V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS
(with effect from Academic Year 2025 - 2026)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes (Aided), 13 UG Programmes (SF), 13 PG Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) &Tamil Nadu State Council for Higher Education (TANSCHE) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English, History, Mathematics, Biochemistry and Tamil upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

A. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose Courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The performance of students is evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

UG PROGRAMMES

Arts & Humanities	:	History (E.M. & T.M.), English, Tamil
Physical & Life Sciences	:	Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology, Data Science, Computer Applications and Computer Applications - Graphic Design
Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Chemistry, Biochemistry, Home Science - Nutrition and Dietetics, Biotechnology, Computer Science and Computer Applications (MCA) *
Commerce & Management	:	Commerce, Business Administration (MBA) *

* AICTE approved Programmes

OUTLINE OF CHOICE BASED CREDIT SYSTEM – UG

1. Core Courses
2. Elective Courses
   - Generic Elective Courses
   - Discipline Specific Elective Courses (DSEC)
   - Non Major Elective Courses (NMEC)
3. Skill Enhancement Courses (SEC)
4. Environmental Studies (EVS)
5. Value Education
6. Self-Study Courses (Online)
7. Extra Credit Courses (Self Study Courses) (Optional)

List of Non Major Elective Courses (NME)
(2024-2025 onwards)

UG PROGRAMMES

Name of the Course	Course Code	Semester	Department
Introduction to Tourism	24UHIN11	I	History (E.M)
Indian Constitution	24UHIN21	II	
சுற்றுலா ஓர் அறிமுகம்	24UHIN11	I	History (T.M)
இந்திய அரசியலமைப்பு	24UHIN21	II	
Popular Literature and Culture	24UENN11	I	English
Philosophy for Literature	24UENN21	II	
அடிப்படைத் தமிழ் இலக்கணம் – I எழுத்தறிதல்/பேச்சுக்கலைத்திறன்	24UBTN11/ 24UTAN11	I	Tamil
அடிப்படைத்தமிழ் – மொழித் திறனறிதல் / பயன்முறைத் தமிழ்	24UBTN21/ 24UTAN21	II	
Basic Hindi - I	24UBHN11	I	Hindi
Basic Hindi - II	24UBHN21	II	
Everyday Banking/ Practical Banking	24UCON11N/ 24UCON11	I	Commerce (Aided)
Basic Accounting Principles	24UCON21	II	
Everyday Banking	24UCON11N	I	Commerce (Self)
Emotional Intelligence	24UCON21N	II	

Everyday Banking/Self- Employment and Startup Business	24UCON11N/ 24UCCN11	I	Commerce C.A.(Self)
Fundamentals of Marketing	24UCCN21	II	
Everyday Banking/ Practical Banking	24UCPN11N/ 24UCPN12N	I	Commerce Professional Accounting
Basic Accounting Principles	24UCPN21N	II	
Basics of Event Management	24UBAN11	I	Business Administration
Managerial Skill Development	24UBAN21	II	
Quantitative Aptitude -I	24UMTN11	I	Mathematics
Quantitative Aptitude - II	24UMTN21	II	
Physics for EveryDay Life	24UPHN11	I	Physics
Astrophysics	24UPHN21	II	
Food Chemistry	24UCHN11	I	Chemistry
Dairy Chemistry	24UCHN21	II	
Ornamental fish farming and Management	24UZYN11	I	Zoology
Biocomposting for Entrepreneurship	24UZYN21	II	
Foundations of Baking and Confectionery	24UHSN11	I	Home Science – Nutrition and Dietetics
Women's Health and Wellness	24UHSN21	II	
Nutrition and Health	24UBCN11	I	Biochemistry
Life Style Diseases	24UBCN21	II	
Social and Preventive Medicine	24UMBN11	I	Microbiology
Nutrition and Health Hygiene	24UMBN21	II	
Herbal Medicine	24UBON11	I	Biotechnology
Organic Farming and Health Management	24UBON21	II	
Basics of Fashion	24UCFN11	I	Costume Design And Fashion
Interior Designing	24UCFN21	II	
Introduction to HTML	24UCSN11N	I	Computer Science
Office Automation	24UCSN21N	II	
Basics of Internet	24UITN11N	I	Information Technology
Data Analysis using Spreadsheet	24UITN21N	II	
Fundamentals of Information Technology	24UDSN11	I	Data Science
Computer Fundamentals	24UDSN21	II	
Web Designing	24UCAN11N	I	B.C.A.
Fundamentals of Computers	24UCAN21N	II	
Organic Farming	24UBYN11	I	Botany
Nursery and Landscaping	24UBYN12	I	
Mushroom Cultivation	24UBYN21	II	Botany
Medicinal Botany	24UBYN22	II	
Library and Information Science - I	24ULSN11	I	Library Science

Library and Information Science - II	24ULSN21	II	
Cadet Corps for Career Development I	24UNCN11	I	National Cadet Corps
Cadet Corps for Career Development II	24UNCN21	II	

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined outcomes. The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and integration of technology in the teaching –learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfil the Vision and Mission of the Institution.

Vision of the Institution

The founding vision of the Institution is to impart Quality Education to the rural womenfolk and to empower them with knowledge and leadership quality.

Mission of the Institution

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals instilling in them life-oriented skills, personal integrity, leadership qualities and service mindedness.

B.1 Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfil the Vision and Mission of the Department offering the Programme.

Vision of the Department of Computer Science

The Department of Computer Science is envisioned to create industry ready Computer Science students with ardour for personal growth.

PEO1	Students gain knowledge and expertise in advanced domains of Computer Science like website design, mobile apps development and data analytics.
PEO2	The rural women students will emerge as eminent software professionals with team building capacity and leadership quality to suit the modern software industry.
PEO3	The students imbibe moral values and professional ethics to shape themselves as skilled persons to work as an individual with topical updates and as a team to contribute towards the need of industry and society.

Mission of the Department of Computer Science

To create an environment conducive for transforming rural women students into eminent students prepared for a globalized technological era and to instil in them a passion to strive for perpetual personal uplift.

Programme Educational Objectives (PEOs) of B.Sc. Computer Science

Key Components of Mission Statement	**P**rogramme **E**ducational **O**bjectives (**PEOs**)		
	PEO1	**PEO2**	**PEO3**
transforming rural women students		√	
eminent students	√	√	√
prepared for a globalized technological era	√	√	
a passion to strive for perpetual personal uplift			√

B.1.2 Programme Outcomes (POs)

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co-operation/Team Work, Scientific Reasoning, Reflective Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

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

1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)

2 articulate innovative thoughts and ideas proficiently in both in spoken and written forms. (*Communication Skills)*

3 identify, formulate and solve problems in real life situations scientifically / systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving)*

4 critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions through assignments, case studies, Internship and projects for the fullfillment of the local, national and global developmental needs. (*Critical Thinking and Analytical Reasoning)*

5 use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - directed and Lifelong Learning)*

6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence)*

7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness)*

B.1.3 Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme specific. It is mandatory that each PO should be mapped to the respective PSO.

PROGRAMME SPECIFIC OUTCOMES

On completion of B.Sc. Computer Science programme, the students will be able to

PO1 - *Disciplinary Knowledge*

PSO 1.a: apply principles, methods and techniques of various domains of Computer Science and courses related to Computer Science to a wide range of applications.

PSO 1.b: use modern software development tools, packages and platforms.

PO2 – *Communication Skills*

PSO 2.a: give and receive clear instructions, write effectual reports, design documentation and make remarkable presentations on concepts related to Computer Science.

PSO 2.b: express complex technical ideas effectively to peers, other assemblage like IT community and the entire society.

PO3 - *Scientific Reasoning and Problem Solving*

PSO 3: design and develop computer programs using programming languages efficiently, in the areas related to database management, mobile applications, operating systems and web design.

PO4 - *Critical Thinking and Analytical Reasoning*

PSO 4: analyse real world problems, identify and formulate the computing requirements appropriate to give efficient and constructive solutions in different research fields of Computer Science and for environmental sustainability.

PO5 - *Digital Literacy, Self - directed and Lifelong Learning*

PSO 5.a: create high quality e-content for demonstrating complex concepts ; pursue the appropriate Massive Open Online Courses.

PSO 5.b: adapt to an ever-changing technological landscape either by pursuing higher studies and engaging in independent and life-long learning or use their potential in their career or entrepreneurial endeavours.

PO6 - *Cooperation/Team Work and Multi-Cultural Competence*

PSO 6: demonstrate the knowledge of technological and management principles to work as a member or leader, with multicultural competence in diverse teams of software projects.

PO7 - *Moral and Ethical Awareness*

PSO 7: develop innovative applications as an employee of a company or an entrepreneur, employing contemporary technologies adhering to ethical, security and legal issues of Internet and Cyber systems.

PO-PEO Mapping Matrix

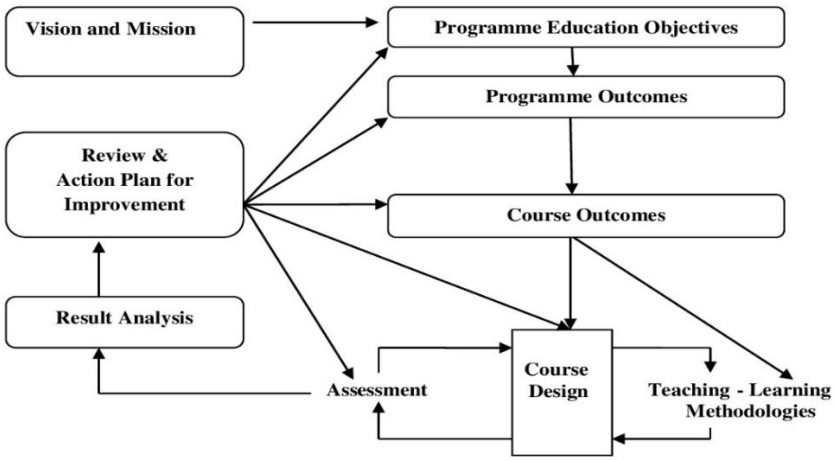
Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc*. It is mandatory that each PEO should be mapped to at least one of the POs.

PEOs / **POs/PSOs**	**PEO1**	**PEO2**	**PEO3**
PO1/PSO1.a	-	✓	✓
PO1/PSO1.b	✓	✓	✓
PO2/PSO2.a	✓	✓	-
PO2/PSO2.b	✓	✓	-
PO3/PSO3	-	✓	✓
PO4/PSO4.a	-	✓	✓

PO4/PSO4.b	✓	✓	-
PO5/PSO5	✓	✓	-
PO6/PSO6	-	✓	✓
PO7/PSO7	-	-	✓

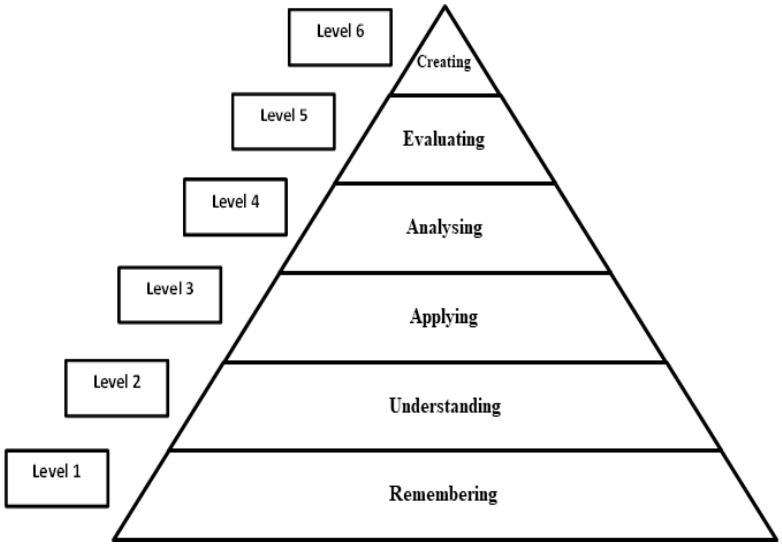
B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the Course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the Course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of Course contents. COs are measurable, attainable and manageable in number. COs contribute to attain POs in such a way that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment strategy may be outlined using the revised Bloom's Taxonomy levels.

BLOOM'S TAXONOMY



CO – PO Mapping of Courses

After framing the CO statements, the COs framed for each Course is mapped with POs based on the relationship that exists between them. The COs which are not related to any of the POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High (H), Medium (M), Low (L) and Nil (-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H, M and L are 3, 2and 1 respectively.

CO-PO/PSO Mapping Table (Course Articulation Matrix)

PO/PSOs / COs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

ELIGIBILITY FOR ADMISSION

The Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other examination accepted by Academic Council with Mathematics as one of the subjects.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I	:	Tamil/Hindi Course
Part II	:	English
Part III	:	Core Courses
		Elective Courses • Generic Elective Courses • Discipline Specific Elective Courses
		Self-Study Course - online
Part IV	:	Skill Enhancement Courses (SEC)
		Elective Course (NMEC)

		Environmental Studies Value Education
		Internship/Industrial Training
		Self-Study Course - online
Part V	:	National Service Scheme/ Physical Education/ Youth Red Cross Society/ Red Ribbon Club/ Science Forum/ Eco Club/ Library and Information Science/ Consumer Club/ Health and Fitness Club/ National Cadet Corps/ Rotaract Club

B.2 EVALUATION SCHEME

B.2.1.PART II

Components	Internal Assessment Marks	Summative Examination Marks	Total Marks
Theory	15	60	100
Practical	5	15	
Assignment	5	-	

Three Periodic Tests - Average of the best two will be considered

B.2.2.Part I & PART III - Core Courses, Elective Courses (Generic, DSEC)

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	**100**

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	K3 Level	:	5
Quiz	K1 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Practical Test*	:	30
Record & Performance	:	10
Total	**:**	**40**

*Average of the two practical tests will be considered

Question Pattern for Internal Tests **Duration: 2 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 4	Multiple Choice	4	4	1	4
B	5 -6	Internal Choice - Either … or Type	3	3	7	21
C	8 -9	Internal Choice - Either… or Type	2	2	10	20
					Total	**45***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 -10	Multiple Choice	10	10	1	10
B	11 - 15	Internal Choice – Either …or Type	5	5	7	35
C	16 - 18	Internal Choice – Either… or Type	3	3	10	30
					Total	**75**

PROJECT
Assessment by Internal Examiner Only
Internal Assessment
Distribution of Marks

Mode of Evaluation	:	Marks
Project work and Report	:	60
Presentation and Viva –Voce	:	40
Total	**:**	**100**

B.2.3 PART IV - Skill Enhancement Courses, Non Major Elective Courses and Foundation Course

B.2.3.1 FOUNDATATION COURSE

INTERNAL ASSESSMENT
Distribution of Marks
Theory

Mode of Evaluation			**Marks**
Periodic Test		:	15
Assignment	K2 Level	:	5
Quiz	K1 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	**Q.No.**	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A	1 - 3	Internal Choice - Either …or Type	3	3	5	15
B	4	Internal Choice – Either …or Type	1	1	10	10
	Total					**25***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Mode of Evaluation		**Marks**
Summative Examination	:	50
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Total	**:**	**75**

Question Pattern **Duration: 2 Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 7	Internal Choice – Either… or Type	2	2	10	20
	Total					**50**

