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 (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS
(with effect from Academic Year 2023 - 2024)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes (Aided), 14 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 and 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, 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, Zoology, Biochemistry, Home Science - Nutrition and Dietetics, Computer Science, and Computer Applications (MCA) *
Commerce & Management	:	Commerce, Business Administration (MBA) *

* AICTE approved Programmes

OUTLINE OF CHOICE BASED CREDIT SYSTEM- PG

1. Core Courses
2. Project
3. Elective Courses
   - 3.1 Discipline Specific Elective Courses (DSEC)
   - 3.2 Non-Major Elective Course (NMEC)
4. Online Course – Practice for SET/NET – General Paper
5. Extra Credit Courses (Optional)

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 channelise their teaching methodologies and evaluation strategies to attain the Programme Educational Objectives (PEOs) and fulfill 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 fulfill the Vision and Mission of the Department offering the Programme.

Vision of the Department of Computer Science (SF)

To promote academic excellence by inculcating the quest for continuous learning, intensive research thereby making students' professionally competent graduates and responsible citizens to outreach wider community.

Mission of the Department of Computer Science (SF)

- To offer an in depth knowledge of the subject.
- To groom the graduates with good attitude, team work and personality skills
- To promote original inquiry and innovations.
- To co-ordinate knowledge, skills and attitude towards successful career.
- To impart moral, ethical and social responsibilities to students

B.1.1 Programme Educational Objectives (PEOs)

PEOs are broad statements that describe the career and professional achievements that the Programme is preparing the graduates to achieve within the first few years after graduation. PEOs are framed for each Programme and should be consistent with the Mission of the Institution.

Programme Educational Objectives (PEOs) of M.Sc. COMPUTER SCIENCE Programme The Students will be able to

PEO1 - utilize the gained knowledge and adapt current emerging technologies throughindependent thinking in the rapid changing world.

PEO2 - enhance the technocrats as successful computer professionals, researchers orentrepreneurs with global competence.

PEO3 - acquire professional integrity, moral ethics and become responsible forsustainable development of society and industrial needs through research outcomes.

Key Components of Mission Statement	**Programme Educational Objectives**		
	PEO1	**PEO2**	**PEO3**
in-depth Knowledge	✓	✓	-
good attitude, team work and personality skills	-	✓	✓
promote inquiry and innovation	-	✓	✓
knowledge, skills and attitude	✓	✓	✓
moral ethical and social responsibility	-	-	✓

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 their in-depth domain knowledge and practical skills in interdisciplinary fields for research-based endeavours, employment and entrepreneurship development. (*Disciplinary Knowledge)*

2 communicate proficiently and confidently with the ability to present complex ideas both in spoken and written forms in a concise manner to assorted groups. (*Communication Skills*)

3 identify, formulate and solve problems in a consistent and systematic way with updated skills using modern tools and techniques. (*Scientific Reasoning and Problem Solving*)

4 analyze the data, synthesis the findings and provide valid conclusion by critical evaluation of theories, policies and practices for the fulfillment of the local, national, regional and global developmental needs. (*Critical Thinking and Analytical Reasoning*)

5 explore and evaluate globally competent research methodologies to apply appropriately in interdisciplinary research; Develop and sustain the research capabilities to meet the emerging needs for the welfare of the society. (*Research Related Skills*)

6 use ICT to mould themselves for lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - directed and Lifelong Learning*)

7 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*)

8 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 PG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme-specific and it is mandatory that each PO should be mapped to the respective PSO.

On Successful completion of M.Sc. Computer Science Programme, the students will be able to

PO 1: *Disciplinary Knowledge*

PSO 1.a: explore in depth knowledge in diverse areas of Computer Science and advanced programming skills to carry research.

PSO 1.b: adapt to new computing technologies with broad range of programming languages and open source platforms for attaining professional excellence and entrepreneurial skill.

PO2: *Communication Skills*

PSO 2: effectively communicate the concepts and ideas of new emerging technologies in computer science through effective reports, documentation and clear presentations.

PO3: *Scientific Reasoning and Problem Solving*

PSO 3: apply the attained knowledge in computer science for problem solving and in developing new application software.

PO4: *Critical thinking and Analytical Reasoning*

PSO 4: integrate the acquired knowledge with social concern and responsibility to

become an efficient entrepreneur and member of the workforce to improve the standard of living in society.

PO5: *Research Related Skills*

PSO 5: enhance technical skills to promote interdisciplinary research in various domains of computer science to fulfill the needs of the society.

PO6: *Digital Literacy, Self - directed and Lifelong learning*

PSO 6a: use online collaboration tools like google classroom, youtube channel, slide share and MOOC platform to negotiate content to enhance their learning behaviour through green environment.

PSO 6b: adapt to new technologies and constantly upgrade their technical skills with an attitude towards independent and lifelong learning to become successful in computer industry.

PO7: *Cooperation/Team Work and Multicultural Competence*

PSO 7: implement and evaluate the software projects as a member in a team by utilizing modern software tools.

PO8: *Moral and Ethical awareness*

PSO 8: promote ethical values and make them professionally responsible with the ability to relate computer applications to broader social context for the growth of the nation.

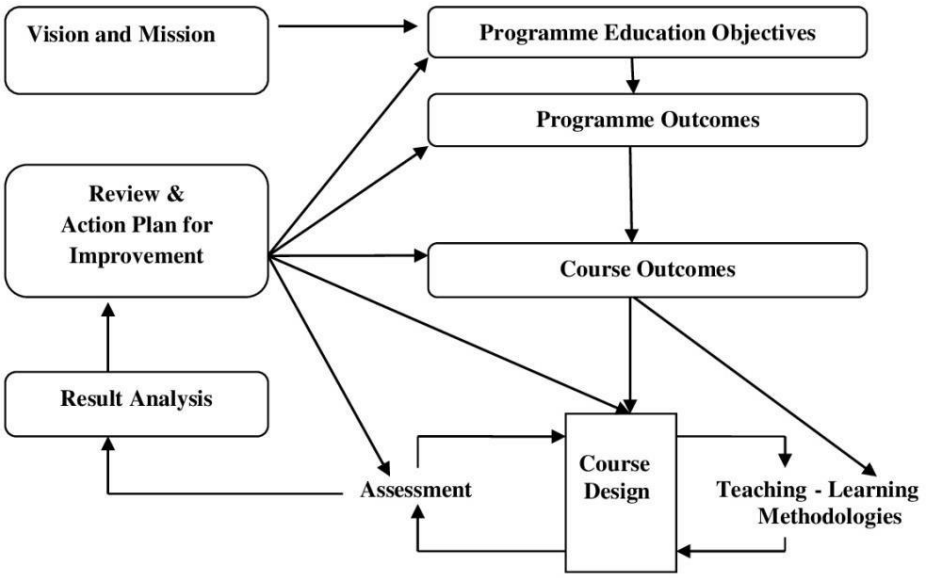
PO-PEO Mapping Matrix

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	✓	✓	✓
PO2/PSO2	✓	✓	✓
PO3/PSO3	✓	✓	✓
PO4/PSO4	✓	✓	-
PO5/PSO5	-	✓	✓
PO6/PSO6	✓	✓	✓
PO7/PSO7	✓	✓	✓
PO8/PSO8	✓	✓	-

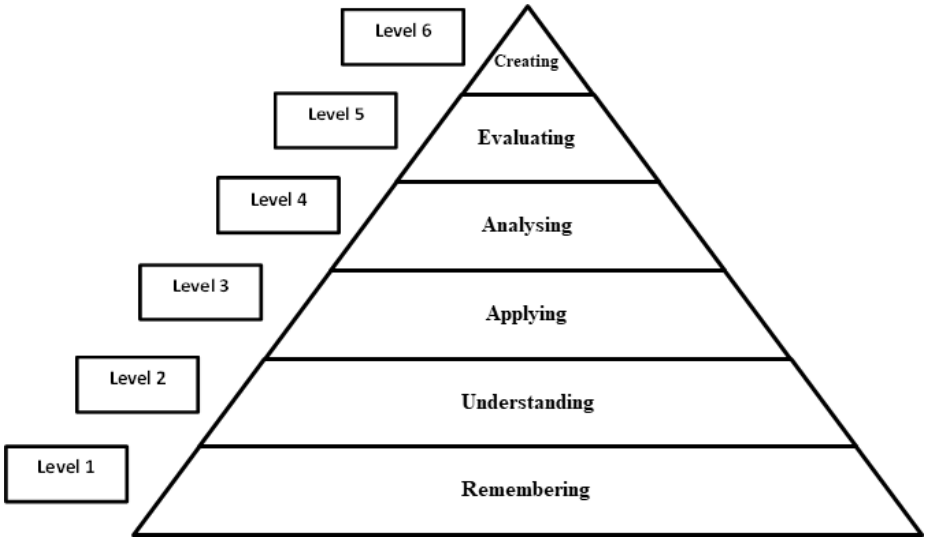
B.1.4 Course Outcomes (COs)

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, 2 and 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	PO8/ PSO8
CO1								
CO2								
CO3								
CO4								
CO5								

ELIGIBILITY FOR ADMISSION

Candidate for admission to the M.Sc. (Computer Science) Course (Full Time) should posses a Bachelors Degree of this University or as an Examination accepted as equivalent there to, with a minimum aggregate of 45% marks in Part III subjects other than languages and mathematics subject as ancillary.

