition, World Conservation Union, 2004.
6. S.S Khanka, "Entrepreneurial Development", S.Chand & Company LTD, New Delhi, 2007.

AUDIT COURSES

AC01 **ENGLISH FOR RESEARCH PAPER WRITING**

L	T	P	C
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COURSE OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING **6**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS **6**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS **6**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS **6**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS **6**

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1 –Understand that how to improve your writing skills and level of readability

CO2 – Learn about what to write in each section

CO3 – Understand the skills needed when writing a Title

CO4 – Understand the skills needed when writing the Conclusion

CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

AC02 **DISASTER MANAGEMENT**

L	T	P	C
2	0	0	0

COURSE OBJECTIVES:

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian **response.**
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 6

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 6

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA 6

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics.

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT 6

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1: Ability to summarize basics of disaster.

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches.

REFERENCES

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep **Publication Pvt. Ltd., New Delhi,2009.**
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall **OfIndia, New Delhi,2001.**

A03 **CONSTITUTION OF INDIA**

L	T	P	C
2	0	0	0

COURSE OBJECTIVES:

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION 6

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION 6

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES 6

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE 6

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION 6

District's Administration head: Role and

Importance, Municipalities, Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION 6

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

SUGGESTED READING

1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.

COURSE OUTCOMES

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist.
- Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

AC 04

CYBER LAW

L	T	P	C
2	0	0	0

Course Objectives

- To understand the origin and development of cyber space and cyber laws.
- To equip the students with understanding of criminal activities in cyberspace.
- To enable to students with newer and evolving concept of cyber space.
- To encounter students with the regulatory regime cybercrimes.

UNIT I: Cyberspace – Constitutional and Human Rights Issues 6

Concept of Cyber Space, Evolution of Cyber law, Limitation of traditional law and need for Laws on Cyberspace, Important definitions under IT Act 2000, Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Right to Privacy.

UNIT II: Cyber Crimes & Jurisdiction 6

Nature and scope of Cyber Crime, Cybercrime against person, property & government, Cyber contraventions under IT Act, Cyber offences under IT Act, Principles for prescription of extraterritorial Jurisdiction under IT Act, Test for personal jurisdiction in Cyberspace, Application of personal jurisdiction test by Indian Courts.

UNIT III: Electronic Documents, Evidences & Contracts 6

Definition of digital signature under IT Act, Need for authentication of electronic documents, Asymmetric cryptosystem and encryption, Hash function, Authentication using electronic signature, Sec 3 and Sec 3A of IT Act, Examples of Electronic signature, Electronic evidence as documentary evidence, Legal recognition of electronic records, Admissibility of electronic evidence, Definition and Formation of e-contract, Types of e- contracts, Legal validity of e-contracts.

UNIT IV: e-Commerce, e-Banking & Intermediaries 6

Definition & Models of e-Commerce, Advantages and disadvantages of e-Commerce, Concept of e-Banking, Online payment Options, Intermediary – Definition, Liability of intermediary and Safe harbour protection, Case studies.

UNIT V: e-Governance, e-Courts & IPR Issues **6**

e-Governance and its provisions under IT Act, Advantages of e-Governance, National e-Governance plan, e-Governance initiatives in India, e-Courts and e-Court mission mode projects. Copyright issues in Cyber Space, Intellectual Property protection in Computer Software, Trade mark issues in Cyber Space, Case studies.

Total: 30 Hours

REFERENCES:

1. Kamath Nandan, Law Relating to Computers Internet & E-Commerce- A Guide to Cyber laws & The Information Technology Act, Rules, Regulations and Notifications Along With Latest Case Laws (2012).
2. Karnika Seth, Computers Internet and New Technology Laws (2013).
3. Kamlesh K. Bajaj, Debjani Nag, E-Commerce: The Cutting Edge of Business, 2nd Ed. (2005).
4. Apar Gupta, Commentary on Information Technology Act (2016).
5. N.S. Nappinai – Technology Laws, 1st Ed LexisNexis (2017).
6. V. D. Dudeja, Information Technology and Cyber Law, Common wealth Publisher (2017)
7. Anirudh Rastogi, Cyber Law: Law of Information Technology and Internet, Lexis Nexis, (2014).
8. Online resources – National Cybercrime reporting portal, PKI India, Ministry of Electronics and Information Technology.

AC05 **INTELLECTUAL PROPERTY LAW**

L	T	P	C
2	0	0	0

Course Objectives

- To understand the fundamentals of IP law.
- To learn the processes for protecting various forms of intellectual property.
- To appreciate the strategic importance of IP in the engineering and technology industries.
- To gain practical insights into the management and commercialization of IP.