B.2.3.2 Skill Enhancement Course - Entrepreneurial skills

INTERNAL ASSESSMENT ONLY
Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment	:	5
Quiz	:	5
Model Examinations	:	60
Online Quiz (Multiple Choice Questions - K2 Level)	:	15
Total	**:**	**100**

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice – Either Or Type	3	3	6	18
B Q. No.(4)	Internal Choice – Either Or Type	1	1	12	12
Total					**30**

*The total marks obtained in the Periodic Test will be calculated for 15 marks

Two Periodic Tests - Better of the two will be considered
Two Assignments - Better of the two will be considered
Two Quiz Tests - Better of the two will be considered

Question Pattern for Model Examination **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1-5)	Internal Choice – Either Or Type	5	5	6	30
B Q. No.(6- 8)	Internal Choice – Either Or Type	3	3	10	30
Total					**60**

B.2.3.3 Skill Enhancement Courses/ Non Major Elective Courses

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			**Marks**
Periodic Test		:	15
Assignment	K3 Level	:	5
Quiz	K2 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 3	Internal Choice - Either …or Type	3	3	5	15
B	4	Internal Choice – Either …or Type	1	1	10	10
	Total					**25***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Mode of Evaluation		**Marks**
Summative Examination	:	50
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Total	**:**	**75**

Question Pattern **Duration: 2 Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 7	Internal Choice – Either… or Type	2	2	10	20
	Total					**50**

B.2.4 PART IV- ENVIRONMENTAL STUDIES / VALUE EDUCATION

INTERNAL ASSESSMENT ONLY

Evaluation Pattern

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment - K3 Level	:	10
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Poster Presentation - K3 Level		10
Report - K3 Level		10
Model Examination	:	30
Total	**:**	**100**

Three Assignment - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice – Either Or Type	3	3	6	18
B Q. No.(4)	Internal Choice – Either Or Type	1	1	12	12
Total					**30**

Two Periodic tests - Better of the two will be considered

*The total marks obtained in the Periodic Test will be calculated for 15 marks

Question Pattern for Model Examination **Duration: 2 ½ Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 8	Internal Choice – Either… or Type	3	3	10	30
	Total					**60***

*The total marks obtained in the Model Examination will be calculated for 30 marks

B. 2. 5 PART IV- Internship / Industrial Training

Internship / Industrial Training is mandatory for all the Students

- **Internship:** Students have to involve in a designated activity, working in an organization under the guidance of an identified mentor for a period of 15 days.
- **Industrial Training:** Student has to undertake in-plant training in industries individually or in group for a period of 15 days.
- Internship / Industrial Training must be done during the fourth semester holidays
- **Internal Assessment only.**

Mode of Evaluation		Marks
Onsite Learning/Survey	:	50
Report	:	25
Viva-Voce	:	25
Total		**100**

B.2.5 SELF STUDY COURSE

B.2.5.1 PART III – Discipline Specific Quiz – Online

- Assessment by Internal Examiner only
- Question Bank is prepared by the Faculty Members of the Departments for all the Core and Elective Courses offered in all the Semesters.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	25
Model Examination	:	75
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.5.2 PART IV - Practice for Competitive Examinations – Online

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in V Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Subject wise Allotment of Marks

Subject		Marks
Tamil	:	10
English	:	10
History	:	10
Mathematics	:	10
Current affairs	:	10
Commerce, Law & Economics	:	10
Physical Sciences	:	10
Life Sciences	:	15
Computer Science	:	5
Food and Nutrition	:	5
Sports and Games	:	5
Total	**:**	**100**

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	25
Model Examination	:	75
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.6. Part V – Extension Activities
INTERNAL ASSESSMENT ONLY
Distribution of Marks

Mode of Evaluation		Marks
Attendance	:	5
Performance	:	10
Report/Assignment/Project/Camp/Practical	:	10
Total	**:**	**25***

*The marks obtained will be calculated for 100 marks

B.2.7 Transfer of credits earned through MOOC (UGC recognized Courses)

- Students can opt for minimum of
    - 12 weeks Courses for Core Courses
    - 8 weeks Courses for Elective Courses
    - 4 weeks Courses for Skill Enhancement Course
- The Online Courses opted by the students will be verified and approved by the Head of the Department and forwarded to the Controller of Examinations through the Principal.
- Students are required to register for the equivalent Online Courses through the Institution's SWAYAM-NPTEL Local Chapter after submitting a Permission letter to the Head of the Department.
- The Course should be completed before the beginning of that particular Semester in which the selected Course is offered.
- The student should submit the Course Completion Certificate immediately after receiving it, to the Department.
- The Head of the Department has to send the list of the students and their Course Completion Certificates to the Controller of Examinations through the Principal.
- The students who have submitted the Completion Certificate are exempted from appearing the Periodic Tests and Summative Examinations of the respective course but without any exemption for class attendance.
- Credits allotted for the particular Course in the Curriculum will be transferred after the completion of the Online Course
- Students can earn up to 10 credits within the mandatory credits requirements of the Degree Programme by completing UGC recognised Online Courses.

B.2.8 EXTRA CREDIT COURSES (OPTIONAL)

2.8.1 Extra Credit Course offered by the Department.

Assessment by Internal Examiner Only (To be conducted along with the III Periodic Test)

Distribution of Marks

Mode of Evaluation		**Marks**
Quiz (Multiple Choice Questions)	:	25
Model Examination	:	75
Total	**:**	**100**

Question Pattern for Model Examination

Section	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A Q.No.(1-5)	Internal Choice-Either or Type	5	5	7	35
B Q.No.(6-9)	Internal Choice-Either or Type	4	4	10	40
				Total	**75**

2.8.2 Extra credit Course offered by MOOC (Massive Open Online Course)

- The Courses shall be completed within the first V Semesters of the Programme.
- The allotment of credits is as follows **(Maximum of 10 credits)**

4weeks Course - 1 credit
8 weeks Course - 2 credits
12 weeks Course - 3 credits

ELIGIBILITY FOR THE DEGREE

- The candidate will not be eligible for the Degree without completing the prescribed Courses of study, lab work, *etc*., and a minimum Pass marks in all the Courses.
- No Pass minimum for Internal Assessment.
- Pass minimum for External Examination is 27 marks out of 75 marks for Core Courses, Elective Courses (Generic Elective, DSEC Courses)
- Pass minimum for External Examination is 18 marks out of 50 marks for Skill Enhancement Courses and Non Major Elective Courses (NMEC).
- The aggregate minimum pass percentage is 40 marks for all Courses.
- Pass minimum for External Practical Examination is 21 marks out of 60 marks.

Attendance

- The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.
- The students who have only 60-75 days (66% - 84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.
- The students who have attended the classes for 59 days and less - up to 45 days (50%- 65%) can appear for the Summative Examinations only after getting special permission from the Principal.
    - The students who have attended the classes for 44 days or less (<50%) cannot appear for the Summative Examinations and have to repeat the whole semester.
    - For Part V in UG Programmes, the students require 75 % of attendance to get a credit.
    - For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

B.3 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a Course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct Assessment (Rubric based) - Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

Indirect Assessment – Done through Course Exit Survey.

CO Assessment Rubrics

For the evaluation and assessment of COs and POs, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory Courses. For the practical Courses, internal assessment contributes 50% and Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

CO Attainment

Direct CO Attainment

Course Outcomes of all Courses are assessed and the CO – wise marks obtained by all the students are recorded for all the assessment tools. The respective CO attainment level is evaluated based on set attainment rubrics

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO

Attainment = Percentage of students who have scored more than the target marks

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who scored more than the Target}}{\text{Total Number of Students}} \times 100$$

Attainment Levels of COs

Assessment Methods	**Attainment Levels**	
Internal Assessment	Level 1	50% of students scoring more than set target marks in Internal Assessment tools
	Level 2	55% of students scoring more than set target marks in Internal Assessment tools
	Level 3	60% of students scoring more than set target marks in internal Assessment tools
End Semester Summative Examination	Level 1	50% of students scoring more than average marks in End Semester Summative Examination
	Level 2	55% of students scoring more than average marks in End Semester Summative Examination
	Level 3	60% of students scoring more than average marks in End Semester Summative Examination

Indirect CO Attainment

At the end of each Course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the Course Outcomes.

Overall CO Attainment= 75% of Direct CO Attainment + 25 % of Indirect CO Attainment

In each course, the level of attainment of each CO is compared with the predefined targets. If the target is not reached, the Course teacher takes necessary steps for the improvement to reach the target.

For continuous improvement, if the target is reached, the Course teacher can set the target as a value greater than the CO attainment of the previous year.

B.3.2 Assessment Process for Overall PO Attainment

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester Examination and 25% weightage is given to attainment through Internal assessments. Indirect assessment is done through Graduate Exit Survey and participation of students in Co-curricular/ Extra curricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage -75%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage - 25%)	Graduate Exit Survey 10%	At the end of the Programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment of Programme Outcomes
	Co-curricular/ Extra-curricular activities 15%	For participation in Co-curricular/Extra-curricular activities during the period of their study.

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Average Direct PO Attainment								
Direct PO Attainment in percentage								

Indirect Attainment of POs for all Courses

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Graduate Exit Survey							
Indirect PO Attainment							

Attainments of POs for all Courses

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Direct Attainment (Weightage - 75%)							
Indirect Attainment (Weightage - 25%)							
Overall PO Attainment							

Overall PO Attainment= 75% of Direct PO Attainment +
25% of Indirect PO Attainment (Graduate Exit Survey & Participation in Co- curricular and Extra curricular Activities)

Expected Level of Attainment for each of the Programme Outcomes

POs	Level of Attainment
Attainment Value ≥70%	Excellent
60% ≤ Attainment Value < 70%	Very Good
50% ≤ Attainment Value < 60%	Good
40% ≤ Attainment Value < 50%	Satisfactory
Attainment Value <40%	Not Satisfactory

Level of PO Attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved? (Yes/No)

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the Courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years of completion of the Programme only through indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	15% of the class strength	30% of the class strength
Progression to Higher Education	50% of the class strength	5% of the class strength
Record of Entrepreneurship	2% of the class strength	5% of the class strength

Attainment of PEOs

Assessment Criteria & Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	**100**

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

POs	Level of Attainment
Attainment Value ≥70%	Excellent
60% ≤ Attainment Value < 70%	Very Good
50% ≤ Attainment Value < 60%	Good
40% ≤ Attainment Value < 50%	Satisfactory
Attainment Value <40%	Not Satisfactory

Level of PEO Attainment

Graduation Batch	Overall PEO Attainment (in percentage)	Whether Expected Level of PEO is Achieved? (Yes/No)

C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stakeholders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analysed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Computer Science Programme.

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BACHELOR OF SCIENCE
COMPUTER SCIENCE (UG) (2019)

Outcome Based Education with Choice Based Credit System

Programme Structure - Allotment of Hours and Credits

For those who joined in the Academic Year 2024-2025 and after

Components	Semester						Total Number of Hours (Credits)
	I	II	III	IV	V	VI	
Part I : Tamil /Hindi	6 (3)	6 (3)	6 (3)	6 (3)	-	-	24 (12)
Part II : English	6 (3)	6(3)	6 (3)	6 (3)	-	-	24 (12)
Part III : Core Courses, Elective Courses and Self-study Course							
Core Course	5 (5)	5 (5)	5 (5)	5 (5)	6 (6)	6 (5)	32 (31)
Core Course	-	-	-	-	6 (6)	6 (5)	12 (11)
Core Course	-	-	-	-	-	-	
Core Course Practical	5(3)	5(3)	5(3)	4 (3)	5 (3)	6 (3)	30 (18)
Core Course Project	-	-	-	-	1 (1)	-	1 (1)
Elective Course (DSEC)	-	-	-	-	5 (4)	5 (4)	10 (8)
Elective Course (DSEC Practical)	-	-	-	-	5 (3)	5 (3)	10 (6)
Elective Course I (Allied)	4 (4)	4 (4)	4 (4)	4 (4)	-	-	16 (16)
Elective Course I Practical I (Allied)	-	-	-	-	-	-	-
Elective Course II (Allied)	-	-	-	-	-	-	-
Elective Course II Practical II(Allied)	-	-	-	-	-	-	-
Self-Study Course	-	-	-	-	-	0 (1)	0 (1)
Part IV: Skill Enhancement Courses, Elective Courses, Self-Study Course and Internship/Industrial Training							
SEC	2 (2)	-	1 (1)	2 (2)	-	-	5 (5)
SEC	-	2 (2)	2 (2)	2 (2)	-	2 (2)	8 (8)
Elective Course(NME)	2 (2)	2 (2)	-	-	-	-	4 (4)
Value Education	-	-	-	-	2 (2)	-	2 (2)
Environmental Studies	-	-	1 (0)	1 (2)	-	-	2 (2)
Self-Study Course	-	-	-	-	0 (1)	-	0 (1
Internship / Industrial Training	-	-	-	-	0 (1)	-	0 (1)
Part V: Extension Activities	-	-	-	-	-	0 (1)	0 (1)
Total	**30 (22)**	**30 (22)**	**30(21)**	**30 (24)**	**30 (27)**	**30(24)**	**180 (140)**
Extra Credit Course (Self Study Course)	-	-	-	-	0(2)	-	0(2)

DSEC: Discipline Specific Elective Course SEC: Skill Enhancement Course

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B.Sc. COMPUTER SCIENCE -2019
PROGRAMME CONTENT

SEMESTER I

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1	**Part I**		Tamil/ Hindi	24UTAG11/ 24UHDG11	6	3	3	25	75	100
2	**Part II**		English	24UENG11	6	3	3	25	75	100
3	**Part III**	Core Course - 1	Python Programming	24UCSC11	5	5	3	25	75	100
4		Core Course - 2 Practical – I	Python Programming Practical	24UCSC11P	5	3	3	40	60	100
5		Elective Course - 1	Discrete Mathematics - I	24UCSA11	4	4	3	25	75	100
6	**Part IV**	Elective Course – 2 (NME – I)	Introduction to HTML	24UCSN11N	2	2	2	25	75	100
7		SEC - 1 Foundation Course	Problem Solving Techniques	24UCSF11	2	2	2	25	75	100
				Total	**30**	**22**				**700**

SEMESTER II

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	24UTAG21/ 24UHDG21	6	3	3	25	75	100
2.	**Part II**		English	24UENG21	6	3	3	25	75	100
3.	**Part III**	Core Course - 3	Programming in C	24UCSC21	5	5	3	25	75	100
4.		Core Course - 4 Practical – II	Programming using C Practical	24UCSC21P	5	3	3	40	60	100
5.		Elective Course -3	Statistical Methods and its Applications	24UCSA21	4	4	3	25	75	100
6.	**Part IV**	Elective Course – 4 (NME – II)	Office Automation	24UCSN21N	2	2	2	25	75	100
7.		SEC - 2	Biometrics	24UCSS21N	2	2	2	25	75	100
				Total	**30**	**22**				**700**

SEMESTER III

Sl. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	24UTAG31/ 24UHDG31	6	3	3	25	75	100
2.	**Part II**		English	24UENG31	6	3	3	25	75	100
3.	**Part III**	Core Course – 5	Data Structures and Algorithms	24UCSC31	5	5	3	25	75	100
4.		Core Course – 6 Practical – III	Data Structures and Algorithms Practical	24UCSC31P	5	3	3	40	60	100
5.		Elective Course - 5	Numerical Methods	24UCSA31	4	4	3	25	75	100
6.	**Part IV**	SEC – 3 Entrepreneurial Skill Course	Web Designing	24UCSS31	1	1	2	100	-	100
7.		SEC – 4	Software Testing	24UCSS32	2	2	2	25	75	100
8			Environmental Studies	24UGES41	1	-	-	-	-	-
				Total	**30**	**21**				**700**