DURATION OF THE PROGRAMME

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

MEDIUM OF INSTRUCTION

English

B.2 EVALUATION SCHEME

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

B.2.1 Core Courses, Discipline Specific Elective Courses

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation		Marks
Internal Test	:	20
Assignment	:	5
Total	**:**	**25**

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

Practical

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

Internal Test - Average of the best two will be considered
Performance - Attendance and Record

Question Pattern for Periodic Test **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	Fill in & Sentence Form	5	5	1	5
B	6-9	Internal Choice – Either… or Type	4	4	5	20
C	10 - 11	Internal Choice – Either…. or Type	2	2	10	20
					Total	**45***

*The total marks obtained in the Periodic Test will be calculated for 25 marks

Summative Examination
External Assessment
Distribution of Marks

Mode of Evaluation		Marks
Summative Examination	**:**	60
Seminar Presentation	**:**	15
Total	**:**	**75**

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 - 5	Fill in & Sentence Form	5	5	1	5
B	6 - 10	Internal Choice - Either ….or Type	5	5	5	25
C	11 - 13	Internal Choice - Either …or Type	3	3	10	30
					Total	**60**

B.2.2 Extra Credit Courses

- Two credits are allotted for each Extra Credit Course offered by the Department.
- Extra credits are allotted for the completion of Open Online Courses offered by MOOC to the maximum of 15 credits.
- The Courses shall be completed within the first III Semesters of the Programme.
- The allotment of credits is as follows

  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 and a minimum of 50% Pass marks in all the Courses.
  - No Pass minimum for Internal Assessment for other Courses.
  - Pass minimum for External Examination is 27 marks out of 60 marks for Core Courses, Discipline Specific Elective Courses and Non-Major Elective Course.
  - Pass minimum for Practice for SET/NET - General Paper is 50 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 60-75days (66% -84%) of attendance are permitted to appear for the Summative Examinations after paying the

required fine amountand fulfilling other conditions according to the respective cases.

- The students who have attended the classes for 59 days and less – upto 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.
- These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2020-2021 onwards.
- 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 - 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	PO8
Average Direct PO Attainment									
Direct PO Attainment in percentage									

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Graduate Exit Survey								
Indirect PO Attainment								

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
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 3 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 M.Sc. Computer Science Programme.

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MASTER OF COMPUTER SCIENCE (7016)

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2023-2024

Components	Semester				Total Number of Hours (Credits)
	I	II	III	IV	
Core Course	5(5)	5(5)	5 (4)	6 (5)	21 (19)
Core Course	5(5)	5(5)	5 (4)	-	15 (14)
Core Course	5(4)	5(4)	5 (4)	-	15 (12)
Core Course Practical	5(3)	5(3)	4 (2)	6 (3)	20 (11)
Core Course Practical	5(3)	5(3)	4 (2)	6 (3)	20 (11)
Project	-	-	-	6 (5)	6(5)
Discipline Specific Elective Course	5(4)	5 (4)	-	-	10 (8)
Elective Course	-	-	5 (3)	-	5 (3)
Skill Enhancement Course/ Professional Competency Skill			2 (2)	5 (3)	7 (5)
Self Study Course	-	-	0 (1)	-	0 (1)
Ability Enhancement Compulsory Course	-	-	-	1(1)	1(1)
Total	**30 (24)**	**30 (24)**	**30 (22)**	**30 (20)**	**120 (90)**
Extra Credit Course(Optional) - Offered by the Department	-	-	0(2)	-	0(2)
Extra Credit Course – (Optional) MOOC	-	-	-	-	Limited to a maximum of 15 credits

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M.Sc. COMPUTER SCIENCE -7016

PROGRAMME CONTENT

For those who join in the Academic Year 2023- 2024

SEMESTER I

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course 1	Analysis & Design of Algorithms	23PCSC11	5	5	3	25	75	100
2	Core Course 2	Python Programming	23PCSC12	5	5	3	25	75	100
3	Core Course 3	Object oriented analysis and Design & C++	23PCSC13	5	4	3	25	75	100
4	Core Practical 1	Algorithm and OOPS Practical	23PCSC11P	5	3	3	40	60	100
5	Core Practical 2	Python Programming Practical	23PCSC12P	5	3	3	40	60	100
6	Discipline Specific Elective 1	Multimedia and its Applications/ Grid Computing / Neural Networks	23PCSE11/ 23PCSE12/ 23PCSE13	5	4	3	25	75	100
			Total	**30**	**24**				**600**

SEMESTER II

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course 4	Data Mining	23PCSC21	5	5	3	25	75	100
2	Core Course 5	Digital Image Processing	23PCSC22	5	5	3	25	75	100
3	Core Course 6	Internet of Things	23PCSC23	5	4	3	25	75	100
4	Core Practical 3	Data Mining using R Practical	23PCSC21P	5	3	3	40	60	100
5	Core Practical 4	Digital Image Processing Practical	23PCSC22P	5	3	3	40	60	100
6	Discipline Specific Elective 2	Network Security and Cryptography/ Cloud Computing/ Distributed Systems /	23PCSE21/ 23PCSE22/ 23PCSE23	5	4	3	25	75	100
			Total	**30**	**24**				**600**

DSEC - Discipline Specific Elective Course

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M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester I	**ANALYSIS & DESIGN OF ALGORITHMS**	Hours/Week: 5	
Core Course 1		Credits: 5	
Course Code **23PCSC11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe elementary Data Structures, Algorithms and its complexity. [K2]

CO2: apply appropriate Data Structures considering its complexity, Greedy methods, Branch & Bound and Backtracking. [K3]

CO3: demonstrate Traversal Techniques, Search & Sort Algorithms using Divide & Conquer and Dynamic Programming. [K3]

CO4: analyze asymptotic performance of elementary data structures, Greedy, Backtracking and Branch & Bound Algorithms. [K4]

CO5: examine methods of binary Tree & Graph Traversal, Searching Techniques, Divide & Conquer and Dynamic Programming. [K4]

UNIT I

Introduction: Algorithm Definition and Specification – Space Complexity - Time Complexity- Asymptotic Notations - **Elementary Data Structure:** Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heap sort- Graph. (15 Hours)

UNIT II

Basic Traversal and Search Techniques: Techniques for Binary Trees-Techniques for Graphs -**Divide and Conquer:** General Method – Binary Search – Merge Sort – Quick Sort. (15 Hours)

UNIT III

The Greedy Method: General Method–Knapsack Problem–Minimum Cost Spanning Tree– Single Source Shortest Path.

(15 Hours)

UNIT IV

Dynamic Programming: General Method–Multistage Graphs–All Pair Shortest Path – Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling. (15 Hours)

UNIT V

Backtracking: General Method – 8-Queens Problem – Sum Of Subsets – Graph Coloring– Hamiltonian Cycles – **Branch And Bound:** The Method – Traveling Salesperson.

(15 Hours)

SELF STUDY:

UNIT I: Elementary Data Structure: Stacks

TEXT BOOK

1. Ellis Horowitz.(2001). Computer Algorithms, Galgotia Publications, 2nd Edition.

REFERENCE BOOKS

1. Goodrich. (2003). Data Structures & Algorithms in Java, Wiley, 3rd Edition.
2. Skiena. (2008). The Algorithm Design Manual, Springer, 2nd Edition.
3. Anany Levith. (2003). Introduction to the Design and Analysis of Algorithm, Pearson Education Asia, 2nd Edition.
4. Robert Sedgewick, Phillipe Flajolet. (2003). An Introduction to the Analysis of Algorithms, Addison-Wesley Publishing Company, 2nd Edition.