UNIT I: IP Law & Patents **6**

Definition and Importance of IP, Types of IP, Overview of International IP Law and Treaties (WIPO, TRIPS), Global Perspectives on IP Law, Definition and Purpose of Patents, Types, Patentability Criteria: Novelty, Non-Obviousness, Utility. The Patent Application Process, Writing Claims and Descriptions, Filing Procedures and Costs. Case Studies: Significant Engineering Patents.

UNIT II: Trademarks & Industrial Designs **6**

Definition and Purpose of Trademarks, Types of Trademarks: Words, Symbols, Logos, Colours & Sounds, Trademark Registration Process, Searching for Existing Trademarks, Application Procedures, Infringement and Enforcement. Definition and importance of industrial Designs, Criteria for Protection, Registration Procedure and Term of Protection in India, Infringement and Remedies.

UNIT III: Geographical Indications (GI) & Copyrights **6**

Introduction to GI, Legal frame work in India, Criteria and process for GI Registration, Economic and Social Impacts of GI, Case study and practical insights. Definition and Scope of Copyrights, Subject matter of Copyright & Term of Copyright, Rights Granted by Copyright & Moral Rights. Registration Process and Duration, Copyright Infringement and Remedies, Case Studies.

UNIT IV: Trade Secrets, IP Strategy and Management **6**

Definition and Importance of Trade Secrets, Criteria for Protection, Managing and Protecting Trade Secrets, Legal Remedies for Misappropriation. Case Studies: Trade Secrets in the Engineering Sector. Developing an IP Strategy, Valuation of Intellectual Property, IP Audits and Due Diligence. Licensing and Technology Transfer, Case Study: Successful IP Management in Engineering Firms.

UNIT V: IP in Emerging Technologies & Ethics **6**

IP Challenges in Emerging Technologies: AI, IoT, Biotechnology, Open Source and IP, Standards & IP, Ethical Considerations in IP Law, IP and Social Responsibility, Balancing Innovation and Public Interest. Case Studies: Ethical Dilemmas in Engineering and IP.

Total: 30 Hours

REFERENCES:

1. R.S. Bhalla, The Institution of Property: Legally, Historically and Philosophically Regarded, Eastern Book Co., (1984)
2. Dr. Mathew Thomas, Understanding Intellectual Property, Eastern Book Company, Lucknow (2016).
3. V.K. Ahuja, Law Relating to Intellectual Property Rights (Lexis Nexis) 2015
4. Elizabeth Verkey, Intellectual Property law and Practice (Eastern Book Company) 2015
5. Taraporevala V J, Law of Intellectual Property, (2nd Edition) Thomson Reuters, 2013.
6. Online resources – Indian Patent Office Website, World Intellectual Property Organization Website, Geographical Indications Registry (India).

AC06 **WATER, SANITATION AND HEALTH**

L	T	P	C
2	0	0	0

COURSEOBJECTIVES:

This course introduces the fundamental concepts of Water, Sanitation, and Hygiene (WASH) and their linkages with public health, water and food security, equity, and sustainability. It examines the multidimensional impacts of inadequate WASH practices in developing regions, including social, economic, demographic, environmental, and political factors. The course explores challenges in managing and developing WASH infrastructure and services, with a focus on community participation, gender sensitivity, and equity.

UNIT I FUNDAMENTALS WASH **6**

Meanings and Definition: Safe Water- Health, Nexus: Water- Sanitation - Health and Hygiene Equity issues-Water security - Food Security. Sanitation And Hygiene (WASH) and Integrated Water Resources Management (IWRM) - Need and Importance of WASH

UNIT II MANAGERIAL IMPLICATIONS AND IMPACT **6**

Third World Scenario – Poor and Multidimensional Deprivation--Health Burden in Developing Scenario -Factors contribute to water, sanitation and hygiene related diseases-Social: Social Stratification and Literacy Demography: Population and Migration- Fertility - Mortality-Environment: Water Borne-Water Washed and Water Based Diseases - Economic: Wage – Water and Health Budgeting -Psychological: Non-compliance - Disease Relapse - Political: Political Will.

UNIT III CHALLENGES IN MANAGEMENT AND DEVELOPMENT **6**

Common Challenges in WASH - Bureaucracy and Users- Water Utilities -Sectoral Allocation:-Infrastructure- Service Delivery: Health services: Macro and Micro- level: Community and Gender Issues- Equity Issues - Paradigm Shift: Democratization of Reforms and Initiatives.