SEMESTER IV

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	24UTAG41/ 24HDG41	6	3	3	25	75	100
2.	**Part II**		English	24UENG41	6	3	3	25	75	100
3.	**Part III**	Core Course – 7	Java Programming	24UCSC41	5	5	3	25	75	100
4.		Core Course – 8 Practical – IV	Java Programming Practical	24UCSC41P	4	3	3	40	60	100
5.		Elective Course - 6	Resource Management Techniques	24UCSA41	4	4	3	25	75	100
6.	**Part IV**	SEC – 5	Quantitative Aptitude	24UCSS41	2	2	2	25	75	100
7.		SEC – 6	PHP Programming	24UCSS42	2	2	2	25	75	100
8			Environmental Studies	24UGES41	1	2	-	100	-	100
				Total	**30**	**24**				**800**

SEMESTER V

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part III**	Core Course – 9	Database Management Systems	24UCSC51	6	6	3	25	75	100
3.		Core Course – 10	Data Analytics using R	24UCSC52	6	6	3	25	75	100
4.		Core Course – 11 Practical – V	Database Management Systems Practical	24UCSC51P	5	3	3	40	60	100
5.		Core Course – 12	Project	24UCSC53PR	1	1	-	100	-	100
6.		Elective Course – 7 (DSEC)	Introduction to Data Science/ Artificial Intelligence	24UCSE51/ 24UCSE52	5	4	3	25	75	100
7.		Elective Course – 8 (DSEC Practical – I)	Data Science using R Practical/ Artificial Intelligence Practical	24UCSE53P/ 24UCSE54P	5	3	3	40	60	100
8.	**Part IV**		Value Education	24UGVE51	2	2	2	100	-	100
9.		Self-Study Course	Practice for Competitive Examinations - Online	24UGCE51	-	1	-	100	-	100
10.		Internship/ Industrial Training	Internship	24UCSI51	-	1	-	100	-	100
				Total	**30**	**27**				**900**
		Extra Credit Course	OOPs with C++ Aptitude	24UCSO51	-	2	-	100	-	100

SEMESTER VI

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part III**	Core Course – 13	Mobile Applications Development	24UCSC61	6	5	3	25	75	100
3.		Core Course – 14	Computer Networks	24UCSC62	6	5	3	25	75	100
4.		Core Course – 15 Practical – VI	Mobile Applications Development Practical	24UCSC61P	6	3	3	40	60	100
5.		Elective Course – 9 (DSEC)	Image Processing/ Cryptography	24UCSE61/ 24UCSE62	5	4	3	25	75	100
6.		Elective Course – 10 (DSEC Practical – II)	Image Processing Practical/ Cryptography Practical	24UCSE63P/ 24UCSE64P	5	3	3	40	60	100
7.	**Part IV**	Self-Study Course	Discipline Specific Quiz-Online	24UCSQ61	-	1	-	100	-	100
8.		SEC – 7 Professional Competency Skill Enhancement Course	Multimedia Systems	24UCSS61	2	2	2	25	75	100
9.	**Part V**		Extension Activities		-	1	-	100	-	100
				Total	**30**	**24**				**800**

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(2025-2026 onwards)

Semester I	**INTRODUCTION TO HTML**	Hours/Week: 2	
Elective Course – 2 NME – 1		Credits: 2	
Course Code **24UCSN11N**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: understand the features of the web, web browsers and HTML tags. [K1]

CO2: describe the basic concepts of Internet, web programming and HTML program. [K1]

CO3: associate the various HTML tags like paragraphs, lists, frames, tables, forms, images and hyperlinks in the creation of webpages and formatting of images in HTML. [K2]

CO4: exemplify the use of various HTML tags in developing web pages for personal and business applications. [K2]

CO5: examine the different formatting options in text, tables, images, frames and forms to improve the web pages look and feel. [K3]

UNIT I

Introduction to Internet: Internet. **Internet Technologies:** Modem – Internet Addressing – Physical Connections – Telephone Lines. **Internet Browsers:** Internet Explorer: Window – File Menu – Edit Menu – View Menu – Favorites Menu – Tool bar. (6 Hours)

UNIT II

Introduction to HTML: HTML Documents – Anchor Tag – Hyper Links. **Designing the Body Section:** Heading Printing – Aligning the Headings – Horizontal Rule – Paragraph –Tab Settings: Formatting Characters – Physical Styles Format – Font Tag. (5 Hours)

UNIT III

Designing the Body Section: Images and Pictures: Low resolution Images – Adding Space Around the Image – Border for an Image. **Ordered and Unordered Lists:** Lists – Unordered Lists – Ordered Lists – Nested Lists. (6 Hours)

UNIT IV

Table Handling: Tables – Table creation in HTML – Width of the Table and Cells – Cell Spanning Multiple Rows/Columns – Coloring Cells – Column Specification – Some Sample Tables. (6 Hours)

UNIT V

Frames: Frameset Definition – Frame Definition. **Forms**: Action Attribute – Method Attribute – Enctype Attribute – Drop Down List – Sample Forms. (7 Hours)

TEXT BOOK

Xavier C, (2015). *World Wide Web design with HTML*, McGraw-Hill Education (India) Private Limited.

UNIT	CHAPTER	SECTION
I	1	1.3
	2	2.1-2.4
	3	3.1.1-3.1.4, 3.1.7, 3.1.8
II	4	4.4-4.6
	6	6.1-6.4, 6.5.1-6.5.3
III	6	6.6
	7	7.1, 7.2, 7.4, 7.5
IV	8	8.1-8.7
V	10	10.1, 10.2
	12	12.1-12.5

REFERENCE BOOKS

1. *Mastering HTML5 and CSS3 Made Easy*, TeachUComp Inc., 2014.
2. Thomas Michaud (2014), *Foundations of Web Design: Introduction to HTML & CSS*, New Riders, a division of Pearson Education.
3. Rohit Khurana. (2010). *Computer Fundamentals and Internet Basics*, APH Publishing Corporation.

PO/CO Course Code 24UCSN11N	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	-	-	2	-	-
CO2	1	1	1	-	2	1	-
CO3	2	2	2	2	3	1	-
CO4	2	2	-	-	-	-	-
CO5	2	2	2	1	3	1	-

Strong (3) Medium (2) Low (1)

Dr. K. Annbuselvi
Mrs. P. Aruna Devi
Heads of the Departments

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Course Designers

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B.Sc. COMPUTER SCIENCE
(2025 – 2026 onwards)

Semester II	**OFFICE AUTOMATION**	Hours/Week: 2	
Elective Course – 4 NME – 2		Credits: 2	
Course Code **24UCSN21N**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: outline the purpose of computer system, word processing, spreadsheet and power point presentation. [K1]

CO2: recognize the functional units of computer system, the features of operating systems and programming languages. [K1]

CO3: describe the basics of word documentation, excel sheet and presentation slide designing. [K2]

CO4: demonstrate the various formatting options in word document, chart preparation and inclusion of multimedia content in power point presentation. [K2]

CO5: experiment the usage of word processing, spreadsheet, and power point presentation in effective office automation. [K3]

UNIT I

Input/Output Units: Traditional Computer Input/Output Units - Other Input Technologies – Computer Output devices. **Operating Systems**: Why Do We Need an Operating System? - Batch Operating System - Multiprogramming Operating System - Time Sharing Operating System - On-line and Real-Time Systems - UNIX Operating System. (6 Hours)

UNIT II

Word Processing: Creating a New Word Document – Saving a Word Document – Apply Basic Formatting - Applying Bulleted and Numbered List – Using Cut, Copy and Paste Commands - Using Find, Replace and GoTo Commands – **Working with Graphics:** Working with Basic Graphic Objects – Capturing a Screenshot – Removing Background from an Image. (6 Hours)

UNIT III

Spreadsheets: Creating a New Excel Workbook – Saving an Excel Workbook – Adding Data to Cells Adding Data using the AutoFill Feature – Modifying Cells, Rows, Columns and Worksheet – Hiding and Unhiding Rows and Columns – Wrapping Text – Changing Number Formats – Adding Border to Cells – Applying Conditional Formatting – Inserting Data Bars – Renaming a Worksheet. (6 Hours)

UNIT IV

Working with Tables and Charts: Working with Tables – Creating a Pivot Table – Working with Excel Sparklines and Slicers – Working with Charts – Working with Formulas. (6 Hours)

UNIT V

PowerPoint: Creating a Presentation – Saving a Presentation – Adding and Removing Slides – Adding a Title and Subtitle to a Slide – Adding Text to a Slide using Textboxes – Changing the Layout of a Slide – Applying Background to Slide – Applying Themes to a Presentation – Working with Audio Clips and Videos. (6 Hours)

TEXT BOOKS

1. V.Rajaraman, Neeharika Adabala (2015). *Fundamentals of Computers,* 6th Edition, PHI Learning Private Limited.
2. Kogent Learning Solutions Inc. (2015). *Office 2013 in Simple Steps*, Dreamtech Press.

UNIT	TEXT BOOK	CHAPTERS	PAGE No.
I	Text Book1	3	31-48
		10	191-205, 210-212
II	Text Book2	2	24-41, 46-54
		3	61-70, 74-76
III		5	128-154, 158
IV		6	163-192
		7	193-202
V		8	217-227
		9	243-251, 255-269

REFERENCE BOOKS

1. Peter Norton, *Introduction to Computers*, Tata McGraw Hill.
2. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, *Microsoft 2003*, TataMcGraw Hill.

WEB RESOURCES

1. https://www.udemy.com/course/office-automation-certificate-course/
2. https://www.javatpoint.com/automation-tools

Course Code 24UCSN21N	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	2	-	-
CO2	3	2	2	2	2	-	-
CO3	3	3	2	2	3	1	-
CO4	3	1	1	2	3	2	-
CO5	3	3	1	2	3	2	-

Strong (3) Medium (2) Low (1)

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Quality Education with Wisdom and Values

B.Sc. COMPUTER SCIENCE
(2025 – 2026 onwards)

Semester II	**BIOMETRICS**	Hours/Week: 2	
SEC - 2		Credits: 2	
Course Code **24UCSS21N**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the fundamental concepts of biometric system, including its general architecture and its types. [K1]

CO2: identify various biometric traits and their role in authentication methods. [K1]

CO3: explain the working principles and design considerations of biometric recognition systems like fingerprint, iris, and face biometrics. [K2]

CO4: discuss privacy concerns associated with biometric deployments and compare privacy-enhanced biometric techniques. [K2]

CO5: apply biometric techniques for security applications such as enterprise authentication, border control, and smart card technology. [K3]

UNIT I

Introduction: What is Biometrics – History of Biometrics– Types of Biometric Traits – General Architecture of Biometric Systems – Basic Working of Biometric Matching–Biometric System Error and Performance Measures – Design of Biometric Systems– Applications of Biometrics – Benefits of Biometrics versus Traditional Authentication Methods. **Face Biometrics:** Introduction– Background of Face Recognition – Design of Face Recognition System – Face Detection in Video Sequences – Challenges in Face Biometrics – Advantages and Disadvantages. (6 Hours)

UNIT II

Retina and Iris Biometrics: Introduction–Performance of Biometrics – Design of Retina Biometrics – Design of Iris Recognition System – Applications of Iris Biometrics – Advantages and Disadvantages. **Vein and Fingerprint Biometrics:** Introduction –

Biometrics Using Vein Pattern of Palm– Fingerprint Biometrics – Fingerprint Recognition System (Excluding Binarization, Image Segmentation)– Fingerprint Indexing – Advantages and Disadvantages (6 Hours)

UNIT III

Privacy Enhancement Using Biometrics: Introduction – Privacy Concerns Associated with Biometric Deployments – Identity and Privacy – Privacy Concerns – Biometrics with Privacy Enhancement – Comparison of Various Biometrics in Terms of Privacy– Soft Biometrics. **Biometric Cryptography and Multimodal Biometrics:** Introduction to Multimodal Biometrics – Basic Architecture of Multimodal Biometrics – Multimodal Biometrics Using Face and Ear – Characteristics and Advantages of Multimodal Biometrics. (6 Hours)

UNIT IV

Watermarking Techniques: Introduction – Data Hiding Methods – Basic Framework of Watermarking– Classification of Watermarking – Applications of Watermarking – Attacks on Watermarks – Characteristics of Watermarks – General Watermarking Process – Image Watermarking Techniques – Watermarking Algorithm – Effect of Attacks on Watermarking Techniques. **(**6Hours)

UNIT V

Biometric Scope and Future: Scope and Future Market of Biometrics–Biometric Technologies–Applications of Biometrics – Biometrics and Information Technology Infrastructure – Role of Biometrics in Enterprise Security – Role of Biometrics in Border Security – Smart Card Technology and Biometrics – Radio Frequency Identification (RFID) Biometrics – DNA Biometrics – Comparative Study of Various Biometric Techniques. (6 Hours)

SELF- STUDY: (Not included for Examination)

Iris Segmentation Method – Determination of Iris Region (Section: 4.5, 4.6)

TEXT BOOK

G.R. Sinha, Sandeep B.Patil. (2013). *Biometrics: Concepts and Applications*, Wiley.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1 – 1.9**
	3	**3.1 – 3.3, 3.5,3.6,3.8**
II	**4**	**4.1 – 4.4, 4.8,4.9**
	5	**5.1 – 5.4, 5.6,5.8**
III	**7**	**7.1 – 7.7**
	8	**8.6 – 8.9**
IV	**9**	**9.1 – 9.6,9.8-9.11,9.13**
V	**10**	**10.1 – 10.10**

REFERENCE BOOKS

1. Ruud M. Bolle, Sharath Pankanti, Nalinik. Ratha, Andrew W.Senior, Jonathan H. Connell. (2009). *Guide to Biometrics*, Springer.
2. Anil k. Jain, Arun A. Ross, Karthik Nandakumar. (2011). *Introduction to Biometrics*, Springer.
3. Anil K. Jain, Patrick Flynn, Arun A. Ross. (2007). *Hand book of Biometrics*, Springer-Nature New York Inc.