WEB RESOURCES

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://www.javatpoint.com/daa-tutorial

Course Code 23PCSC11	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	2	2	1	1	1	1	1	1	-	2
CO2	3	2	2	1	2	1	2	1	-	1
CO3	3	2	2	1	2	1	2	2	-	1
CO4	3	2	2	1	2	1	2	2	-	1
CO5	3	2	2	1	2	2	2	2	-	1

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

Mrs. P.Aruna Devi
Head of the Department

Ms. A. Dhivya
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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VIRUDHUNAGAR - 626 001

M.Sc. COMPUTER SCIENCE

(2023-2024 onwards)

Semester I	**PYTHON PROGRAMMING**	Hours/Week: 5	
Core Course 2		Credits: 5	
Course Code **23PCSC12**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: interpret the basic concepts of Python Programming, file storage, web services and Big Data. [K2]

CO2: acquire the knowledge of using data structures, modules, packages, OOP's Concepts, exception handling in Python. [K3]

CO3: apply the concepts of file handling, client server network applications and web applications in Python. [K3]

CO4: analyze the usage of data structures, code structures, file handling, OOP's concepts, modules and packages in various real time applications in python. [K4]

CO5: explore the ideas of creating dynamic web pages, network applications in Python. [K4]

UNIT I

Python: Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets – Comparison. (15 Hours)

UNIT II

Code Structures: if, elseif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions. (15 Hours)

UNIT III

Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes:** Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods – Composition. (15 Hours)

UNIT IV

Data Types: Text Strings – Binary Data. **Storing and Retrieving Data:** File Input / Output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores. **Web:** Web Clients – Web Servers – Web Service sand Automation. (14 Hours)

UNIT V

Systems: Files – Directories – Programs and Processes – Calendars and Clocks. **Concurrency:** Queues – Processes – Threads – Green Threads and gevent – twisted – Redis. **Networks:** Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ – Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds. (16 Hours)

SELF STUDY

UNIT V: Calendars and Clocks

TEXT BOOKS

1. Bill Lubanovic, (2014), *Introducing Python*, First Edition – Second Release, O'Reilly.
2. Mark Lutz (2013), *Learning Python*, Fifth Edition, O'Reilly.

REFERENCE BOOKS

1. David M. Beazley, (2009), *Python Essential Reference*, Fourth Edition, Developer's Library.
2. Sheetal Taneja, Naveen Kumar, (2017), *Python Programming – A Modular Approach*, First Edition, Pearson Publications.

WEB RESOURCES

1.https://www.programiz.com/python-programming/

2.https://www.tutorialspoint.com/python/index.htm

3.https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Course Code 23PCSC12	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	3	2	1	1	1	-	2	2	1	-
CO2	3	2	1	1	1	-	2	2	1	-
CO3	3	3	2	3	3	1	3	3	2	2
CO4	3	3	2	3	3	1	3	3	2	2
CO5	3	3	3	3	3	1	3	3	2	2

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

Mrs. P.Aruna Devi
Head of the Department

Mrs. T.Chitra
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M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester I	**OBJECT ORIENTED ANALYSIS AND DESIGN & C++**	Hours/Week: 5	
Core Course 3		Credits: 4	
Course Code **23PCSC13**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe object oriented concepts in C++. [K2]

CO2: illustrate object model and concepts of object oriented programming paradigm. [K3]

CO3:examine functions, type conversions, pointers, array, memory management operators, files, string and exceptions handling. [K3]

CO4: outline object oriented programming approaches, templates, pointers and arrays. [K4]

CO5: categorize functions, inheritance, constructors, overloading and control structures of C++. [K4]

UNIT I

The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. **Classes and Objects:** The Nature of an Object – Relationship among Objects. (15 Hours)

UNIT II

Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. **Classification:** The importance of Proper Classification – Identifying classes and objects – Key Abstractions and Mechanism. (15 Hours)

UNIT III

Introduction to C++ – Input and output statements in C++ – Declarations – Control structures– Functions in C++. (15 Hours)

UNIT IV

Classes and Objects – Constructors and Destructors – Operators overloading – Type Conversion Inheritance – Pointers and Arrays. (15 Hours)

UNIT V

Memory Management Operators – Polymorphism – Virtual functions – Files – Exception Handling – String Handling – Templates. (15 Hours)

.

SELF STUDY:

UNIT I: Input and output statements in C++

TEXT BOOK

1. Grady Booch. Object Oriented Analysis and Design with Applications, Pearson Education, 2nd Edition.
2. Ashok N. Kamthane. (2003).Object-Oriented Programming with ANSI & Turbo C++, Pearson Education.

REFERENCE BOOKS

1. Balagurusamy. (2003). Object Oriented Programming with C++,TMH, 2nd Edition.

WEB RESOURCES

1.https://onlinecourses.nptel.ac.in/noc19_cs48/preview

2.https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/

3. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.html

Course Code 23PCSC13	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	1	2	1	2	2	1	1	2	-	2
CO2	1	1	1	2	2	1	2	2	-	2
CO3	2	3	1	3	3	2	1	3	-	1
CO4	2	3	1	3	3	2	1	3	-	1
CO5	2	2	1	3	2	2	2	1	-	1

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

Mrs. P.Aruna Devi
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Mrs.V.Subhasini
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Virudhunagar - 626 001

M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester I	**ALGORITHM AND OOPS PRACTICAL**	Hours/Week: 5	
Core Practical 1		Credits: 3	
Course Code **23PCSC11P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write programs to illustrate elementary data structures and algorithms. [K2]

CO2: write C++ programs using OOPs concepts. [K2]

CO3: execute elementary data structure operations through OOPs concepts for the specified problem. [K3]

CO4: Prepare record with formatted output. [K3]

CO5: Analyse the performance of data structures and complexity of algorithms. [K4]

UNIT I

1. Solve the Tower of Hanoi using recursion.
2. Traverse through Binary Search Tree using Traversals.
3. Perform various operations on Stack using Linked List.
4. Perform various operations in Circular Queue.
5. Sort an array of an elements using Quick Sort.
6. Solve number of elements in ascending order using Heap Sort.
7. Solve the Knapsack Problem using Greedy Method.
8. Search for an element in a tree using Divide& Conquer Strategy.
9. Place the 8-Queens on an 8X8matrix so that no two Queens Attack.
10. C++ program to perform Virtual Function.
11. C++ program to perform Parameterized Constructor.
12. C++ program to perform Friend Function.
13. C++ program to perform Function Overloading.

14. C++ program to perform Single Inheritance.
15. C++ program to perform Employee Details using Files.

Course Code 23PCSC11P	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	2	2	2	3	3	1	1	2	1	1
CO2	2	2	2	3	3	1	1	2	1	1
CO3	3	3	2	3	3	1	2	2	-	-
CO4	2	2	3	3	3	1	2	2	-	-
CO5	3	3	2	3	3	2	2	2	1	1

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

Mrs. P.Aruna Devi
Head of the Department

Ms. A. Dhivya
Course Designer

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M.Sc. COMPUTER SCIENCE

(2023-2024 onwards)

Semester I	**PYTHON PROGRAMMING PRACTICAL**	Hours/Week: 5	
Core Course Practical 2		Credits: 3	
Course Code **23PCSC12P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write Python programs using various data structures in Python with conditional branches and loop statements. [K2]

CO2: write Python programs with functions and modules. [K2]

CO3: demonstrate data representation using Arrays, Strings, List, Tuple, Dictionaries, Files and Exception handling in Python. [K3]

CO4: Prepare record with formatted output. [K3]

CO5: develop dynamic and interactive web pages using forms in Python. [K4]

Write Python Programs for the following

1. Programs using elementary data items, lists, dictionaries and tuples.
2. Programs using conditional branches.
3. Programs using loops.
4. Programs using functions.
5. Programs using exception handling.
6. Programs using inheritance.
7. Programs using polymorphism.
8. Programs to implement file operations.
9. Programs using modules.
10. Programs for creating dynamic and interactive web pages using forms.
11. Programs using CSV file.
12. Programs using Numpy, Pandas and Matplot Library.
13. Programs using Turtle Graphics.