UNIT IV GOVERNANCE **6**

Public health -Community Health Assessment and Improvement Planning (CHA/CHIP)-Infrastructure and Investments on Water, (WASH) - Cost Benefit Analysis – Institutional Intervention-Public Private Partnership - Policy Directives - Social Insurance -Political Will vs Participatory Governance -

UNIT V INITIATIVES **6**

Management vs Development -Accelerating Development- Development Indicators –Inclusive Development-Global and Local- Millennium Development Goal (MDG) and Targets - Five Year Plans - Implementation - Capacity Building - Case studies on WASH.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Capture to fundamental concepts and terms which are to be applied and understood all through the study.

CO2: Comprehend the various factors affecting water sanitation and health through the lens of third world scenario.

CO3: Critically analyse and articulate the underlying common challenges in water, sanitation and health.

CO4: Acquire knowledge on the attributes of governance and its say on water sanitation and health.

CO5: Gain an overarching insight in to the aspects of sustainable resource management in the absence of a clear level playing field in the developmental aspects.

REFERENCES

1. Bonitha R., Beaglehole R.,Kjellstorm, 2006, “Basic Epidemiology”, 2nd Edition, World Health Organization.
2. Van Note Chism, N. and Bickford, D. J. (2002), Improving the environment for learning: An expanded agenda. New Directions for Teaching and Learning, 2002: 91–98. doi: 10.1002/tl.83Improving the Environment for learning: An Expanded Agenda
3. National Research Council. Global Issues in Water, Sanitation, and Health: Workshop Summary. Washington, DC: The National Academies Press, 2009.
4. Sen, Amartya 1997. On Economic Inequality. Enlarged edition, with annex by JamesFoster and Amartya Sen, Oxford: Claredon Press, 1997.
5. Intersectoral Water Allocation Planning and Management, 2000, World Bank Publishers www. Amazon.com
6. Third World Network.org (www.twn.org

AC07 **ETHICAL MANAGEMENT**

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COURSE OBJECTIVE:

This course aims to provide students with a comprehensive understanding of ethical management and its significance in organizational and societal contexts. It explores managerial and professional ethics, emphasizing individual and corporate social responsibility in light of cultural and societal expectations. The course develops ethical decision-making skills, particularly in crisis situations, through the analysis of real-world scenarios and stakeholder dynamics.

UNIT I ETHICS AND SOCIETY **6**

Ethical Management- Definition, Motivation, Advantages-Practical implications of ethical management. Managerial ethics, professional ethics, and social Responsibility-Role of culture and society's expectations- Individual and organizational responsibility to society and the community.

UNIT II ETHICAL DECISION MAKING AND MANAGEMENT IN A CRISIS **6**

Managing in an ethical crisis, the nature of a crisis, ethics in crisis management, discuss case studies, analyze real-world scenarios, develop ethical management skills, knowledge, and competencies. Proactive crisis management.

UNIT III STAKEHOLDERS IN ETHICAL MANAGEMENT **6**

Stakeholders in ethical management, identifying internal and external stakeholders, nature of stakeholders, ethical management of various kinds of stakeholders: customers (product and service issues), employees (leadership, fairness, justice, diversity) suppliers, collaborators, business, community, the natural environment (the sustainability imperative, green management, Contemporary issues).

UNIT IV INDIVIDUAL VARIABLES IN ETHICAL MANJAGEMENT **6**

Understanding individual variables in ethics, managerial ethics, concepts in ethical psychologyethical awareness, ethical courage, ethical judgment, ethical foundations, ethical emotions/intuitions/intensity. Utilization of these concepts and competencies for ethical decisionmaking and management.

UNIT V PRACTICAL FIELD-GUIDE, TECHNIQUES AND SKILLS **6**

Ethical management in practice, development of techniques and skills, navigating challenges and dilemmas, resolving issues and preventing unethical management proactively. Role modelling and creating a culture of ethical management and human flourishing.

COURSE OUTCOMES

CO1: Role modelling and influencing the ethical and cultural context.
CO2: Respond to ethical crises and proactively address potential crises situations.
CO3: Understand and implement stakeholder management decisions.
CO4: Develop the ability, knowledge, and skills for ethical management.
CO5: Develop practical skills to navigate, resolve and thrive in management situations

REFERENCES

1. Brad Agle, Aaron Miller, Bill O' Rourke, The Business Ethics Field Guide: the essential companion to leading your career and your company, 2016.
2. Steiner & Steiner, Business, Government & Society: A managerial Perspective, 2011.
3. Lawrence & Weber, Business and Society: Stakeholders, Ethics, Public Policy, 2020.