WEB RESOURCES

1. https://www.tutorialspoint.com/biometrics/index.htm
2. https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

Course Code 24UCSS21N	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	2	2	2	1	2	2	2	2	1	-
CO2	2	2	2	1	2	2	2	3	1	-
CO3	3	3	2	2	2	2	2	3	1	-
CO4	3	3	3	2	2	3	3	3	1	1
CO5	3	3	3	2	2	3	2	3	2	1

Strong (3) Medium (2) Low (1)

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Mrs. V. Subhasini
Mrs. M. Suguna
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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester III	**DATA STRUCTURES AND ALGORITHMS**	Hours/Week: 5	
Core Course – 5		Credits: 5	
Course Code **24UCSC31**		Internal 25	External 75

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1: define the data structures used to represent data in memory. [K1]

CO2: explain the linear and non-linear data structures as ADT and algorithmic techniques. [K2]

CO3: describe the operations of data structures and algorithmic procedures. [K2]

CO4: use suitable data structures and algorithms for solving problems. [K3]

CO5: implement the operations of data structures and algorithmic procedures. [K3]

UNIT I

Pointers and Array-Based Lists: Array-Based Lists: Introduction – Search – Insert – Remove – Time Complexity of List Operations. **Linked Lists:** Some Properties - Item Insertion and Deletion - Building a Linked List - Linked List as an ADT - Structure of Linked List Nodes – Destroy the List - Initialize the List - Print the List - Length of a List - Retrieve the Data of the First Node - Retrieve the Data of the Last Node. Unordered Linked Lists: Search the List, Insert the First Node, Insert the Last Node. Definition of Doubly and Circular linked list. (15 Hours)

UNIT II

Stacks: Implementation of Stacks as Arrays: Initialize Stack, Empty Stack, Full Stack, Push, Return the Top Element, Pop. Linked Implementation of Stacks: Empty Stack and Full Stack, Initialize Stack, Push, Return the Top Element, Pop. **Queues**: Implementation of Queues as Arrays: Empty Queue and Full Queue, Initialize Queue, Front, Back, Add Queue, Delete Queue. Linked Implementation of Queues: Empty and Full Queue, Initialize Queue, addQueue, front, back, and deleteQueue Operations. (15 Hours)

UNIT III

Binary Trees And B-Trees: Binary Trees: Copy Tree, Binary Tree Traversal: Inorder Traversal - Preorder Traversal - Postorder Traversal, Implementing Binary Trees. Binary Search Trees: Search, Insert. (15 Hours)

UNIT IV

Graphs: Introduction - Graph Definitions and Notations - Graph Representation: Adjacency Matrices, Adjacency Lists. Operations on Graphs - Graphs as ADTs - Graph Traversals - Depth-First Traversal - Breadth-First Traversal. (15 Hours)

UNIT V

Divide-and-Conquer: Binary Search – Mergesort – Quicksort. **The Greedy Approach:** Minimum Spanning Trees: Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm for Single Source Shortest Paths. (15 Hours)

SELF-STUDY: (Not included for Examination)

Applications of Stacks: Postfix Expression Calculator (Text Book 1: Pages: 428-437), Huffman Code (Text Book 2: Pages: 169-173)

TEXT BOOKS

1. D.S. Malik. (2009). *Data Structures Using C++*, 2nd Edition, Cengage Learning, India.
2. Richard Neapolitan & Kumarss Naimipour. (2008). *Foundations of Algorithms Using C++ Pseudocode*. 3rd Edition. Jones and Bartlett Publishers, Inc., Sudbury, MA, United States.

UNIT	TEXT BOOK	CHAPTERS	PAGES
I	**Text Book1**	**3**	**170-179, 181-186**
		5	**266-279, 286-288, 292-295, 310, 326**
II		**7**	**400-406, 415-422**
		8	**454-462, 463-469**
III		**11**	**600-621, 635-651**
IV		**12**	**686-699**
V	**Text Book2**	**2**	**48–51, 53-55,60-62**
		4	**140-148, 150-152, 156-158**

REFERENCE BOOKS

1. Mark Allen Weiss. (2014). *Data Structures and Algorithm Analysis in C++*, 4th Edition, Pearson Education.
2. Reema Thareja. (2014). *Data Structures Using C*, 2nd Edition, Oxford Universities Press
3. ISRD Group. (2011). *Data Structures through C++*, 1st Edition, McGraw-Hill Company.
4. John R.Hubbard. (2000). *Data Structures with C++*, 2nd Edition, Schaum's Outline.
5. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta. (2006). *Fundamentals of Data Structures in C++*, 2nd Edition, Silicon Press.

Course Code 24UCSC31	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	-	-	2	3	-	-	2	-	-
CO2	3	-	2	2	2	-	2	2	2	-
CO3	3	-	2	2	2	2	-	2	-	-
CO4	3	2	-	2	3	2	-	3	-	-
CO5	3	2	-	2	3	2	2	3	2	-

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester III	**DATA STRUCTURES AND ALGORITHMS PRACTICAL**	Hours/Week: 5	
Core Course – 6 Practical – III		Credits: 3	
Course Code **24UCSC31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write programs to implement data structures and algorithmic techniques. [K2]

CO2: identify ADT required for linear and non-linear data structures. [K2]

CO3: implement operations like search, merge, insertion and deletion on various linear data structures. [K3]

CO4: apply traversals algorithms on tree data structure. [K3]

CO5: execute searching and sorting algorithms for solving problems. [K3]

Write C++ programs for the following

1. to perform insertion and deletion operation in the given one dimensional dynamic array.
2. to perform the insertion operation in a singly Linked list.
3. to perform the deletion operation in a singly Linked list.
4. to perform search operation in a singly linked list.
5. to perform push and pop operations in a stack – (represent stack as array).
6. to perform push and pop operations in a stack – (represent stack as linked list).
7. to evaluate postfix expression using stack.
8. to perform insert and delete operations in a queue – (represent queue as array).
9. to perform insert and delete operations in a queue – (represent queue as linked list).
10. to traverse a binary search tree – (Inorder , Preorder, Postorder).
11. to count number of leaf nodes in the given binary search tree.
12. to search a node in the given binary search tree.
13. to insert a node in the given binary search tree.
14. to search an element in the given one dimensional dynamic array using linear search.

15. to search an element in the given one dimensional dynamic array using binary search.
16. To sort an array of numbers using quicksort.
17. to sort an array of numbers using mergesort.

Course Code 24UCSC31P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	2	2	2	2	2	3	-	-
CO2	3	3	2	2	2	2	2	3	-	-
CO3	3	3	3	2	2	2	2	3	-	-
CO4	3	3	3	2	3	3	2	3	2	-
CO5	3	3	2	2	3	3	2	2	-	-

Strong (3) Medium (2) Low (1)

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B.Sc. Computer Science
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Semester III	**NUMERICAL METHODS**	Hours/Week: 4	
Allied Course		Credits: 4	
Course Code **24UCSA31**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: Recall the fundamental concepts of algebraic, transcendental and simultaneous equations.[K1]

CO2: Derive the solutions of equations by various iterative methods. [K2]

CO3: Find the missing data by using interpolation and inverse interpolation methods.[K2]

CO4: Perform numerical differentiation and integration to find the derivatives and integral value numerically.[K3]

CO5: Apply Taylor series method, Picard's method, Euler's and Runge-kutta methods to obtain the solution of the initial value problems. [K3]

UNIT I

Algebraic and Transcendental Equations:

Introduction - Errors in numerical computation-Iteration method-Bisection method-Regula-Falsi method-Newton-Raphson method-Horner's method. (12 hours)

UNIT II

Simultaneous Equations:

Introduction-Simultaneous equations-Back substitution-Gauss Elimination method-Gauss-Jordan Elimination method-Calculation of Inverse of a matrix- Crout's method-Iterative methods-Gauss-Jacobi Iteration method- Gauss Seidal Iteration method-Newton Raphson's method for simultaneous equations. (12 hours)

UNIT III

Interpolation

Introduction - Newton's interpolation Formula - Central difference Interpolation Formulae- Gauss Forward Interpolation Formula, Gauss Backward Interpolation Formula, Lagrange's Interpolation Formula - Divided Differences-Newton's Divided Difference Formula-Inverse Interpolation. (12 hours)

UNIT IV

Numerical Differentiation and Integration:

Introduction - Derivatives using Newton's forward difference Formula - Derivatives using Newton's backward difference Formula.

Numerical Integration: Newton-cotes quadrature -Trapezoidal Rule-Simpson's one third rule-Simpson's 3/8th rule. (12 hours)

UNIT V

Numerical Solution of Ordinary Differential Equations:

Introduction-Taylor series method-Picard's method-Euler's method-Runge-kutta method of second, third, fourth order- Predictor & corrector methods-Milne's method.

(12 hours)

TEXT BOOK

Arumugam. S, Thangapandi lssac.A, Somasundaram.A, *Numerical Methods*, Second Edition, Scitech Publications. Reprint, December 2013.

Unit	Chapter	Section
I	3	3.0 - 3.6
II	4	4.0 - 4.8, 4.10
III	7	7.0 - 7.2((i), (ii) and related problems), 7.3, 7.4,7.5, 7.6
IV	8	8.0 - 8.2,8.5 (excluding Weddles rule, Booles rule, Romberg's method and related problems)
V	10	10.0 - 10.2, 10.3(excluding modified Euler's method & its related problems), 10.4 - 10.6

REFERENCE BOOK

1. Mathews J.H. Numerical Method for Maths, Science and Engineering: PHI, New Delhi, 2001.
2. P.Kandasamy, K.Thilagavathy, K.Gunavathy, Numerical Methods (2016), S.Chand & Company Ltd., New Delhi-55.
3. P.Duraipandian and Dr.S.Udayabaskaran, Allied Mathematics Volume I (2014), S.Chand & Company Ltd., New Delhi-55.

SELF STUDY

Modified Euler's method

WEB RESOURCES

https://27x37.files.wordpress.com/2011/05/mcgraw-hill-numerical-methods-using-matlab.pdf

Course Code 24UCSA31	PO1	PO2	PO3	PO4	PO5	PO 6	PO7
CO1	3	2	1	3		1	-
CO2	3	2	1	3	2	1	-
CO3	3		1	3	2	1	-
CO4	3	2	1	3	2	1	-
CO5	-	2	1	3	2	1	-

Strong (3) Medium (2) Low (1)

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Semester III	**WEB DESIGNING**	Hour/Week: 1	
SEC - 3		Credit: 1	
Course Code **24UCSS31**		Internal 100	External -

Course Outcomes:

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

CO1 : recognize elements and their purposes of HTML, CSS and JavaScript. [K1]

CO2 : identify the functionalities of components to build simple web pages. [K1]

CO3 : discuss the concepts to develop web application based on ethics using HTML, CSS and JavaScript. [K2]

CO4 : describe the purpose of different HTML tags and CSS properties to create dynamic content through JavaScript. [K2]

CO5 : apply HTML tags to create secured structured web content, utilize CSS styles, and use JavaScript to validate form inputs. [K3]

UNIT I

HTML (HYPERTEXT MARKUP LANGUAGE): Introduction - Structure of HTML document: Header or Head Section, Body Section, Heading Tags, Paragraph Formatting Tags, Font Setting Tag - Creating Lists: The OL (Ordered List) Tag, Nesting Lists – Tables: Basic Table Tags – Frames: Defining Frameset. (3 Hours)

UNIT II

HTML (HYPERTEXT MARKUP LANGUAGE): Images: Using the ALT Attribute, Using the Align Attribute in Inline Graphics, Setting the Height and Width of an Inline Image – Forms: Creating a Form, Input Elements, Adding a Check Box, Adding a Radio Button, Adding a Password Field, Multiple Line Text Input, Pull Down Menus, Adding Submit and Reset Button, Attributes to Form tag. (4 Hours)

UNIT III

CASCADING STYLE SHEET (CSS): Introduction – Style Sheet: Style Rule, Including Style Information Inline-Inline Styles – Embedding Style Sheet – Grouping Style Rules.

(2 Hours)

UNIT IV

JAVASCRIPT AND AJAX: What is JavaScript? - What can a JavaScript Do? – How to Put a JavaScript into an HTML Page – Variables – Conditional Statements – JavaScript Functions – JavaScript Loops. (3 Hours)

UNIT V

JAVASCRIPT AND AJAX: Object Oriented Programming: Properties, Methods, String object, Defining Arrays, Boolean Object, Math Object – The HTML DOM - Browser Detection – JavaScript Form Validation. (3 Hours)

SELF-STUDY: (Not included for examination)

JAVASCRIPT AND AJAX: JavaScript Popup Boxes (Section 5.7)

TEXT BOOK

Pankaj Sharma. (2011). *Web Technology*, 5th Edition Sk Kataria & Sons, Bangalore.

UNIT	CHAPTER	SECTIONS
I	**2**	**2.0, 2.2.2 - 2.2.6, 2.3.1, 2.3.2, 2.4.1, 2.7.1**
II	**2**	**2.5.1 - 2.5.3, 2.6.2 - 2.6.10**
III	**3**	**3.0, 3.1.1 – 3.1.4**
IV	**5**	**5.1 – 5.5, 5.8, 5.9**
V	**5**	**5.13.1 - 5.13.6, 5.14 - 5.16**

REFERENCE BOOKS

1. Mike Mcgrath. (2006). *Java Script*, 1st Edition, Dream Tech Press.
2. Achyut S Godbole & AtulKahate. (2002). *Web Technologies*, 2nd Edition, Tata McGraw-Hill Companies.

3. Laura Lemay, RafeColburn, Jennifer Kyrnin. (2016). *Mastering HTML, CSS & Javascript Web Publishing*, 1st Edition, BPB Publications.
4. DT Editorial Services (Author). (2016). *HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)* 2nd Edition, Dream Tech Press.

WEB RESOURCES

1. NPTEL & MOOC courses titled Web Design and Development.
2. https://www.geeksforgeeks.org

Course Code 24UCSS31	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	3	2	2	1	2	2	2	2	-	-
CO2	3	2	2	1	2	2	2	2	-	-
CO3	3	2	2	2	2	2	2	2	-	3
CO4	3	2	2	2	2	2	3	2	-	-
CO5	3	3	2	3	3	3	3	2	1	1

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester III	**SOFTWARE TESTING**	Hours/Week: 2	
SEC - 4		Credits: 2	
Course Code **24UCSS32**		Internal 25	External 75

Course Outcomes:

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

CO1 : understand the purpose and significance of software testing. [K1]

CO2 : enumerate different testing concepts. [K1]

CO3 : recall the taxonomy of bugs and software testing methods. [K2]

CO4 : illustrate several testing techniques. [K2]

CO5 : apply various software testing techniques for testing. [K3]

UNIT I

Introduction: The Purpose of Testing: Productivity and Quality in Software – Some Dichotomies: Testing Vs Debugging – A Model for Testing. **The Taxonomy of Bugs:** A Taxonomy for Bugs. (6 Hours)

UNIT II

Flow Graphs and Path Testing: Predicates, Path Predicates and Achievable Paths – Path Instrumentation - Implement and Application of Path Testing **Transaction Flow Testing:** Transaction Flows – Transaction Flow Testing Techniques. (6 Hours)

UNIT III

Data Flow Testing: Data Flow Testing Basics - Data Flow Testing Strategies. (6 Hours)

UNIT IV

Metrics and Complexity: Linguistic Metrics - Structural Metrics. **Paths, Path Products and Regular Expressions:** Path Products and Path Expressions. **Syntax Testing:** A grammar for Formats - Test Case Generation: Generators, Recognizers, and Approach, Test Case Design, Sources of Syntax, Ambiguities and Contradictions. (6 Hours)

UNIT V

Logic Based Testing: Decision Tables - **States, State Graphs and Transition Testing:** State Graphs - Good State Graphs and Bad - State Testing. (6 Hours)

SELF-STUDY: (Not included for examination)

Domain Testing: Domains and Paths (Section: 6.2)

TEXT BOOK

B. Beizer. (2003). *Software Testing Techniques*, 2nd Edition, Dream Tech India, New Delhi.

UNIT	CHAPTERS	SECTIONS
I	1	1.2, 2.1, 3.1-3.8
	2	3.1-3.8
II	3	3.1-3.5, 5.1-5.6, 6.1-6.4
	4	3.1-3.7, 4.1-4.7
III	5	2.1-2.3, 3.1-3.4
IV	7	3.1-3.4, 4.1-4.3
	8	3.1-3.8
	9	3.1, 3.2, 4.1-4.4
V	10	3.1-3.6
	11	3.1-3.6, 4.1-4.5, 5.1-5.6

REFERENCE BOOKS

1. I.Burnstein. (2003). *Practical Software Testing*, Springer-Verlag Berlin Newyork Inc.
2. E. Kit. (1995). *Software Testing in the Real World: Improving the Process*, Pearson Education, Delhi.
3. R. Rajani and P.P.Oak. (2004). *Software Testing*, Tata Mcgraw Hill, New Delhi.