14. Programs using Database.
15. Updating the student database from SQLite Query.
16. Developing a games.

Course Code 23PCSC12P	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	2	3	1	1	1	2	1	1	1	-
CO2	2	3	1	1	1	2	1	1	1	-
CO3	3	3	3	2	1	2	2	2	1	-
CO4	3	3	2	2	1	2	2	2	1	-
CO5	3	3	3	3	3	2	2	3	2	3

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

Mrs. P. Aruna Devi
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M.Sc. Computer Science
(2023-2024 onwards)

Semester I	**MULTIMEDIA AND ITS APPLICATIONS**	Hours/Week: 5	
DSEC-1		Credits: 4	
Course Code **23PCSE11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: understand the basic concepts of multimedia and Internet.[K2]

CO2: illustrate the working of multimedia authoring tools and multimedia building blocks. [K3]

CO3: determine the usage of multimedia, Internet and WWW. [K3]

CO4: analyse the role of multimedia in Internet and real time applications. [K4]

CO5: examine the applications and basic software tools for WWW and multimedia. [K4]

UNIT I

INTRODUCTION: What is Multimedia?: Definitions – CD-ROM and the Multimedia Highway – Where to use Multimedia – **Introduction to making Multimedia**: The Stages of a Project – What you need – **Macintosh and Windows Production platforms** : Macintosh versus Windows – The Machintosh Platform – The Windows Platform – Networking Macintosh and Windows Computers – Connections – Memory and Storage Devices – Input Devices – Output Hardware - Communication Devices. (15 Hours)

UNIT II

Basic Software tools: Text Editing and Word Processing Tools – OCR Software – Painting and Drawing tools – 3D Modeling and Animation Tools – Image Editing Tools – Sound Editing Tools – Animation, Video and Digital Movie Tools.

MULTIMEDIA TOOLS : Making Instant Multimedia: Linking Multimedia Objects – Office Suites – Word Processors – Spreadsheets – Databases – Presentation Tools – **Multimedia Authoring Tools:** Types of Authoring Tools – Card- and Page-Based Authoring Tools – Icon- Based Authoring Tools – Time- Based Authoring Tools – Cross-Platform Authoring Notes. (16 Hours)

UNIT III

Multimedia building blocks: **Text**: The Power of Meaning – About Fonts and Faces – Using Text in Multimedia – Computers and Text – Font Editing and Designing Tools – Hypermedia and HyperText – **Sound :** The Power of Sound – Multimedia System Sounds – MIDI Versus Digital Audio – Digital Audio – Making MIDI Audio – Audio File Formats – Adding Sound to Your Multimedia Project – Toward Professional Sound: The Red Book Standard – Production Tips. (14 Hours)

UNIT IV

Multimedia building blocks: **Images**: Before you start to create – Making Still Images – Color – Image File Formats – **Animation:** The Power of Motion – Principles of Animation – Making Animations that Work – **Video**: Using Video – Hoe Video Works – Broadcast Video Standards – Integrated Computers Television – Shooting and Editing Video – Video Tips – Recording Formats – Digital Video. (15 Hours)

UNIT V

Multimedia and the Internet: **The Internet and how it works**: History – Internetworking – Connections – Internet Services – The World Wide Web and HTML – Dynamic Web Pages and XML – Multimedia on the Web – **Tools for World Wide Web**: Web Servers – Web Browsers – Web Page Makers and Site Builders – Plug-ins and Delivery Vehicles – Beyond HTML – **Designing for the World Wide Web**: Working on the Web – Text for the Web – Image for the Web – Sound for the Web – Animation for the Web. (15 Hours)

TEXT BOOK

Tay Vaughan. “Multimedia making it work”, Fifth Edition, Tata McGraw Hill.

REFERENCE BOOK

Judith Jeffloate. (2003) "Multimedia in Practice (Technology and Applications)", PHI.

WEB RESOURCES

1. https://www.tutorialspoint.com/multimedia/index.htm
2. https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_multimedia.htm
3. https://nptel.ac.in/courses/117/105/117105083/

Course Code 23PCSE11	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	3	2	3	2	2	2	2	2	1	-
CO2	3	2	3	2	3	2	3	2	2	-
CO3	3	3	3	2	3	3	3	3	2	1
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	1

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

Mrs. P. Aruna Devi
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Ms. M. Porkalai Selvi
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M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester I	**GRID COMPUTING**	Hours/Week: 5	
DSEC 1		Credits: 4	
Course Code		Internal	External
23PCSE12		25	75

COURSE OUTCOMES

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

CO1: express the history, architecture, service elements and layered model. [K2]

CO2: recognize the deployment issues, approaches and tools of grid computing. [K2]

CO3: illustrate the different architecture views and management issues of grid computing. [K3]

CO4: Determine the Open Grid Service Architecture services, grid service tools and issuesdeployment of grid computing. [K3]

CO5: analyze the supporting standards of Open Grid Services Infrastructure (OGSI) & OGSA, service relationships and security of grid computing. [K4]

UNIT I

Introduction: Grid Computing & Key Issues – Applications – Other Approaches– Grid Computing Standards – Pragmatic Course of Investigation. **Grid Benefits & Status of Technology:** Motivations – History of Computing, Communications and Grid Computing – Grid Computing Prime Time – Suppliers and Vendors – Economic Value – Challenges.

(14 Hours)

UNIT II

Components of Grid Computing Systems and Architectures: Basic Constituent Elements – A Functional View – A Physical View – Service View. (14 Hours)

UNIT III

Grid Computing Standards-OGSI: Standardization – Architectural Constructs – Practical View – OGSA/OGSI Service Elements and Layered Model – More Detailed View. (15 Hours)

UNIT IV

Standards Supporting Grid Computing-OGSA: Functionality Requirements – OGSA Service Taxonomy – Service Relationships – OGSA Services – Security Considerations. (16 Hours)

UNIT V

Grid System Deployment Issues, Approaches, and Tools: Generic Implementations: Globus Toolkit – Grid Computing Environments – Basic Grid Deployment and Management Issues – Grid Security Details– Deployment Peace of Mind. (16 Hours)

SELF STUDY

UNIT I: Challenges

TEXT BOOK

Daniel Minoli,*A Networking Approach to Grid Computing*, Wiley Publication

REFERENCE BOOKS

1. Ahmar Abbas, *Grid Computing – A Practical Guide to Technology and Applications*, Charles River Media Publication.
2. Joshy Joseph & Craig Fellenstein. (2004), *Grid Computing*, Pearson/PHI.
3. D.Janakiram. (2005), *Grid Computing*, Tata McGraw Hill Pvt Ltd.,
4. Maozhen Li & Mark Baker. (2005), *The Grid Core Technologies*, John Wiley & Sons.

Course Code 23PCSE12	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5.a	PSO 6.a	PSO 6.b	PSO 7	PSO 8
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CO2	1	-	2	-	-	2	-	-	-	-
CO3	1	-	2	2	1	2	-	-	-	2
CO4	2	1	3	2	1	3	1	1	-	2
CO5	2	1	3	2	2	3	1	1	-	-

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

Mrs. P.Aruna Devi
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M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester I	**NEURAL NETWORKS**	Hours/Week: 5	
DSEC 1		Credits: 4	
Course Code **23PCSE13**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: discuss ANS technology, architecture of adaline, madaline, counter propagation network, spatio temporal network and necognitron. mathematical foundations of backprogpagation, self organizing maps and adaptive resonance theory. [K2]

CO2: express data processing in Adaline, Madaline, Boltzmann Machine, CPN, classification in Spatiotemporal Network and neocognitron. [K3]

CO3: apply Backpropagation, BAM, self organizing maps and neocognitron, ART network for application. [K3]

CO4: examine Adaptive linear and signal processing, Statistical mechanics in Simulated Annealing, performance of spatiotemporal network and necognitron [K4]

CO5: investigate BAM, Backpropagation, SOM and Adaptive Resonance Theory. [K4]

UNIT I

Introduction to ANS Technology: Elementary Neurophysiology – From Neurons to ANS. **Adaline and Madaline:** Adaline and Adaptive Linear Combiner – Applications of Adaptive Signal Processing – The Madaline. (15 Hours)

UNIT II

Backpropagation: The Backpropagation Network – The Generalized Delta Rule – BPN Applications. **The BAM and the Hopfield Memory:** Associative Memory Definitions – The BAM – The Hopfield Memory. (16 Hours)

UNIT III

Simulated Annealing: Information Theory and Statistical Mechanics – The Boltzmann Machine. **The Counter propagation Network:** CPN Building Blocks – CPN Data Processing. (16 Hours)

UNIT IV

Self-Organizing Maps: SOM Data Processing – Applications of Self-Organizing Maps.