WEB RESOURCES

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

Course Code 24UCSS32	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	3	2	1	2	2	2	1	2	1	-
CO2	2	2	1	1	2	2	1	2	1	-
CO3	2	1	1	1	3	3	2	2	1	1
CO4	2	1	2	2	3	3	2	2	2	2
CO5	3	2	1	2	3	3	2	2	2	2

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester IV	**JAVA PROGRAMMING**	Hours/Week: 5	
Core Course – 7		Credits: 5	
Course Code **24UCSC41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: understand the Object-oriented concepts and constructs in Java. [K1]

CO2: infer packages, inheritance, interface, multi-threads, and exceptions. [K2]

CO3: describe the usage of IO streams, AWT controls, Swing components and event handling mechanisms. [K2]

CO4: implement inheritance, packages, interfaces, exception handling, multi-threading, I/O streams. [K3]

CO5: employ event handling mechanisms with AWT controls and Swing components to create GUI. [K3]

UNIT I

Introducing Classes: Class Fundamentals – Declaring Objects – Assigning Object Reference variables – Introducing Methods – Constructors – The this keyword. **A Closer look at Methods and classes:** Overloading Methods **–** Understanding static. **Inheritance**: Inheritance basics – Using super – Creating a Multilevel hierarchy – When Constructors are called - Method Overriding– using Abstract classes - using final with Inheritance. (15 Hours)

UNIT II

Packages and Interfaces: Packages - Access Protection – Importing Packages - Interfaces. **Exception Handling**: Exception Handling Fundamentals - Using try and catch– Multiple catch Clauses – Nested try statements - throw - throws – finally– Java's Built-in Exceptions – Creating own Exception subclasses. (15 Hours)

UNIT III

String Handling: Character Extraction – String Comparision: equals() and equalsIgnoreCase(), compareTo() – Searching Strings – Modifying String – String Buffer. **Multithreaded Programming**: The Thread Class and the Runnable interface – The Main Thread – Creating a Thread – Creating Multiple Threads. **Event Handling:** The Delegation Event Model - Event Classes: The ActionEvent Class, The ItemEvent Class, The KeyEvent Class, The MouseEvent Class – Event Listener Interfaces: The ActionListener Interface, The ItemListener Interface, The KeyListener Interface, The MouseListener Interface, The MouseMotionListener Interface– Using the Delegation Event Model. (15 Hours)

UNIT IV

Input/Output: Exploring java.io: The Java I/O classes and Interfaces – File – The Stream classes – The Byte Streams: InputStream, OutputStream, FileInputStream, FileOutputStream. The Character Streams: Reader, Writer, FileReader, FileWriter. **Introducing the AWT: Working with Windows, Graphics, and Text:** The AWT Classes – Window fundamentals – Working with Frame windows – Working with Color – Working with Fonts. (15 Hours)

UNIT V

Using AWT Controls, Layout Managers and Menus: Labels – Using Buttons – Applying Check Boxes – CheckBox Group – Choice Controls – Using Lists – Managing Scroll bars – Using a TextField – Using a TextArea. The Swing Packages – **Exploring Swing:** Jlabel and ImageIcon – JTextField –The Swing Buttons. (15 Hours)

SELF-STUDY: (Not included for Examination)

Java Evolution (Pages: 13, 14)

TEXT BOOK

Herbert Schildt. (2010). *Java: The Complete Reference,* 7th Edition, Tata McGraw Hill, New Delhi.

UNIT	CHAPTERS	PAGES
I	6	105 – 120
	7	125 – 128, 141 – 143
	8	157 – 173, 177 – 182
II	9	183 – 203
	10	205, 207 – 221
III	15	365 – 367, 369 – 374, 377 – 384
	11	226 – 233
	22	638 – 641, 644 – 646, 650 – 657
IV	13	555 – 559, 562 – 565, 578 – 581
	23	663 – 668, 682 – 684, 686 – 691
V	24	702 – 723
	30	879 – 891

REFERENCE BOOKS

1. Debasish Jana. (2005). *Java and Object-Oriented Programming Paradigm*, 1st Edition, Prentice Hall of India Private Limited, New Delhi.
2. Y. Daniel Liang. (2010). *Introduction to Java Programming*, 7th Edition, Pearson Education India
3. Dr.Somasundaram. (2013). *Introduction to Java Programming*, 1st Edition, Jaico Publishing House, India.

WEB RESOURCES

1. https://javabeginnerstutorial.com/core-java-tutorial
2. http://docs.oracle.com/javase/tutorial/
3. https://www.coursera.org/

Course Code 24UCSC41	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	2	3	2	2	2	2	-	-
CO2	3	3	2	3	2	2	3	3	-	-
CO3	3	3	2	3	2	2	3	3	-	-
CO4	3	3	2	3	3	3	3	3	3	2
CO5	3	3	2	3	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester IV	**JAVA PROGRAMMING PRACTICAL**	Hours/Week: 4	
Core Course – 8 (Practical – IV)		Credits: 3	
Course Code **24UCSC41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write Java programs using arrays, strings, methods, inheritance, interface and threads. [K2]

CO2: write Java programs using packages, exceptions, AWT Controls and Swing Components. [K2]

CO3: execute Java programs for various inputs. [K3]

CO4: prepare record with Java programs using basic object oriented programming concepts, packages, multi-threads and exception concepts. [K3]

CO5: implement simple graphical methods using AWT Controls and Swing Components. [K3]

Write a Java program for the following:

1. to print all the prime numbers between two limits
2. to find sum of elements in the array.
3. to multiply two given matrices.
4. to perform String Manipulation:
   a. String length
   b. String concatenation
   c. Finding a character at a particular position
   d. String comparison
5. to perform string operations using String Buffer class:
   a. Length of a string
   b. Reverse a string
   c. Delete a substring from the given string
6. to display the number of characters, lines and words in a text.

7. to perform arithmetic operations using package.
8. to implement interface.
9. to implement a multi-thread application that has two threads by generating odd and even numbers.
10. to implement a multi-thread application which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2
11. to Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.
12. to demonstrate the use of following exceptions:
    a. ArithmeticException
    b. NumberFormatException
    c. ArrayIndexOutofBoundException
    d. NegativeArraySizeException
13. to handle User defined Exception.
14. to use AWT frames and controls to accept a text and change its size and font.
15. to handle all mouse events and shows the event name at the center of the window when a mouse event is fired.
16. to simulate a traffic light in Swing. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.

Course Code 24UCSC41P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	2	2	3	1	1	3	-	-
CO2	3	3	3	2	3	2	1	3	-	-
CO3	3	3	3	2	2	2	2	3	2	-
CO4	3	3	3	1	2	2	2	3	3	2
CO5	3	3	3	2	3	2	3	3	2	2

Strong (3) **Medium (2)** **Low (1)**

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B.Sc. Computer Science
(2024-2025 onwards)

Semester IV	**RESOURCE MANAGEMENT TECHNIQUES**	Hours/Week: 4	
Elective Course		Credits: 4	
Course Code **24UCSA41**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: define the basic concepts in OR, LPP and Transportation Problems. [K1]

CO2: explain various methodologies involved in resource management techniques. [K2]

CO3: find the optimal solutions to various problems using optimization techniques. [K2]

CO4: apply the acquired computational skills to formulate the problems in real life situations.[K3]

CO5: use various transportation techniques in various domains. [K3]

UNIT I

Development of OR : Definition of OR- Modelling-Characteristics and Phases- Tools,Techniques & Methods-scope of OR. (12 hours)

UNIT II

Linear Programming Problem : Formulation-Slack & surplus variables-Graphical solution of LPP. (12 hours)

UNIT III

Simplex Method : Computational Procedure-Big M method-Concept of duality in LPP-Definition of primal and dual problems-General rules for converting any primal into its dual. (12 hours)

UNIT IV

Duality: Theorems(without proof)- Primal and dual correspondence-Duality and simplex method – Mathematical formulation of assignment problem-Method for solving assignment problem. (12 hours)

UNIT V

Mathematical Formulation of Transportation Problem : Methods for finding Initial Basic Feasible Solution for the Transportation Problems, Optimal Solution (Excluding Unbalanced, Degeneracy and Non-Degeneracy). (12 hours)

TEXT BOOK

Sharma.S.D, *Operations Research*, Kedar Nath Ram Nath & Co.

REFERENCE BOOKS

1. R.Sivarethinamohan, *Operation Research*, Tata McGraw Hill, 2005.
2. Nita H.Shah, Ravi M.Gor and Hardiksoni, *Operation Research*, Prentice-Hall of India Pvt. Ltd., New Delhi 2008.
3. Kanti Swarup, Gupta. P. K, Man Mohan. (Reprint 2011). *Operations Research*, Sultan Chand& Sons.
4. Hamdy A.Taha, A.M. Natarajan, P.Balasubramanie and A.Tamilarasi, (2009).

Operations Research - An Introduction, Eighth Edition, Prentice-Hall of India Pvt. Ltd.

5. Arumugam. S and Thangapandi Isaac. A.(2015).*Topics in Operations Research Linear Programming*, New Gamma Publishing house.

Self Study:

Minimal Spanning Tree Problem

Web Resources:

Web resources from NDL Library, E-content from open-source libraries

Course Code 24UCSA41	PO1	PO2	PO3	PO4	PO5	PO 6	PO7
CO1	3	2	1	3	2	1	
CO2	3	2	-	3	2	1	-
CO3	3	2	1	3	2	1	
CO4	3	2	1	3	2	1	
CO5	3	2	1	3	1	1	

Strong (3) Medium (2) Low (1)

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Semester IV	**QUANTITATIVE APTITUDE**	Hours/Week: 2	
SEC - 5		Credits: 2	
Course Code **24UCSS41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: identify the arithmetic ability concepts. [K1]

CO2: represent the data pictorially. [K1]

CO3: understand number systems, arithmetic operations, fractions, percentages and ratios. [K2]

CO4: interpret the concepts of tables, graphs and charts. [K2]

CO5: implement relevant data and appropriate mathematical formulae. [K3]

UNIT I

Arithmetical Ability: Number System – HCF and LCM of Numbers – Decimal Fractions – Simplification (5 Hours)

UNIT II

Average – Problems on Numbers – Problems on Ages – Percentage – Profit and Loss – Ratio and Proportion. (7 Hours)

UNIT III

Time and Work – Time and Distance – Simple Interest – Compound Interest (6 Hours)

UNIT IV

Area – Volume and Surface Area – Calendar – Clocks – Height and Distances. (6 Hours)

UNIT V

Odd Man Out and Series - **Data Interpretation**: Tabulation – Bar Graphs – Pie Chart – Line Graphs. (6 Hours)

SELF-STUDY: (Not included for Examination)

Square Roots and Cube Roots: (Pages: 180 - 184)

TEXT BOOK:

Dr. R. S. Aggarwal. (2017). *Quantitative Aptitude*, Revised Edition, S.Chand and Company Ltd, New Delhi

UNIT	CHAPTER	PAGES
I	1	3-10
	2	51-55
	3	69-74
	4	95-100
II	6	206-209
	7	240-243
	8	264-265
	11	308-312
	12	374-380
	13	426-432
III	17	526-531
	18	562-567
	22	641-645
	23	663-668
IV	24	688-693
	25	766-770
	28	823-840
	34	870-872
V	35	877-880
	37	905-908
	38	923-926
	39	937-940

REFERENCE BOOKS

1. R.V.Praveen. (2013). *Quantitative Aptitude and Reasoning*, 2nd Revised Edition, Prentice Hall of India Pvt. Ltd.
2. G. K. Ranganath, C.S. Sampangiram and Y. Rajaram. (2008). *A text Book of business Mathematics*, Himalaya Publishing House.
3. Nishit K. Sinha. *Logical Reasoning and Data Interpretation for CAT*, 5th Edition, Pearson Education

Course Code 24UCSS41	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	-	-	-	-	1	3	3	-	-
CO2	3	-	2	2	2	1	2	2	1	-
CO3	3	1	1	-	3	3	2	2	2	-
CO4	3	-	2	1	1	2	2	2	1	-
CO5	3	-	1	-	-	2	3	3	1	-

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester IV	**PHP PROGRAMMING**	Hours/Week: 2	
SEC - 6		Credits: 2	
Course Code **24UCSS42**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe the basics concepts of PHP. [K1]

CO2: explain form handling and session management in PHP. [K1]

CO3: infer looping, control statements ,functions ,operators ,arrays using PHP. [K2]

CO4: interpret the concepts of database, session and cookies in PHP. [K2]

CO5: apply the concepts of basic programming , functions , arrays , database and cookies in PHP programs. [K3]

UNIT I

Introduction: Getting PHP – Creating a First PHP Page – Running First PHP Page – Mixing HTML and PHP – Working with Variables – Storing Data in Variables – Creating Variables – Creating Constants – Understanding PHP's Internal Data Types. **Operators and Flow Control:** PHP's Math Operators – Working with the Assignment Operators – Incrementing and Decrementing Values. PHP String Operators. (5 Hours)

UNIT II

Operators and Flow Control: Bitwise Operators – Execution Operators – PHP Operator Precedence – Using the if Statement – PHP Comparison Operators – PHP Logical Operators – else Statement – elseif Statement – Ternary Operators – Switch Statement – Using for Loops – Using while Loops – Using do..while Loops. (6 Hours)

UNIT III

Strings and Arrays: Arrays – Modifying Data in Arrays – Deleting Array Elements – Handling Arrays with Loops – PHP Array Functions – Extracting Data from Arrays – Sorting Arrays - Using PHP's Array Operator – Comparing Arrays to Each Other – Handling Multidimensional Arrays – Using Multidimensional Arrays in Loops (7 Hours)

UNIT IV

Creating Functions: Creating Functions in PHP – Passing Functions – Passing Arrays to Functions – Passing by Reference – Using Default Arguments – Passing Variable Numbers of Arguments – Returning Data from Functions – Returning Arrays – Returning Lists – Returning References. (6 Hours)

UNIT V

Working with Databases: What Is a Database? – Creating a MySQL Database – Creating a New Table – Putting Data into the New Database – Accessing the Database in PHP – Updating Databases – Inserting New Data Items into a Database – Deleting Records. **Sessions, Cookies, and FTP:** Setting a Cookie –Reading a Cookie – Setting Cookies Expiration – Deleting Cookies. (6 Hours)

SELF-STUDY: (Not included for Examination)

Working with Databases: Creating New Tables – Creating a New Database – Sorting Data (Pages: 385 - 394)

TEXT BOOK:

Steven Holzner. (2011). *PHP: The Complete Reference*, TATA McGraw-Hill Education

UNIT	CHAPTERS	PAGES
I	1	3 - 5, 8 - 13, 26 - 30, 33 - 39
	2	41 - 50
II	2	51 - 75
III	3	92 - 115
IV	4	123 - 143
V	10	362, 364 - 385
	11	395 - 402