Adaptive Resonance Theory: ART Network Description – ART1 – ART2. (14 Hours)

UNIT V

Spatiotemporal Pattern Classification: Architectures of Spatiotemporal Network (STNS) – The Sequential Competitive Avalanche Field – Applications of STNS. **The Neocognitron:** Neocognitron Architecture – Necognitron Data Processing – Performance of the Neocognitron. (14 Hours)

SELF STUDY

UNIT I : Applications of Adaptive Signal Processing

TEXT BOOK

James A. Freeman and David M.Skapura (2007), *Neural Networks Algorithms, Applications and Programming Techniques,* 1st Edition, Pearson Education

REFERENCE BOOKS

1. J. Hertz, A. Krogh and R. Palmer. (1991). *Introduction to the Theory of Neural Computation*, Addison-Wesley.
2. Clark S. Lindsey (1998). *Neural Networks in Hardware: Architectures, Products and Applications.*
3. Simon Haykin (2003). *Neural Networks: A Comprehensive Foundation*, Second Edition, Prentice-Hall.

4. Laurence V.Fausett. (2004). *Fundamentals of Neural Networks: Architectures, Algorithms and Applications*, First Edition, Pearson Education.

Course Code 23PCSE13	**PO1**		**PO2**	**PO3**	**PO4**	**PO5**	**PO6**		**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6.a**	**PSO 6.b**	**PSO 7**	**PSO 8**
CO1	2	1	2	-	-	2	-	-	-	-
CO2	2	1	1	1	-	2	-	-	-	-
CO3	2	2	3	2	1	2	2	2	-	-
CO4	3	2	1	2	2	3	1	2	-	-
CO5	3	3	2	2	3	2	1	2	-	2

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

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M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester II	**DATA MINING**	Hours/Week: 5	
Core Course 4		Credits: 5	
Course Code **23PCSC21**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: infer data mining basics, data preprocessing, data warehousing and online analytical processing. [K2]

CO2: apply associations, correlations, OLAP operations, classification, mining frequent patterns, clustering and outlier detection methods. [K3]

CO3: illustrate the usage of data preprocessing, data warehouse, WEKA functionalities, classification, clustering and Visualization in WEKA. [K3]

CO4: analyse pre-processing methods, data warehousing, OLAP operations and various frequent itemset mining methods. [K4]

CO5: explore data mining algorithms to perform classification, clustering and outlier detection on particular data set. [K4]

UNIT I

Introduction: Data mining - Kinds of data mined - Kinds of Patterns mined – Technologies used. **Getting to Know your Data:** Data Objects and Attribute Types **Data Preprocessing:** Data Preprocessing: An Overview - Data Cleaning - Data Integration – Data Transformation and Data Discretization. (14 Hours)

UNIT II

Data Warehouse and Online Analytical Processing: Data Warehouse: Basic Concepts - Data Warehouse Modeling: Data Cube and OLAP - Data Warehouse Design and Usage – Data Warehouse implementation – Data Generalization by Attribute-Oriented Induction. (16 Hours)

UNIT III

Mining frequent patterns, Associations and Correlations: Basic Concepts and Methods Basic Concepts – Frequent Itemset Mining Method. **Classification: Basic Concepts:** Basic Concepts – Decision Tree Induction.

Case Study: Mining Customer Value: From Association Rules to Direct Marketing. (15 Hours)

UNIT IV

Classification: Advanced Methods: Classification by Back Propagation. **Cluster Analysis:** Cluster Analysis – Partitioning Methods – Hierarchical Methods – Density - Based Methods. (16 Hours)

UNIT V

Outlier Detection: Outliers and Outlier Analysis - Outlier Detection Methods. **Data Mining Trends and Research Frontiers:** Data Mining Applications. **Data Mining with WEKA:** Introduction - Basic Functionality of WEKA - Launching WEKA - The WEKA Explorer - Preprocessing - Classification - Clustering – Associating – Selecting Attributes – Visualizing – WEKA Experiment Environment - WEKA Knowledge Flow GUI - WEKA CLI (Command Line Interface) - **Demo:** WEKA Data Mining Tool. (14 Hours)

SELF STUDY:

UNIT V: Data Mining Trends and Research Frontiers.

TEXT BOOK

Jiawei Han and Micheline Kamber, Jian Pei. (2016). *Data Mining Concepts and Techniques*, New Delhi: Morgan Kaufmann Publishers, An imprint of Elsevier, Third Edition.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.2 - 1.6**
	2	**2.1**
	3	**3.1 - 3.3, 3.5**
II	**4**	**4.1 - 4.5**
III	**6**	**6.1 - 6.3**
	8	**8.1, 8.2**
IV	**9**	**9.2, 9.5**
	10	**10.1 - 10.4**
V	**12**	**12.1, 12.2**
	13	**13.2, 13.3**

Data Mining with WEKA – Material will be provided

REFERENCE BOOKS

1. Mehmed Kantardzic. (2011). *Data mining Concepts, Models, Methods, and Algorithms,* New Delhi: Wiley Inter science, Second Edition.
2. Alex Berson,& Stephen J. Smith. (2016). *Data Warehousing, Data Mining and OLAP*, Mumbai: Tata McGraw Hill Edition, 35th Reprint 2007.
3. Soman, K.P., Shyam Diwakar and Ajay, V. (2014). Insight *into Data Mining Theory and Practice*, New Delhi: PHI Learning Private Limited, Eastern Economy Edition, Seventh Printing.
4. Ian H.Witten, Eibe Frank, Mark A. Hall and Christopher J. Pal (2017). *Data Mining: Practical Machine Learning Tools and Techniques*, New Delhi: Elsevier - Morgan Kaufmann an imprint of Elsevier, Fourth Edition.
5. G. K. Gupta (2006). *Introduction to Data Mining with Case Studies*, New Delhi: Prentice Hall of India, Easter Economy Edition.
6. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani (2014). *An Introduction to Statistical Learning: with Applications in R*, United States: Springer.

Course Code 23PCSC21	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	2	-	2	-	-	-	1	1	-	-
CO2	2	1	2	-	-	-	1	1	-	-
CO3	3	3	3	1	2	2	2	2	-	-
CO4	3	3	3	3	2	3	3	3	-	1
CO5	3	3	3	3	3	3	2	3	-	1

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

Mrs. P.Aruna Devi
Head of the Department

Ms. M.Porkalai Selvi
Course Designer

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VIRUDHUNAGAR - 626 001

M.Sc. COMPUTER SCIENCE

(2023-2024 onwards)

Semester II	**DIGITAL IMAGE PROCESSING**	Hours/Week: 5	
Core Course 5		Credits: 5	
Course Code **23PCSC22**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe digital image fundamentals, relationship between pixels, image compression, spatial filtering, Discrete Fourier Transform. [K2]

CO2: identify various filters in spatial and frequency domain, color image processing, image segmentation, image restoration and reconstruction methods. [K3]

CO3: apply image smoothing and sharpening filters, color model conversion, intensity transformation on images, histograms. [K3]

CO4: examine image acquisition, image segmentation, compression techniques, color models. [K4]

CO5: analyze histogram processing, image restoration and reconstruction, functionalities of Spatial and Frequency filters for image enhancement [K4]

UNIT I

Digital Image Fundamentals: Elements of Visual Perception: Structure of the Human Eye – Image formation in the Eye – Brightness Adaptation and Discrimination – Light and the Electromagnetic Spectrum – Image Sensing and Acquisition: Image Acquisition Using a Single Sensor –Image Acquisition Using Sensor Strips – Image Acquisition Using Sensor Arrays – A Simple Image Formation Model – Image Sampling and Quantization: Basic Concepts in Sampling and Quantization – Representing Digital Images – Some Basic Relationships Between Pixels: Neighbors of a Pixel – Adjacency, Connectivity, Regions and boundaries – Distance Measures. **Color Image Processing:** Color Fundamentals – **Color Models:** The RGB Color Model – The CMY and CMYK Color Models – The HSI Color Model. (14 Hours)

UNIT II

Intensity Transformations and Spatial Filtering: Background: The Basics of Intensity Transformations and Spatial Filtering – Some Basic Intensity Transformation Functions: Image Negatives – Log Transformations – Power Law Transformations – Piecewise Linear Transformation Functions – Histogram Processing: Histogram Equalization – Histogram Matching (Specification) – Local Histogram Processing – Fundamentals of Spatial Filtering: The Mechanics of Spatial Filtering – Spatial Correlation and Convolution – Vector Representation of Linear Filtering – Generating Spatial Filter Masks – Smoothing Spatial Filters: Smoothing Linear Filters – Order-Statistic (Nonlinear) Filters – Sharpening Spatial Filters: Foundation – Using the Second Derivative for Image Sharpening – The Laplacian – Unsharp masking and Highboost Filtering. (16 Hours)