REFERENCE BOOKS

1. DT Editorial Services. (2016). *HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*, 2nd Edition, Dreamtech Press.
2. Alan Forbes, *The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL* .
3. Lynn mighley and Michael Morrison. (2009). *Head First PHP & MySQL: A Brain-Friendly Guide*

Course Code 24UCSS42	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	2	2	3	2	2	2	2	-
CO2	3	3	2	2	3	2	2	2	2	-
CO3	3	3	2	2	3	2	2	2	2	-
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester V	**DATABASE MANAGEMENT SYSTEMS**	Hours/Week:6	
Core Course 9		Credits:6	
Course Code **24UCSC51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: understand the basic concepts of data base system management systems and PL/SQL . [K1]

CO2: describe the principles of database design concepts and SQL.[K2]

CO3: illustrate database operations by utilizing relational algebra and PL/SQL, normalization methods, and the E-R model.[K2]

CO4: discover the usefulness of different relational algebra operations with SQL and the quality of the database design using different normal forms. [K3]

CO5: apply the concepts of database management systems to solve any real database applications. [K3]

UNIT I

Database Concepts: Database Systems: Data vs Information - Introducing the database – Evolution of the File System Data Processing - Problems with File System Data Processing – Database Systems. **Data Models:** Data Modeling and Data Models - Importance of Data Models – Data Model Basic Building Blocks - Evolution of Data models - Degrees of Data Abstraction**.** (18 Hours)

UNIT II

Design Concepts: Relational Database Model: Logical view of Data - Keys - Integrity Rules - Relational Set Operators - Relationships within the Relational Database -

Indexes. **Entity Relationship (ER) Modeling:** The Entity Relationship Model (ERM) – Developing an ER diagram (18 Hours)

UNIT III

Normalization of Database Tables: Database Tables and Normalization – The Need for Normalization – The Normalization Process – Higher-Level Normal Forms. **Introduction to Structured Query Language (SQL):** Introduction to SQL - Data Definition Commands – Data Manipulation Commands – SELECT Queries. (18 Hours)

UNIT IV

Introduction to Structured Query Language (SQL): Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables. **Advanced SQL**: Relational SET Operators - SQL Join Operators - Sub Queries and Correlated Queries -SQL Functions. (18 Hours)

UNITV

PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment Operation – Arithmetic Operators. **Control Structures and Embedded SQL:** Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation in PL/SQL – Transaction Control Statements. **PL/SQL Cursors and Exceptions:** Cursors – Implicit Cursors - Explicit Cursors - Explicit Cursor and Attributes – Cursor FOR Loops – SELECT…FOR UPDATE Cursor – WHERE CURRENT OF Clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions. (18 Hours)

SELF-STUDY: (Not included for Examination)

Codd's Relational Database Rules (Text book1 - Pages: 88, 89)

TEXT BOOKS

1. Coronel, Morris, Rob. (2009). *Database Systems, Design, Implementation and Management*, 9th Edition, Cengage Learning.
2. Nilesh Shah. (2016). *Database Systems Using Oracle*, 2nd edition, Pearson Education India.

UNIT	TEXT BOOK	CHAPTERS	PAGES
I	**1**	**1**	**5-24**
		2	**30-32, 34-50**
II		**3**	**59-74, 76-83, 88**
		4	**100-128**
III		**6**	**175-187, 192-197**
		7	**221-253**
IV		**7**	**253-275**
		8	**298-330**
V	**2**	**10**	**225-234, 236, 240**
		11	**245-264**
		12	**268-289**

REFERENCE BOOKS

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan. (2020). *Database System Concepts*, 7th Edition, McGraw Hill International Publication.
2. Shio Kumar Singh. *Database Systems*, 2nd Edition, Pearson publications.
3. Ramez Elmasri, Shamkant B. Navathe. (2016). *Fundamentals of Database Systems*, 7th Edition, Pearson Education Pvt. Ltd, India.

Course Code 24UCSC51	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	2	1	3	1	1	1	2	2	1	-
CO2	2	3	3	1	2	2	2	3	1	-
CO3	3	3	2	2	3	2	2	2	1	-
CO4	3	2	2	2	1	3	3	3	2	-
CO5	3	3	2	3	3	3	3	3	2	1

Strong (3) Medium (2) Low (1)

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Semester V	**DATA ANALYTICS USING R**	Hours/Week:6	
Core Course 10		Credits:6	
Course Code **24UCSC52**		Internal 25	External 75

COURSEOUTCOMES

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

CO1: define big data analytics concepts and basic programming constructs in R Programming [K1]

CO2: understand the characteristics of big data applications and R Programming data structures.[K2]

CO3: infer the data analytics using R.[K2]

CO4: use analytics methods, data structures and object oriented programming in R.[K3]

CO5: apply R Programming data structures and mathematical functions to solve the real time problems.[K3]

UNIT I

Introduction to Big Data: What is analytics? – Characteristics of Big Data – Domain Specific Examples of Big Data. **Big Data Patterns:** Analytics Architecture Components & Design Styles. **Big Data Storage:** HDFS**. Batch Analysis:** Hadoop and Map Reduce – Hadoop - Map Reduce Examples. (18 Hours)

UNIT II

Getting Started: Introduction to Functions – Preview of Some Important R Data Structures. **Vectors:** Scalars, Vectors, Arrays and Matrices – Declarations – Common Vector Operations – Vectorized Operations. **R Programming Structures:** Control Statements – Environment and Scope Issues. (18 Hours)

UNIT III

Lists: Creating Lists – General List Operations – Accessing List Components and Values – Applying Functions to Lists. **Data Frames:** Creating Data Frames: Accessing Data Frames – Other Matrix-Like Operations. (18 Hours)

UNIT IV

Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables. **Doing Math and Simulations in R:** Math Functions – Functions for Statistical Distributions. **(**18 Hours)

UNIT V

Object-Oriented Programming: S3 Classes - S4 Classes - S3 Versus S4. **String Manipulation:** An Overview of String-Manipulation Functions. (18 Hours)

SELF-STUDY: (Not included for Examination)

Doing Math and Simulations in R: Linear Algebra Operations on Vectors and Matrices (Section: 8.4)

TEXT BOOKS

1. Norman Matloff. (2011). *The Art of R Programming- A Tour of Statistical Software Design*.
2. Arshdeeep Bahga, Vijay Madaisetti. (2018). *Big Data Analytics, A Hands-On Approach.*

UNIT	TEXT BOOK	CHAPTERS	SECTIONS
I	2	1	1.1, 1.3, 1.4
		3	3.1
		6	6.1
		7	7.1, 7.2
II	1	1	1.3, 1.4
		2	2.1, 2.2, 2.4, 2.6
		7	7.1, 7.6
III	1	4	4.1 - 4.4
		5	5.1, 5.1.1, 5.2
IV	1	6	6.1 - 6.3
		8	8.1, 8.2
V	1	9	9.1 - 9.3
		11	11.1

REFERENCE BOOKS

1. Garrett Grolemund, Hadley Wickham. (2014). *Hands-On Programming with R: Write Your Own Functions and Simulations* , 1st Edition, O'Reilly Media, Inc.,
2. Tom White. (2012). *Hadoop: The Definitive Guide* 3rd Edition, O'Reilly Media, Inc
3. Seema Acharya, Subhasini Chellappan. (2015). *Big Data Analytics*, 2nd edition,Wiley

Course Code 24UCSC52	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	3	1	2	1	2	2	1	-
CO2	3	3	3	1	2	2	2	3	1	-
CO3	3	3	2	2	3	2	2	2	1	1
CO4	3	3	2	2	3	3	3	3	3	1
CO5	3	3	2	3	3	3	3	3	3	1

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester V	**DATABASE MANAGEMENT SYSTEMS PRACTICAL**	Hours/Week: 5	
Core Course 11 Practical V		Credits: 3	
Course Code **24UCSC51P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write SQL statements to create and manipulate tables using DDL & DML and display using DQL statements. [K2]

CO2: write PL/SQL programs using functions, procedures, exceptions, cursors and triggers. [K2]

CO3: execute programs for different database and interactive user inputs. [K3]

CO4: generate the results and prepare the output in the required format. [K3]

CO5: apply the results of database query statements in various environments such as command prompt, admin window and user-interactive programs. [K3]

Write SQL commands for the following

1. Create and manipulate the employee pay details using DDL and DML commands.
2. Perform string operations using built-in function.
3. Manipulate students mark details using aggregate functions.
4. Apply nested queries on employee details.
5. Use group by & having clause.
6. Implement different types of join operations.

Write PL/SQL programs for the following

1. Using any 7 string functions.
2. Using any 5 date functions.

3. Display the name of the department with the maximum number of employees.
4. Calculate the student grade using case statement.
5. Calculate incentive achieved according to the specific sale limit.
6. Print the number of products whose price between 0 and Rs. 50, Rs. 51 and Rs. 100, Rs 101 and Rs. 150 and Rs. 151 and Rs. 200.
7. Handle user-defined exception for inventory details.
8. Use built-in exception for bank customer details.
9. Update the employee's salary using implicit cursor.
10. Find the highest salary of an employee using explicit cursor.
11. Calculate simple and compound interest using user defined function.
12. Raise the trigger after every insertion and deletion.
13. Prepare EB-Bill for a customer using procedure**.**
14. Calculate employee's net pay using package.

Course Code	PO1		PO2		PO3	PO4	PO5		PO6	PO7
24UCSC51P	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	2	2	3	2	2	2	1	2
CO2	3	3	2	2	3	2	2	2	1	2
CO3	3	3	2	2	3	2	2	2	1	-
CO4	3	3	3	2	3	2	2	2	1	-
CO5	3	3	3	2	3	2	2	3	1	-

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester V	**PROJECT**	Hours/Week: 1
Core Course 12		Credits: 1
Course Code **24UCSC53PR**		Internal: 100 Marks

COURSE OUTCOMES

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

CO1: understand the problem for the project. [K2]

CO2: solve the problem by identifying the objective and project requirements. [K3]

CO3: collect the data for the problem domain and identify design methodologies based on the collected data. [K3]

CO4: implement the source code based on programming tools and techniques to solve the problem. [K3]

CO5: test the project work based on the formulated problem domain. [K4]

- Students are expected to select a project in the field of Computer Science or related interdisciplinary fields.
- One/Two students can do one project.
- Minimum pages for project report should be 20.
- A copy of the project report will be submitted to the Controller of Examinations through the Head of the Department in the month of November during V Semester.
- Evaluation will be done internally.

Project work & Report - 60 marks

Presentation & Viva-voce - 40 marks

Course Code 24UCSC53PR	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	2	3	1	2	2	2	2
CO3	3	3	2	3	3	2	3	2	2	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	3

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester V	**INTRODUCTION TO DATA SCIENCE**	Hours/Week: 5	
Elective Course - 7		Credits: 4	
Course Code **24UCSE51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : outline the basics of data science, frameworks (Hadoop, Spark), and types of database. [K1]

CO2 : explain the facets of data, big data ecosystem, model building, machine learning and their types. [K2]

CO3 : discuss the data science process, techniques, graph databases and frameworks. [K2]

CO4 : illustrate methods for retrieving and transforming data from different sources, and applying basic techniques to datasets. [K3]

CO5 : explore the process of data science, frameworks (Hadoop, Spark) and types of databases. [K3]

UNIT I

Data science in a big data world: Benefits and uses of data science and big data – Facets of data – The data science process – The big data ecosystem and data science. (15 Hours)

UNIT II

The data science process: Overview of the data science process – Step 1: Defining research goals and creating - Step 2: Retrieving data – Step 3: Cleansing, integrating and transforming data – Step 4: Exploratory data analysis – Step 5: Build the models. (15 Hours)

UNIT III

Machine learning: What is machine learning? – The modeling process – Types of machine learning - Semi-supervised learning. (15 Hours)

UNIT IV

First steps in big data: Distributing data storage and processing with frameworks. **Join the NoSQL movement:** Introduction to NoSQL. (15 Hours)

UNIT V

Join the NoSQL movement: Case study: What disease is that? **The rise of graph databases**: Introducing connected data and graph databases – Introducing Neo4j: a graph database. (15 Hours)

SELF-STUDY: (Not included for Examination)

First steps in big data: Case study: Assessing risk when loaning money (Section: 5.2)

TEXT BOOK

Davy Cielen, Arno D. B. Meysman, Mohamed Ali. (2016). *Introducing Data Science*, Manning Publications.

UNIT	CHAPTERS	SECTIONS
I	1	1.1 – 1.4
II	2	2.1 – 2.6
III	3	3.1 – 3.4
IV	5	5.1
	6	6.1
V	6	6.2
	7	7.1,7.2

REFERENCE BOOKS

1. Roger D. Peng. (2016). *The Art of Data Science*, lulu.com.
2. Murtaza Haider. (2015). *Getting Started with Data Science – Making Sense of Data with Analytics*, 1st Edition, IBM press.
3. Lillian Pierson. (2017). *Data Science for Dummies*, 2nd Edition, For Dummies.

WEB RESOURCES

1. https://www.w3schools.com/datascience/
2. https://en.wikipedia.org/wiki/Data_science
   http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

Course Code 24UCSE51	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	3	3	1	2	2	2	2	2	1	-
CO2	3	3	1	2	2	2	2	2	1	-
CO3	3	3	1	2	3	3	2	3	1	-
CO4	3	3	2	2	3	3	2	3	2	-
CO5	3	3	2	2	3	3	2	3	2	-

Strong (3) Medium (2) Low (1)

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(2024 – 2025 onwards)

Semester V	**ARTIFICIAL INTELLIGENCE**	Hours/Week: 5	
Elective Course-7		Credits: 4	
Course Code **24UCSE52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: represent knowledge using various logical and probabilistic formalisms and reason about that knowledge to draw conclusions and make decisions. [K1]

CO2: recognize the basics of AI, the problem of uncertainty and probabilistic reasoning. [K2]

CO3: understand intelligent agents that can solve problems and make decisions in various environments. [K2]

CO4: apply various problem-solving strategies, including search algorithms, adversarial search, and probabilistic reasoning, to solve complex problems. [K3]

CO5: Construct modern logical inference systems and apply reinforcement learning techniques to make decisions under uncertainty. [K3]

UNIT I

Introduction: What is AI? –The History of Artificial Intelligence – Risks and Benefits of AI. **Intelligent Agents:** Agents and Environments – The Nature of Environments – **Solving Problems by Searching:** Problem-Solving Agents –Example Problems. (15 Hours)

UNITII

Solving Problems by Searching: Search Algorithms – Uninformed Search Strategies: Breadth-first search – Depth-first search and the problem of memory– Informed (Heuristic) Search Strategies: Greedy best-first search, A* Search. (15 Hours)

UNIT III

Adversarial Search and Games: Optimal Decisions in Games: The minimax search algorithms – Alpha-Beta Pruning. **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain - The Semantics of Bayesian Networks. (15 Hours)

UNIT IV

Logical Agents: Knowledge-Based Agents – Propositional Logic: A Very Simple Logic - Propositional Theorem Proving: Inference and proofs, Forward and backward chaining. **First-Order Logic:** Using First-Order Logic: Assertions and queries in first-order logic - Numbers, sets, and lists - Knowledge Engineering in First-Order Logic: The knowledge-engineering process. (15 Hours)

UNIT V

Quantifying Uncertainty: Basic Probability Notation: What probabilities are about - The language of propositions in probability assertions - Inference using Full Joint Distributions - Independence - Bayes' Rule and its Use - **Reinforcement Learning:** Passive Reinforcement Learning - Active Reinforcement Learning: Temporal-difference Q-learning.

(15 Hours)

SELF-STUDY: (Not included for Examination)

Exact Inference in Bayesian Networks (Section: 13.3)

TEXT BOOK

Stuart Russell and Peter Norvig. (2022). *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson Education, India.

UNIT	CHAPTERS	SECTIONS
I	1	1.1, 1.3, 1.5
	2	2.1, 2.3
	3	3.1, 3.2
II	3	3.3, 3.4.1, 3.4.3, 3.5.1, 3.5.2
III	6	6.2.1, 6.2.3
	13	13.1, 13.2
IV	7	7.1, 7.4, 7.5.1, 7.5.4
	8	8.3.1, 8.3.3, 8.4.1
V	12	12.2.1, 12.2.2, 12.3, 12.4, 12.5
	22	22.2, 22.3.3

REFERENCE BOOKS

1. Trivedi, M.C. (2018). *A Classical Approach to Artificial Intelligence*, Khanna Publishing House, Delhi.
2. Saroj Kaushik. (2011). *Artificial Intelligence*, Cengage Learning India.
3. David Poole and Alan Mackworth. (2017). *Artificial Intelligence: Foundations for Computational Agents*, Cambridge University Press.

WEB RESOURCES

1. https://github.com/dair-ai/ML-Course-Notes
2. https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html
3. https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tlqU1LXlRFbcghLMZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE

Course Code 24UCSE52	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	3	3	2	1	3	3	-	-
CO2	3	3	3	3	2	1	3	3	-	-
CO3	3	3	3	3	1	1	3	3	2	1
CO4	3	3	2	3	3	1	3	3	2	1
CO5	3	3	2	3	3	1	3	3	2	1

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester V	**DATA SCIENCE USING R PRACTICAL**	Hours/Week: 5	
Elective Course - 8 Practical - I		Credits: 3	
Course Code **24UCSE53P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the basic concepts like vector, matrix, control structures and data frame. [K2]

CO2: write programs to evaluate the output of data analysis. [K2]

CO3: use algorithms to manipulate the data. [K3]

CO4: apply various plot methods using different dataset. [K3]

CO5: utilize the results for further analysis of data. [K3]

Write R Programs for the following:

1. Vector manipulation
2. Matrix manipulation
3. Creating Data frames
4. Implementing Conditional and Iterative Statements
5. Applying Mathematical functions
6. Using Statistical functions
7. Using Date functions
8. Generating
    i. Bar Plot
    ii. Pie Chart
    iii. Box Plot
    iv. Scatter Plot
    v. Line graph

9. Implementing Apriori Algorithm.
10. Implementing K-Means Clustering Algorithm.
11. Importing dataset from various file formats.

Course Code 24UCSE53P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	3	3	2	2	3	2	2	2	1	-
CO2	3	3	2	2	3	2	2	3	1	-
CO3	3	3	3	3	3	3	3	3	1	-
CO4	3	3	3	3	3	3	3	3	1	1
CO5	3	3	3	3	3	3	3	3	1	1

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester V	**ARTIFICIAL INTELLIGENCE PRACTICAL**	Hours/Week:5	
Elective Course - 8 Practical - I		Credits:3	
Course Code **24UCSE54P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write the programs to implement AI algorithms. [K2]

CO2: understand the techniques needed for creating AI applications. [K2]

CO3: build smart system using different informed search / uninformed search or heuristic approaches. [K3]

CO4: apply difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing. [K3]

CO5: design intelligent expert models for perception and prediction from intelligent environment. [K3]

Write programs to implement the following concepts

1. Breadth-First Search to find a path in a maze.
2. Breadth-First Search to find the shortest path in a graph.
3. Depth First Search to find a path in a maze.
4. A* search to find the shortest path in a weighted graph.
5. Tic-Tac-Toe game using the Minimax algorithm.
6. Alpha-Beta pruning to optimize the Minimax algorithm.
7. Propositional logic.
8. Predicate logic.
9. Parser for First-Order Logic formulae.

10. Represent a simple knowledge base using First-Order Logic and implement a query system to retrieve information.
11. Bayesian network to model a simple probabilistic domain.
12. Probabilistic reasoning algorithms (e.g., variable elimination, junction tree algorithm).
13. Decision-making system under uncertainty.

Course Code 24UCSE54P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO1.a	PSO1.b	PSO 2.a	PSO 2.b	PSO3	PSO4	PSO 5.a	PSO 5.b	PSO6	PSO7
CO1	3	3	1	1	3	1	2	3	1	2
CO2	3	3	1	1	3	1	3	3	1	2
CO3	3	3	2	1	3	2	3	3	1	3
CO4	3	3	3	2	3	2	3	3	2	2
CO5	3	3	2	2	3	2	3	3	3	3

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester V	**INTERNSHIP**	Credit: 1
Internship/ Industrial Training		
Course Code 24UCSI51		Internal: 100 Marks

COURSE OUTCOMES

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

CO1: observe, analyze, and understand organizational processes, systems, and cultures, and identify areas for further improvement. [K2]

CO2: apply theoretical concepts learned in the classroom to Industry based problems. [K3]

CO3: demonstrate professional skills, including team communication and work, and time management, and adhere to organizational norms and etiquette. [K3]

CO4: develop industry ready graduates and lifelong learning. [K3]

CO5: analyse problem-solving and critical thinking skills by identifying and addressing organizational challenges and problems. [K4]

Guidelines/ Regulations

- Each student must go for Internship training in a reputed Industry / Company / Organization/ Educational Institution.
- Students should produce the completion certificate after the completion of Internship period.
- A report of 10-15 pages must be submitted by each student after the completion of the Internship period.
- Internal Viva-voce examination will be conducted.
- Students with diverse disabilities must complete a 10 day internship programme at their preferred places.

Course Code 24UCSI51	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	3	2	2	2	2	2	2	3
CO2	3	3	3	2	3	2	2	2	2	3
CO3	3	3	2	3	3	2	3	2	2	3
CO4	3	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	3	2	2	3

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester V	**OOPs WITH C++ APTITUDE**	Credits: 2
Extra Credit Course		
Course Code **24UCSO51**		Internal Marks 100

COURSE OUTCOMES

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

CO1: describe the OOPs Concepts with C++.

CO2: demonstrate operator overloading, type conversion, constructors, and destructors in C++.

CO3: implement inheritance, pointers, virtual functions, and polymorphism in C++ programs.

CO4: develop C++ Program using exception handling techniques, string operations, Console I/O Operation and Templates.

CO5: utilize the concepts of object oriented programming with C++ for various entry level exams.

UNIT I

OOPs Concept – Classes and Objects – Structure of C++ Program – Operators in C++: Scope Resolution Operator – Manipulators – Inline Functions – Default Arguments – Function Overloading.

UNIT II

Operator Overloading – Type Conversion – Constructors and Destructors.

UNIT III

Inheritance – Pointers, Virtual Functions and Polymorphism.

UNIT IV

Exception Handling in C++ – Strings in C++.

UNIT V

Managing Console I/O Operations – Templates.

REFERENCE BOOKS

1. E. Balagurusamy. (2008). *Object Oriented Programming with C++*, 4th Edition, McGraw-Hill Education, India.
2. Yashwant Kanetkar. (2003*). Test Your C++ Skills*, BPB Publications, India.
3. Herbert Schildt. (2003). *C++: Complete Reference*, 4th Edition, McGraw-Hill Education, India.

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(2024 – 2025 onwards)

Semester VI	**MOBILE APPLICATIONS DEVELOPMENT**	Hours/Week: 6	
Core Course 13		Credits: 5	
Course Code **24UCSC61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recognize the basic android widgets and other android application based components. [K1]

CO2: describe the attributes and methods of layouts, media, maps, animation storage and user interfaces classes . [K2]

CO3: explain the android widgets, dialogs, menus, databases in android applications. [K2]

CO4: classify widgets, layouts and other significant components that can be used in android applications. [K3]

CO5: choose appropriate widgets, layouts and storage requirements for creating secure android applications that prioritize user privacy and data protection. [K3]

UNIT I

Getting Started with Android Programming: What is Android: Android Versions, Features of Android, Architecture of Android - Obtaining the Required Tools: Android SDK, Installing the Android SDK Tools, Configuring the Android SDK Manager, Eclipse, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs) – Create your First Android Application.

Activities, Fragments, And Intents: Understanding Activities: Applying Styles and Themes to an Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog - Linking Activities Using Intents: Resolving Intent Filter Collision, Returning Results from an Intent, Passing Data Using an Intent Object – Fragments (without program). (18 Hours)

UNIT II

Getting to Know the Android User Interface: Understanding the Components of a Screen: Views and ViewGroups, LinearLayout, AbsoluteLayout, TableLayout, RelativeLayout, FrameLayout, ScrollView.

Designing your User Interface with Views: Using Basic Views: TextView View, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView View - Using Picker Views: TimePicker View, DatePicker View - Using List Views to Display Long Lists: ListView View, Using the Spinner View. (18 Hours)

UNIT III

Displaying Pictures and Menus with Views: Using Image Views to Display Pictures: Gallery and Image View Views, Image Switcher, Grid View – Using Menus with Views: Creating the Helper Methods, Options Menu, Context Menu - Some Additional Views: Analog Clock and Digital Clock Views, Web View. **Messaging:** SMS Messaging: Sending SMS Messages Programmatically, Sending SMS Messages Using Intent, Receiving SMS Messages - Sending E-mail. (18 Hours)

UNIT IV

Location-Based Services: Displaying Maps: Creating the Project, Obtaining the Maps API Key, Displaying the Map, Displaying the Zoom Control - Changing Views - Navigating to a Specific Location. **Data Persistence:** Creating and Using Databases: Creating the DBAdapter Helper Class, Using the Database Programmatically, Pre-Creating the Database. (18 Hours)

UNIT V

Media Components: Camcorder, Camera, Player, Speech Recognizer, Text to Speech, Video Player – **Drawing and Animation Components:** Canvas. **Sensor Components:** Barcode Scanner, Location Sensor - **Social Components:** ContactPicker, EmailPicker, PhoneCall, PhoneNumberPicker. **Storage Components:** CloudDB, File, TinyDB, TinyWebDB. (18 Hours)

SELF-STUDY: (Not included for Examination)

User Interface Components: List Picker (Study Material – Pages: 32 - 34)

TEXT BOOK

Wei – Meng Lee. (2012). *Beginning Android 4 Application Development*, Wiley Pubishing, India.

UNIT	CHAPTERS	PAGES
I	**1** **2**	**1-5, 9-29** **36-49, 53-69**
II	**3**	**105-123**
	4	**159-202**
III	**5** **8**	**219-249** **321-324, 328-332, 345-347**
IV	**9** **6**	**352-365** **273-289**
V	**Study Material**	**1 - 31**

REFERENCE BOOKS

1. Karen Lang and Selim Tezel. (2022). *Become an App Inventor The official guide from MIT App Inventor*, Miteen Press, Walker Books Limited.
2. Reto Meier. (2012). *Professional Android 4 Application development*, John Wiley and Sons, Inc.
3. Prasanna Kumar Dixit. (2014). *Android*, First Edition, Vikas Publishing House Private Ltd, India.
4. John Horton. (2015). *Android Programming for beginners*, 1st Edition, Packt Publishing, Birmingham, Mumbai, India.

WEB RESOURCES

1. http://ai2.appinventor.mit.edu/reference/ (UNIT – V)
2. http://appinventor.mit.edu/explore/paint-pot-extended-camera

Course Code 24UCSC61	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	2	2	3	2	3	3	-	-
CO2	3	3	2	2	3	2	3	3	-	-
CO3	3	3	2	3	3	2	3	3	2	-
CO4	3	3	2	3	3	3	3	3	2	2
CO5	3	3	2	3	3	3	3	3	2	3

Strong (3) **Medium (2)** **Low (1)**

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester VI	**COMPUTER NETWORKS**	Hours/Week: 6	
Core Course - 14		Credits: 5	
Course Code **24UCSC62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: outline the computer network basics, devices, architecture, functions and various protocols in different layers. [K1]

CO2: summarize the role of different layers in the network architecture. [K2]

CO3: understand the basics of data communication, transmission media and networking concepts.[K2]

CO4: implement different routing algorithms, flow control and error control protocols, congestion control mechanism, network models and transmission media. [K3]

CO5: discover appropriate media for data transmission, routing algorithms, error handling methods, protocols for data transmission. [K3]

UNIT I

Introduction: Network Hardware – Network Software – Reference Models: The OSI Reference Model, The TCP/IP Reference Model – **The Physical Layer**: The Theoretical Basis for Data Communication - Guided Transmission Media. (18 Hours)

UNIT II

The Physical Layer: Wireless Transmission - Communication Satellites – The Public Switched Telephone Network: Structure of the Telephone System, Trunks and Multiplexing, Switching. **The Data Link Layer:** Data Link Layer Design Issues – Error Detection and Correction. (18 Hours)

UNIT III

Data Link Layer: Elementary Data Link Protocols - Sliding Window Protocols – **The Medium Access Control Sublayer:** The Channel Allocation Problem – Multiple Access Protocols – Bluetooth. (18 Hours)

UNIT IV

The Network Layer: Network Layer Design Issues - Routing Algorithms: Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing - Congestion Control Algorithms: Congestion Control in Virtual Circuits subnets, Congestion Control in Datagram subnets – The Network Layer in the Internet: The IP Protocol, IP Addresses. (18 Hours)

UNIT V

The Transport Layer: The Transport Service – Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release, Flow Control and Buffering - The Internet Transport Protocols: UDP – The Internet Transport Protocols: TCP: The TCP Segment Header, TCP Connection Establishment, TCP Connection Release

(18 Hours)

SELF-STUDY: (Not included for Examination)

Network Security: Communication Security (Section: 8.6)

TEXT BOOK

Tanenbaum A.S. (2011). *Computer Networks*, 4th Edition, Prentice-Hall of India.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.2, 1.3, 1.4.1, 1.4.2**
	2	**2.1, 2.2**
II	**2**	**2.3, 2.4, 2.5.1, 2.5.4, 2.5.5**
	3	**3.1, 3.2**
III	**3**	**3.3, 3.4**
	4	**4.1, 4.2, 4.6**
IV	**5**	**5.1, 5.2.2 – 5.2.6, 5.3.3,5.3.4, 5.6.1, 5.6.2**
V	**6**	**6.1, 6.2.1 - 6.2.4, 6.4,6.5.4-6.5.6**

REFERENCE BOOKS

1. Forouzan B.A. (2017). *Data Communications and Networking*, 4th Edition, Tata McGraw Hill.
2. Halsall F. (2008). *Data Communications,Computer Networks and Open Systems*, Pearson Education.
3. Bertsekas, D and Gallagher, R. (2008). *Data Networks*, 2nd Edition, PHI.
4. Lamarca. (2002). *Communication Networks*, Tata McGraw- Hill.