UNIT III

Filtering in the Frequency Domain: Preliminary Concepts: Convolution – The Discrete Fourier Transform (DFT) of One Variable: Obtaining the DFT from the continuous Transform of a Sampled Function – Relationship between the Sampling and Frequency Intervals – Extension to Functions of Two Variables: The 2-D Discrete Fourier Transform and its inverse – Some properties of the 2-D Discrete Fourier Transform: Relationships between Spatial and Frequency Intervals – Translation and Rotation – Periodicity – Symmetry Properties – The2-D Convolution Theorem – Image Smoothing using Frequency Domain Filters: Ideal Lowpass Filters – Butterworth Lowpass Filters – Gaussian Lowpass Filters – Image Sharpening using Frequency Domain Filters: Ideal Highpass Filters – Butterworth Highpass Filters – Gaussian Highpass Filters – Selective Filtering: Band Reject and Band Pass Filters – Notch Filters. (15 Hours)

UNIT IV

Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process – Restoration in the Presence of Noise Only-Spatial Filtering: Mean Filters – Order Statistic Filters – Periodic Noise Reduction by Frequency Domain Filtering: Bandreject Filters – Bandpass Filters – Inverse Filtering – Minimum Mean Square Error (Wiener) Filtering. Image Segmentation: Point, Line, and Edge Detection: Background – Detection of Isolated Points – Line Detection – Edge Models – Basic Edge Detection – Thresholding: Foundation – Basic Global Thresholding – Region

Based Segmentation: Region Growing – Region Splitting and Merging – The Use of Motion in Segmentation: Spatial Techniques. (15 Hours)

UNIT V

Image Compression: Fundamentals: Image Compression Models – Some Basic Compression Methods: Huffman Coding – Arithmetic Coding – Symbol based coding – Bitplane coding. Morphological Image Processing: Erosion and Dilation: Erosion – Dilation – Duality – Opening and Closing – Some Basic Morphological Algorithms: Boundary Extraction – Hole Filling. (15 Hours)

SELF STUDY

UNIT II: Image Negatives.

TEXT BOOK

Rafael C. Gonzalez, Richard E. Woods. (2002). *Digital Image Processing*, Third edition, New Delhi: Prentice Hall of India Publications.

UNIT	CHAPTERS	SECTIONS
I	**2**	**2.1, 2.2, 2.3, 2.4.1-2.4.3, 2.5**
	6	**6.1, 6.2**
II	**3**	**3.1.1, 3.2, 3.3.1-3.3.3, 3.4, 3.5, 3.6.1-3.6.3**
III	**4**	**4.2.5, 4.4, 4.5.5, 4.6.1-4.6.4,4.6.6, 4.8.1-4.8.3, 4.9.1-4.9.3, 4.10**
IV	**5**	**5.1, 5.3.1, 5.3.2, 5.4.1, 5.4.2, 5.7, 5.8**
	10	**10.2.1-10.2.5, 10.3.1, 10.3.2, 10.4, 10.6.1**
V	**8**	**8.1.6, 8.2.1, 8.2.3, 8.2.6, 8.2.7**
	9	**9.2, 9.3, 9.5.1, 9.5.2**

REFERENCE BOOKS

1. Dr. S.Sridhar, *Digital Image Processing*, Second Edition, Oxford University Press, Noida.
2. Madhuri A. Joshi. (2006). *Digital Image Processing An Algorithmic Approach*, New Delhi: PHI Learning Pvt. Ltd.
3. K. Anil Jain. (2011). *Fundamentals of Digital Image Processing*, New Delhi: PHI Learning Pvt. Ltd.
4. Chris Solomon & Toby Breckon, *Fundamentals of Digital Image Processing: A Practical Approach with Examples in Matlab*, United States: Wiley Blackwell.

Course Code 23PCSC22	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	3	2	3	1	1	-	2	1	-	-
CO2	3	2	3	1	1	1	3	2	-	-
CO3	3	2	3	2	2	3	3	3	-	1
CO4	3	2	2	2	2	3	3	3	-	1
CO5	3	2	2	2	2	3	2	3	-	-

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

Mrs. P.Aruna Devi
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M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester II	**INTERNET OF THINGS**	Hours/Week: 5	
Core Course 6		Credits: 4	
Course Code		Internal	External
23PCSC23		25	75

COURSE OUTCOMES

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

CO1: express basic design of IoT, domain specific IoT, IoT and M2M communication. [K2]

CO2: examine IoT system management, logical design of IoT using Python, IoT design methodology, physical servers and cloud offering in IoT. [K3]

CO3: use Python program for IoT system components, IoT system management protocols and domain specific IoTs. [K3]

CO4: manage IoT system, physical servers and cloud offerings. [K4]

CO5: explore domain specific applications, M2M communication, logical design and Physical devices programming in IoT. [K4]

UNIT I

Introduction to Internet of things: Introduction –Physical Design of IoT –Logical Design of IoT – IoT Enabling Technologies – IoT Levels and Deployment Templates

(14 Hours)

UNIT II

Domain Specific IoTs: Introduction – Home Automation – Cities –Environment – Energy – Retail – Logistics – Agriculture – Industry – Health & Lifestyle–**IoT and M2M**: Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT

(14 Hours)

UNIT III

IoT System Management with NETCONF-YANG: Need for IoT Systems Management-Simple Network Management Protocol (SNMP) – Network Operator Requirements– NETCONF – YANG–IoT Systems Management with NETCONF-YANG. **IoT Plat Forms Design Methodology:** Introduction –IoT Design Methodology –Case Study on IoT System for Weather Monitoring –Motivation for Using Python.

(16 Hours)

UNIT IV

IoT Systems - Logical Design Using Python : Introduction –Python Data Types and Data Structures - Control Flow – Functions – Modules – Packages –File Handling – Date/Time Operations – Classes –Python Packages of Interest for IoT **IoT Physical Devices & End Points:** What is an IoT Device – Exemplary Device: Raspberry Pi – About The Board – Linux on Raspberry pi – Raspberry pi Interfaces – Programming Raspberry pi with Python. (15 Hours)

UNIT V

IoT Physical Servers &Cloud Offerings–Introduction to Cloud Storage Models& Communication API's – WAMP –- Auto Bahn for IoT –Xively cloud For IoT –Python Web Application Framework – Django– Designing a REST ful Web API – Amazon Web Services for IoT –Sky Net IoT Messaging Platform. (16 Hours)

SELF STUDY

UNIT IV: Python Data Types and Data Structures

TEXT BOOK

Arshdeep.VijayMadisetti (2015), *Internet of Things A Hands-ON Approach*, 1st Edition, Universities Press Private Limited.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1 - 1.5**
II	**2**	**2.1 - 2.10**
	3	**3.1 - 3.4**
III	**4**	**4.1 - 4.6**
	5	**5.1 - 5.4**
IV	**6**	**6.1, 6.3 - 6.11**
	7	**7.1 - 7.6**
V	**8**	**8.1 - 8.7**

REFERENCE BOOKS

1. Francis DaCosta (2013), *Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*, First Edition, Apress Publications.
2. Cuno P Fister (2011), *Getting Started with Internet Of Things*, First Edition, ORELLY.
3. Boris Adryan, DominikObermaier and Paul Fremantle (2017), *The Technical Foundations of IoT*, Artech House Publishers.
4. Pethuru Raj and AnupamaC.Raman (2017), *The Internet of Things: Enabling Technologies, Platforms and Use Cases*, Auerbach Publications.

Course Code 23PCSC23	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	1	-	2	-	-	1	-	-	-	-
CO2	1	1	2	-	-	2	-	-	-	-
CO3	1	1	3	1	-	2	1	1	-	-
CO4	2	1	1	1	1	1	2	2	-	2
CO5	2	2	1	1	1	2	2	3	-	2

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

Mrs. P.Aruna Devi — Head of the Department

Ms.A.Dhivya — Course Designer

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M.Sc. COMPUTER SCIENCE

(2023-2024 onwards)

Semester II	**DATA MINING USING R PRACTICAL**	Hours/Week: 5	
Core Course Practical 3		Credits: 3	
Course Code **23PCSC21P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write R programs to import library and desirable dataset with its proper statements.[K2]

CO2: write R programs with necessary data mining algorithms and plot the outputs. [K2]

CO3: execute R program through apriori, éclat, decision trees, K Means Clustering, scatter plot mosaic plot with different parameters to obtain the desired output and evaluate the performance and the completion of their record work. [K3]

CO4: implement various data mining algorithms in R.[K3]

CO5: compare the different data mining algorithms and plotting methods in R. [K4]

List of Programs:

1. Implement Apriori Algorithm.
2. Implement Eclat Algorithm.
3. Implement FP Growth Algorithm.
4. Generate Decision Trees.
5. Implement ID3 Algorithm.
6. Implement K Means Clustering Algorithm.
7. Implement K Nearest Neighbor Algorithm.
8. Implement Bayes Classification Algorithm.
9. Data Manipulation with dplyr package
10. Data Manipulation with data.table package
11. Create dataset.

12. Import dataset from various file formats.
13. Create various Scatter Plots.
14. Create Mosaic Plots.
15. Study and implementation of Data Visualization with ggplot2.

Course Code 23PCSC21P	**PO1**		**PO2**	**PO3**	**PO4**	**PO5**	**PO6**		**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6.a**	**PSO 6.b**	**PSO 7**	**PSO 8**
CO1	3	3	3	2	1	2	3	3	2	2
CO2	3	2	2	2	2	-	2	2	2	2
CO3	3	2	2	2	2	2	2	2	1	2
CO4	3	2	2	2	2	2	2	3	1	1
CO5	3	3	2	2	2	2	2	3	1	1

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

Mrs. P.Aruna Devi
Head of the Department

Mrs.T.Chitra
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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M.Sc. COMPUTER SCIENCE

(2023-2024 onwards)

Semester II	**DIGITAL IMAGE PROCESSING PRACTICAL**	Hours/Week: 5	
Core Practical 4		Credits: 3	
Course Code **23PCSC22P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write correct statements for vector & matrix creation, reading the image, displaying the image and looping statements with proper syntax. [K2]

CO2: write MATLAB programs using various geometric transformation operations, thresholding and stretching techniques, filtering operations, histogram processing, morphological operations and edge detection. [K2]

CO3: execute MATLAB programs to get the desired output and evaluate the performance and the completion of their record work. [K3]

CO4: identify the implementation of various logical operations, filtering operations, histogram equalization operations and edge detection. [K3]

CO5: analyze the brightness of image for various mean value, low pass filter into high pass filter & vice versa and mask window size. [K4]

List of Programs:

1. To read and display digital image using MATLAB
    i. Become familiar with MATLAB Basic commands
    ii. Read and display image in MATLAB
    iii. Resize given image
2. 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&Iplanes

v. Convert given color/gray-scale image into black & white image

3. To convert image between different color spaces
    i. RGB to Grayscale conversion with and without using function
    ii. RGB to HSI conversion
4. To write and execute image processing programs to
    i. Obtain Negative image
    ii. Obtain Flip image
    iii. Apply Thresholding
    iv. Apply Contrast stretching
5. To write and execute programs for image arithmetic operations
    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
6. To write and execute programs for image logical operations
    i. AND operation between two images
    ii. OR operation between two images
    iii. Calculate intersection of two images
    iv. Water Marking using EX-OR operation
7. To write a program for histogram equalization
    i. Standard MATLAB function
    ii. Program without using standard MATLAB functions
8. To write and execute program for geometric transformation of image
    i. Translation
    ii. Scaling
    iii. Rotation
9. To perform smoothing operation using spatial filters
    i. Mean filter
    ii. Median filter
    iii. Rank filter

10. To understand various image noise models to sharpen image and to write programs for
    i. image restoration
    ii. Remove Salt and Pepper Noise
11. To understand various image noise models to sharpen image and to write programs for
    i. Minimize Gaussian noise
    ii. Median filter and Weiner filter
12. To reduce Speckle Noise.
13. To apply filters on images using fspecial function.
14. Write and execute programs for image frequency domain filtering
    i. Apply DFT on given image
    ii. Perform low pass and high pass filtering in frequency domain
    iii. Apply IDFT to reconstruct image
15. To perform edge detection on images using various algorithms
16. Write and execute program for image morphological operations erosion and dilation.
17. To apply some basic image operations on MAT lab GUI Environment.
18. To display Bit planes of an Image.
19. Implementation of Relationships between pixels.
20. Implementation of Canny edge detection algorithm.
21. Computation of Mean, Standard Deviation, Correlation coefficient of the given image.
22. To display of FFT (1-D & 2-D) of an Image.
23. To perform Intensity Slicing for Image Enhancement.

Course Code 23PCSC22P	PO1		PO2	PO3	PO4	PO7	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	2	2	1	-	-	2	2	-	-	-
CO2	2	2	2	1	1	2	2	-	1	-
CO3	2	2	2	1	1	2	2	-	1	-
CO4	3	3	2	2	2	3	3	2	2	-
CO5	3	3	3	3	2	3	3	2	3	1

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

Mrs. P.Aruna Devi
Head of the Department

Mrs. K.Kasthuri
Course Designer

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VIRUDHUNAGAR - 626 001

M.Sc. COMPUTER SCIENCE
(2023-2024 onwards)

Semester II	**NETWORK SECURITY AND CRYPTOGRAPHY**	Hours/Week: 5	
Discipline Specific Elective Course 2		Credits: 4	
Course Code **23PCSE21**		Internal 25	External 75

COURSE OUTCOMES

On completion of course, the learners will be able to

CO1: summarize encryption techniques, public key cryptography and hash functions. [K2]

CO2: implement various encryption algorithms, hash functions, digital signature algorithm. [K3]

CO3: use block ciphers, encryption standards, public key cryptosystems, digital signature protocols, authentication protocols, cryptography algorithm for IP & Network Security. [K3]

CO4: analyze and resolve security issues in authentication protocols and security policies.[K4]

CO5: examine the performance of encryption standard algorithms, hash algorithms, message authentication functions and authentication services for security. [K4]

UNIT I

Classical Encryption Techniques: Symmetric Cipher Model – Substitution Techniques – Transposition Techniques. **Block Ciphers and the Data Encryption Standard:** Traditional Block Cipher Structure –The Data Encryption Standard – The Strength of DES – Block Cipher Design Principles. **Advanced Encryption Standard:** AES Structure – AES Transformation Functions.

(14 Hours)

UNIT II

Public Key Cryptography and RSA: Principles of Public Key Cryptosystem – TheRSA Algorithm. **Other Public Key Cryptosystems:** Diffie – Hellman Key Exchange.

Cryptographic Hash Functions: Applications of cryptographic hash functions -Requirements and Security – Secure Hash Algorithm. (16 Hours)

UNIT III

Message Authentication Codes: Message Authentication Requirements – Message Authentication Functions – Requirements for Message Authentication Codes – MACs Based on Hash Functions HMAC. **Digital Signatures:** Digital Signatures – ELGAMAL Digital Signature Scheme. **Key Management and Distribution:** Symmetric Key Distribution Using Symmetric Encryption - Symmetric Key Distribution Using Asymmetric Encryption- – Distribution of Public Keys – X.509 Certificates – Public-Key Infrastructure. (16 Hours)

UNIT IV

User Authentication: Remote User Authentication Principles – Remote User Authentication using Symmetric Encryption – KERBEROS.

Transport Level Security: Web Security Considerations – Secure Sockets Layer – Transport layer Security. (15 Hours)

UNIT V

Wireless Network Security: Wireless Security – Mobile Device Security. **Electronic-Mail Security:** Pretty Good Privacy. **IP Security:** IP Security Overview – IP Security Policy – Encapsulating Security Payload – Combining Security Associations – Internet Key Exchange – Cryptographic Suites. (14 Hours)

SELF STUDY

Unit II - SHA3 Algorithm.

TEXT BOOK

William Stallings, C*ryptography and Network Security: Principles and Practices,* Sixth Edition, Pearson Education.

UNIT	CHAPTERS	PAGES
I	1	8 – 30
	2	43 – 54
	3	57 – 60
	4	114 – 130
II	8	244 –266
	9	277 – 280
	10	305 – 310, 312 – 318, 319 – 329
III	11	349 – 364
	12	389 – 394
	13	412 - 439
IV	14	447 – 471
	15	493 – 513
V	16	531 – 538
	17	565 – 572
	18	604 - 635

REFERENCE BOOKS

1. John E. Hershey, *Cryptography Demystified*, McGraw-Hill Publication.
2. Bruce Schneier (2008),*Applied Cryptography*, Second Edition, John Willey & Sons.
3. WenboMao(2014), *Modern Cryptography*, Second Edition, Pearson Education.
4. Roberta Bragg, Mark Rhodes & Keith Strassberg (2014), *Complete Reference Network Security*, Tata McGraw Hill Edition.