WEB RESOURCES

1. https://en.wikipedia.org/wiki/Computer_network
2. https://citationsy.com/styles/computer-networks

Course Code 24UCSC62	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	2	1	2	2	1	2	2	2	-	-
CO2	3	1	2	2	1	2	2	2	-	-
CO3	3	1	3	2	1	2	2	2	-	-
CO4	3	1	3	2	2	3	3	3	-	1
CO5	3	2	3	2	2	3	3	3	-	2

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE
(2024 – 2025 onwards)

Semester VI	**MOBILE APPLICATIONS DEVELOPMENT PRACTICAL**	Hours/Week: 6	
Core Course 15 Practical VI		Credits: 3	
Course Code **24UCSC61P**		Internal 40	External 60

COURSE OUTCOME
On completion of the course, the students will be able to

CO1: write an android program to implement layouts and widgets in android applications. [K2]

CO2: design the android applications with Spinner, Date/TimePicker, Menus, ListView, GridView. [K2]

CO3: execute android applications using the objects intent, database. [K3]

CO4: prepare record with procedures for designing mobile applications. [K3]

CO5: design android applications by using the right layouts, widgets, listeners, and android components in order to ensure privacy and security. [K3]

Develop Android applications using following widgets

1. Simple Counter.
2. Display personal details of a student.
3. Simple Calculator that uses radio buttons and text view.
4. Intent and Activity.
5. Dialog Boxes.
6. Splash Screen.
7. Layout Managers.
8. Different types of Menus.
9. Send messages from one mobile to another mobile.
10. Send E-mail.

11. Play Audio and Video.
12. Local File Storage.
13. Simple Animation.
14. Login Page using Sqlite.
15. Student Marklist processing using Sqlite.

Course Code 24UCSC61P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	1	1	3	2	2	2	1	2
CO2	3	3	1	1	3	2	3	2	1	2
CO3	3	3	2	1	3	2	3	2	1	3
CO4	3	3	3	2	3	2	3	2	2	2
CO5	3	3	2	2	3	3	3	3	3	3

Strong (3) **Medium (2)** **Low (1)**

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester VI	**IMAGE PROCESSING**	Hours/Week: 5	
Elective Course - 9		Credits: 4	
Course Code **24UCSE61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: outline the fundamentals of digital image, image processing system and applications. [K1]

CO2: understand the representation of images and image processing operations. [K2]

CO3: perform the various operations and transformations on 2D color and gray images. [K2]

CO4: use the different techniques and methods for image enhancement. [K3]

CO5: apply the image compression and reduction techniques for further classification. [K3]

UNIT I

Introduction: What is Digital Image Processing? – Fundamental Steps in DIP - **Digital Image Fundamentals:** Representing Digital Images – Some Basic Relationship between Pixels. **Introduction to Image-processing System:** Elements of an Image-processing System – Applications of Digital Image Processing. **2D Signals and Systems:** 2D Systems – Classification of 2D Systems – 2D Convolution. **Convolution and Correlation:** 2D Convolution Through Graphical Method – 2D Convolution Through Matrix Analysis. (18 Hours)

UNIT II

Image Transforms: Properties of 2D Discrete Fourier Transform (2D-DFT) – Walsh Transform – Hadamard Transform – Haar Transform – Discrete Cosine Transform – Karhunen-Loeve Transform (KL Transform) – Singular Value Decomposition.

(18 Hours)

UNIT III

Image Enhancement: Introduction – Image Enhancement in Spatial Domain – Enhancement Through Point Operation – Types of Point Operation – Histogram Manipulation – Linear Gray-level Transformation – Nonlinear Gray-level Transformation – Local or Neighborhood Operation – Median Filter – Spatial Domain High-pass Filtering or Image Sharpening – Bit-plane Slicing – Image Enhancement in the Frequency Domain – Homomorphic Filter. (17 Hours)

UNIT IV

Image Segmentation: Introduction – Classification of Image-segmentation Techniques – Region Approach to Image Segmentation – Clustering Techniques – Image Segmentation based on Thresholding – Edge-based Segmentation – Classification of Edges – Edge Detection – Hough Transform – Active Contour. **(**11 Hours)

UNIT V

Image Compression: Introduction – Need for Image Compression – Redundancy in Images – Classification of Image Compression Schemes – Huffman Coding – Arithmetic Coding – Dictionary based Compression – Transform based Compression. (11 Hours)

SELF- STUDY: (Not included for Examination)

Binary Image Processing: (Section – 10.3-10.5)

- Mathematical Morphology
- Structuring Elements
- Morphological Image Processing

TEXT BOOKS

1. S Jayaraman, S Esakkirajan, T Veerakumar. (2017). *Digital image processing*, 1st Edition, McGraw Hill Education, India.
2. Rafael C. Gonzalez, Richard E. Woods. (2008). *Digital Image Processing*, 3rd Edition, Pearson Education, India.

UNIT	TEXT BOOKS	CHAPTERS	SECTIONS
I	2	1	1.1, 1.4
		2	2.4.2, 2.5
	1	1	1.8(1.8.1-1.8.2, 1.8.6, 1.8.11-1.8.14), 1.10
		2	2.5 - 2.7
		3	3.2, 3.4
II	1	4	4.6, 4.8 - 4.10, 4.12, 4.13,4.14 (4.14.1, 4.14.2)
III	1	5	5.1-5.13
IV	1	7	7.1-7.8, 7.10, 7.11
V	1	9	9.1-9.3, 9.6, 9.10-9.12, 9.14

REFERENCE BOOKS

1. Jain Anil K. (2015). *Fundamentals of digital image processing*, 1st Edition, Pearson Education, India.
2. Kenneth R. Castleman. (2007).*Digital image processing*, 2nd Edition, Pearson Education, India.
3. Pratt William K. (2007). *Digital image processing*, 4th Edition, John Wiley.

Course Code 24UCSE61	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	1	1	3	1	1	1	2	2	2	-
CO2	2	1	3	2	2	2	2	3	2	-
CO3	3	3	2	2	3	2	2	2	2	-
CO4	2	2	2	2	1	3	3	3	1	-
CO5	3	3	2	3	3	3	3	3	1	1

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester VI	**CRYPTOGRAPHY**	Hours/Week: 5	
Elective Course - 9		Credits: 4	
Course Code **24UCSE62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the fundamental concepts of network security and its architecture. [K1]

CO2: discuss symmetric, asymmetric and public-key cryptography. [K2]

CO3: summarize the principles of firewalls and intrusion detection systems. [K2]

CO4: apply classical encryption techniques to encrypt and decrypt messages. [K3]

CO5: implement the algorithm and virus counter measures to protect systems from malicious attacks. [K3]

UNIT I

INTRODUCTION: Services, Mechanisms and Attacks - The OSI Security Architecture – A Model for Network Security. (15 Hours)

UNIT II

CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Model: Cryptography, Cryptanalysis - Substitution Techniques: Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Polyalphabetic Ciphers, One-Time Pad - Transposition Techniques – Steganography. (15 Hours)

UNIT III

BLOCK CIPHERS AND THE DATA ENCRYPTION STANDARD: Block Cipher Principles – The Data Encryption Standard – The Strength of DES – **PUBLIC-KEY CRYPTOGRAPHY AND RSA:** The RSA Algorithm. (15 Hours)

UNIT IV

IP SECURITY: IP Security Overview - IP Security Architecture – Authentication Header. **WEB SECURITY:** Secure Sockets Layer and Transport Layer Security – Secure Electronic Transaction. (15 Hours)

UNIT V

INTRUDERS: Intruders – Intrusion Detection – Password Management – **MALICIOUS SOFTWARE:** Viruses and Related Threats – Virus Countermeasures – **FIREWALLS:** Firewall Design Principles – Trusted Systems. (15 Hours)

SELF-STUDY: (Not included for Examination)

Hill Cipher (Page No. : 37-40)

TEXT BOOK

William Stallings**.** (2002). *Cryptography and Network Security Principles and Practices*, 3rd Edition, Pearson.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1 – 1.3**
II	**2**	**2.1 – 2.3, 2.5**
III	**3**	**3.2 - 3.4**
	9	**9.2**
IV	**16**	**16.1-16.3**
	17	**17.2, 17.3**
V	**18**	**18.1-18.3**
	19	**19.1, 19.2**
	20	**20.1, 20.2**

REFERENCE BOOKS

1. Behrouz A. Foruzan. (2007). *Cryptography and Network Security*, 1st Edition, Tata McGraw-Hill, India.
2. AtulKahate. (2003). *Cryptography and Network Security*, 2nd Edition, Tata McGraw-Hill, India.
3. M.V. Arun Kumar. (2011). *Network Security*, 1st Edition, Laxmi Publications, India.

WEB RESOURCES

1. https://www.tutorialspoint.com/cryptography/
2. https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography

Course Code 24UCSE62	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	2	2	1	1	1	1	3	2	-	-
CO2	2	2	2	2	1	1	2	2	-	-
CO3	3	2	1	3	2	1	2	2	2	2
CO4	3	2	3	3	2	3	2	2	2	2
CO5	3	2	3	3	2	3	2	3	2	2

Strong (3) Medium (2) Low (1)

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B.Sc. COMPUTER SCIENCE

(2024 – 2025 onwards)

Semester VI	**IMAGE PROCESSING PRACTICAL**	Hours/Week: 5	
Elective Course -10 Practical - II		Credits: 3	
Course Code **24UCSE63P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the basic concepts of image processing, including image representation, color models, and spatial resolution. [K2]

CO2: describe various image filtering and segmentation techniques, including low-pass and high-pass filtering, edge detection, and region-based segmentation. [K2]

CO3: enter and execute the code with proper image input. [K3]

CO4: implement various image transformation and conversion techniques, including image scaling, rotation, and color space conversion. [K3]

CO5: apply various image enhancement techniques, including histogram equalization, contrast stretching, and spatial filtering. [K3]

Write Programs for the following concepts:

1 To work with color spaces

i. Separate color image in three R G & B planes
ii. Create color image using R, G and B three separate planes
iii. Separate color image in three C M&Y planes
iv. Separate color image in three H S&I planes
v. Convert given color/gray-scale image into black & white image

2 Arithmetic Operations on Images

i. Addition of two images
ii. Subtract one image from other image
iii. Calculate mean value of image
iv. Different Brightness by changing mean value

3 Conversion between color spaces
   i. RGB to Grayscale conversion with and without using function
   ii. RGB to HSI conversion
4 Basic morphological operations
5 Histogram equalization
6 Intensity transformation of images
7 2-D DFT analysis of images
8 2-D DCT analysis of images
9 DWT of images
10 To perform Image transforms
   i. Walsh transform
   ii. Hadamard transform
   iii. DCT transform
   iv. Haar transform
11 To display Bit planes of an Image
12 Image enhancement using spatial filtering
13 Image enhancement using filtering in frequency domain
14 Region based segmentation
15 Segmentation using watershed transformation
16 To perform Image segmentation
   i. edge detection
   ii. line detection
   iii. point detection
17 Image compression techniques

Course Code 24UCSE63P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	2	3	2	2	2	2	2	2	-
CO2	3	3	3	2	2	2	2	3	2	-
CO3	3	3	2	2	3	2	2	2	2	-
CO4	3	2	2	2	2	3	3	3	2	1
CO5	3	3	2	3	3	3	3	3	2	1

Strong (3) Medium (2) Low (1)

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(2024 – 2025 onwards)

Semester VI	**CRYPTOGRAPHY PRACTICAL**	Hours/Week: 5	
Elective Course -10 Practical - II		Credits: 3	
Course Code **24UCSE64P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the basic cryptographic operations such as XOR, AND, and bitwise manipulation for text encoding. [K2]

CO2: illustrate the concepts of symmetric and asymmetric encryption techniques. [K2]

CO3: demonstrate encryption and decryption algorithms. [K3]

CO4: implement programs using substitution and transposition techniques. [K3]

CO5: design and develop software applications incorporating secure encryption methods. [K3]

Write C/Java program to implement the following

1. XOR each character in string with 0 and displays the result.
2. AND and XOR each character in the string with 127 and display the result.
3. Caesar Cipher technique.
4. Shift Cipher technique.
5. Caesar Cipher technique.
6. Vigenere Cipher technique.
7. Play fair Cipher technique.
8. Hill Cipher technique.
9. Rail fence Cipher technique.
10. Row - Columnar Transformation

11. DES algorithm.
12. RSA algorithm.
13. Blowfish algorithm.

Course Code 24UCSE64P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	2	2	1	1	2	2	2	2	-	-
CO2	3	2	1	2	2	2	2	2	-	-
CO3	3	3	2	2	3	3	2	2	1	-
CO4	3	3	2	2	3	3	2	2	1	-
CO5	3	3	2	2	3	3	2	2	-	-

Strong (3) Medium (2) Low (1)

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Semester VI	**MULTIMEDIA SYSTEMS**	Hours/Week: 2	
SEC - 7		Credits: 2	
Course Code **24UCSS61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe the basic concepts and tools in multimedia design. [K1]

CO2: recognize various multimedia file formats and processes used in creating and delivering multimedia content. [K1]

CO3: infer the role of different multimedia elements such as text, images, sound, animation, and video, and explain how they are correlated in multimedia projects. [K2]

CO4: discuss the various technologies involved in production process of multimedia projects.[K2]

CO5: apply multimedia development tools and techniques to create functional and interactive multimedia systems. [K3]

UNIT I

Multimedia: Definitions – Use of Multimedia - Delivering Multimedia. **Text:** About Fonts and Faces - Using Text in Multimedia - Font Editing and Design Tools - Hypermedia and Hypertext. (6 Hours)

UNIT II

Images: Making Still Images - Color – Image File Formats. **Sound:** The Power of Sound - Digital Audio - MIDI Audio – MIDI vs. Digital Audio - Multimedia System Sounds - Audio File Formats. (6 Hours)

UNIT III

Animation: The Power of Motion - Principles of Animation - Animation by Computer - Making Animations that Work. **Video:** Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video. (6 Hours)

UNIT IV

Making Multimedia: The Stage of Multimedia Project – What you need: The Intangible – What you need: Hardware – What you need: Software – What you need: Authoring Systems. **Multimedia Skills:** The Team. (6 Hours)

UNIT V

Planning and Costing: Scheduling – Estimating. **Designing and Producing:** Designing – Producing. **Content and Talent:** Acquiring Content - Acquiring Talent. (6 Hours)

SELF-STUDY: (Not included for Examination)

Adding Sound to Multimedia Project (Pages: 124 -133)

TEXT BOOK

Tay Vaughan. (2011). *Multimedia making it work*, 8th Edition, Tata McGraw Hill.

UNIT	CHAPTERS	Pages
I	1	1 - 12
	2	22 – 40, 50 - 60
II	3	70 - 97
	4	104 - 123
III	5	140 - 157
	6	173 – 190
IV	7	196 - 234
	8	241 - 254
V	9	273 – 280
	10	295 – 323
	11	331 - 342, 347 - 352

REFERENCE BOOKS

1. Ralf Steinmetz, Klara Nahrstedt. (2012). *Multimedia Computing, Communication & Applications*, 1st Edition, Pearson Education.
2. Ranjan Parekh. (2013). *Principles of Multimedia*, 2nd Edition, McGraw Hill Education Private Limited, India.
3. Ralf Steinmetz, Klara Nahrstedt. (2004). *Multimedia Systems*, Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

WEB RESOURCE

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

Course Code 24UCSS61	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	3	2	2	2	1	1	2	2	2	-
CO2	3	2	2	2	1	1	3	2	2	-
CO3	3	2	2	2	2	2	3	2	3	-
CO4	3	2	3	2	2	2	3	2	3	-
CO5	3	3	3	2	3	2	3	2	3	1

Strong (3) Medium (2) Low (1)

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