Course Code 23PCSE21	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	3	3	3	2	1	2	3	3	2	2
CO2	3	2	2	2	2	1	2	2	2	2
CO3	3	2	2	2	2	2	2	2	1	2
CO4	3	2	2	2	2	2	2	3	1	1
CO5	3	3	2	2	2	2	2	3	1	1

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

Mrs. P.Aruna Devi
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Mrs.R.Sabitha
Course Designer

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VIRUDHUNAGAR - 626 001

M.Sc. COMPUTER SCIENCE

***(2023-2024 onwards)**

Semester II	**CLOUD COMPUTING**	Hours/Week: 5	
DSEC 2		Credits: 4	
Course Code **23PCSE22**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: determine the system models and technologies, virtualization, clusters, cloud platform architecture and software environments. [K2]

CO2: classify the computer clusters, data centers, architectural design of cloud, parallel and distributed programming paradigms. [K3]

CO3: illustrate cloud platforms, system and service models, virtualization, cloud programming and software environments. [K3]

CO4: distinguish computer clusters for scalable parallel computing, virtualization structures/tools and mechanisms, platforms and programming, cloud trends. [K4]

CO5: examine the distributed system models, parallel computing, virtualization of clusters and data centers, cloud programming and software environments. [K4]

UNIT I

Distributed System Models and Enabling Technologies: Scalable Computing over the Internet –Technologies for Network-Based Systems – System Models for Distributed and Cloud Computing – Software Environments for Distributed Systems and Clouds **– Computer Clusters for Scalable Parallel Computing:** Computer Clusters and MPP Architectures. (16 Hours)

UNIT II

Computer Clusters for Scalable Parallel Computing: Design Principles of Computer Clusters –Cluster Job and Resource Management. **Virtual Machines and Virtualization of Clusters and Data Centers:** Implementation Levels of Virtualization – Virtualization Structures/Tools and Mechanisms. (15 Hours)

UNIT III

Virtual Machines and Virtualization of Clusters and Data Centers: Virtualization of CPU, Memory, and I/O Devices – Virtual Clusters and Resource Management – Virtualization for Data-Center Automation. **Cloud Platform Architecture over Virtualized Data Centers:** Cloud Computing and Service Models. (15 Hours)

UNIT IV

Cloud Platform Architecture over Virtualized Data Centers: Architectural Design of Compute and Storage Clouds– Public Cloud Platforms: GAE, AWS, and Azure – Inter- cloud Resource Management – Cloud Security and Trust Management. **Cloud Programming and Software Environments:** Features of Cloud and Grid Platforms (15 Hours)

UNIT V

Cloud Programming and Software Environments: Parallel and Distributed Programming Paradigms – Programming Support of Google App Engine – Programming on Amazon AWS and Microsoft Azure – Emerging Cloud Software Environments. (14 Hours)

SELF STUDY

Public Cloud Platforms: GAE, AWS, and Azure

TEXT BOOK

Kai Hwang, Geoffrey C. Fox ,Jack J. Dongarra (2012), *Distributed and Cloud Computing From Parallel Processing to the Internet of Things*, First Edition , China Machine Press, China.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1-1.4**
	2	**2.2**
II	**2**	**2.3-2.4**
	3	**3.1-3.2**
III	**3**	**3.3-3.5**
	4	**4.1**
IV	**4**	**4.3-4.6**
	6	**6.1**
V	**6**	**6.2-6.5**

REFERENCE BOOKS

1. Toby Velte, Anthony Velte, Robert Elsenpeter,(2009). *Cloud Computing - A Practical Approach*, Tata Mcgraw Hill.
2. Rittinghouse, John W., and James F. Ransome. (2017). *Cloud Computing: Implementation, Management and Security*, CRC Press.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi. (2013). *Mastering Cloud Computing*, Tata Mcgraw Hill.

Course Code 23PCSE22	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	2	-	3	1	2	-	2	1	-	-
CO2	2	1	2	1	-	1	2	1	-	-
CO3	2	2	3	-	1	2	3	2	-	3
CO4	2	2	3	2	2	3	2	3	-	-
CO5	2	3	3	3	2	3	1	3	-	-

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

Mrs. P.Aruna Devi
Head of the Department

Mrs.V.Subhasini
Course Designer

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 (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

M.Sc. COMPUTER SCIENCE

(2023-2024 onwards)

Semester II	**DISTRIBUTED SYSTEMS**	Hours/Week: 5	
DSEC 3		Credits: 4	
Course Code **23PCSE23**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: review distributed and shared memory, logical time, algorithms, message ordering and communication recovery algorithm and peer to peer computing. [K2]

CO2: examine the issues related to clock synchronization, need for global state in distributed systems, distributed mutual exclusion and recovery algorithms . [K3]

CO3: implement distributed mutual exclusion and deadlock detection algorithms and consensus and agreement algorithms. [K3]

CO4: analyze the significance of agreement, fault tolerance and recovery protocols in distributed systems. [K4]

CO5: examine the characteristics of peer-to-peer and distributed shared memory systems, distributed mutual exclusive algorithms and message ordering. [K4]

UNIT I

Introduction: Definition –Relation to computer system components –Motivation – Relation to parallel systems – Message-passing systems versus shared memory systems – Primitives for distributed communication –Synchronous versus asynchronous executions. **A model of distributed computations**: A distributed program –A model of distributed executions –Models of communication networks –Global state of a distributed system – Cuts of a distributed computation–Past and future cones of an event –Models of process communications. **Logical Time**: A framework for a system of logical clocks –Scalar time – Vector time – Physical clock synchronization: NTP. (16 Hours)

UNIT II

Global state and snapshot recording algorithms: Introduction –System model and definitions –Snapshot algorithms for FIFO channels. **Message ordering and group communication:** Message ordering paradigms –Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO). (14 Hours)

UNIT III

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart-Agrawala algorithm – Maekawa's algorithm – Suzuki–Kasami's broadcast algorithm. **Deadlock detection in distributed systems:** Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification of distributed deadlock detection algorithms – Chandy–Misra–Haas algorithm for the AND model– Chandy–Misra–Haas algorithm for the OR model. (15 Hours)

UNIT IV

Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion. **Checkpointing and rollback recovery**: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Koo–Toueg coordinated checkpointing algorithm – Juang–Venkatesan algorithm for asynchronous checkpointing and recovery. (15 Hours)

UNIT V

Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure-free system – Agreement in synchronous systems with failures. **Peer-to-peer computing and overlay graphs:** Introduction – Data indexing and overlays – Chord distributed hash table – Content addressable networks – Tapestry. (15 Hours)

SELF STUDY

UNIT II : Message ordering and group communication: Message ordering paradigms

TEXT BOOK

Kshemkalyani, Ajay D., and Mukesh Singhal, (2011). *Distributed computing: principles, algorithms, and systems.* Cambridge University Press.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1-1.7**
	2	**2.1-2.7**
	3	**3.2-3.4,3.9**
II	**4**	**4.1-4.3**
	6	**6.1-6.5**
III	**9**	**9.1-9.4,9.8,9.11**
	10	**10.1-10.5,10.7,10.8**
IV	**12**	**12.1-12.3**
	13	**13.1-13.7**
V	**14**	**14.1-14.4**
	18	**18.1,18.2,18.4-18.6**

REFERENCE BOOKS

1. Pradeep K Sinha (2007). "*Distributed Operating Systems: Concepts and Design*", Prentice Hall of India.
2. Mukesh Singhal and Niranjan G. Shivaratri (1994). *Advanced concepts in operating systems*. McGraw-Hill, Inc.
3 Tanenbaum A.S., Van Steen M., (2007). *Distributed Systems: Principles and Paradigms*, Pearson Education.
4. Liu M.L., *Distributed Computing, Principles and Applications*, Pearson Education, (2004).
5. Nancy A Lynch, *Distributed Algorithms*, Morgan Kaufman Publishers, USA, (2003).

Course Code 23PCSE23	PO1		PO2	PO3	PO4	PO5	PO6		PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6.a	PSO 6.b	PSO 7	PSO 8
CO1	2	-	3	1	2	-	2	1	-	1
CO2	2	1	2	1	-	1	2	1	-	-
CO3	2	2	3	-	1	2	3	2	-	-
CO4	2	2	3	2	2	3	2	3	-	1
CO5	2	3	3	3	2	3	1	3	-	-

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

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