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 2020 - 2021)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 20 UG Programmes, 14 PG Programmes, 6 M.Phil. 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 and Computer Applications.
Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration.

PG PROGRAMMES

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

* AICTE approved Programmes

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Biochemistry
Commerce & Management	:	Commerce

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)

List of Non Major Elective Courses (NMEC) Offered

PG PROGRAMMES

Name of the Course	Semester	Department
History of Freedom Movement in India (A.D. 1885 - 1947)	III	History
English for Job Aspirants	III	English
தமிழும் பிறதுறைகளும்	III	Tamil
Taxation Concepts and Assessment	III	Commerce
Entrepreneurship	III	Business Administration
Mathematics for Competitive Examinations	III	Mathematics
Digital Electronics	III	Physics
Chemistry for Competitive Examinations	III	Chemistry
Apiculture	III	Zoology
Nutrition and Health	III	Home Science - Nutrition and Dietetics
Clinical Biochemistry	III	Biochemistry
Web Programming	III	Computer Science
Fundamentals of Information Technology	III	Information Technology
Web Technology	III	Computer Applications

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. Programme
The students will be able to

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

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

PEO3 - acquire professional integrity, moral ethics and become responsible for sustainable 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 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, synthesise the findings and provide valid conclusion by critical evaluation of theories, policies and practices for the betterment of society. (*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 ProgrammeSpecific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each PG Programme**.** ProgrammeSpecific 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.

PO 2: Communication Skill

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

PO 3: Scientific Reasoning

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

PO 4: Critical Thinking

PSO 4: transform original ideas into novel solutions and apply it with ease to adapt recent trends in diverse areas of computer science.

PO 5: 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.

PO 6: Digital Literacy

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

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

PO 7: Cooperation/TeamWork

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

PO 8: Moral Ethical Values

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.

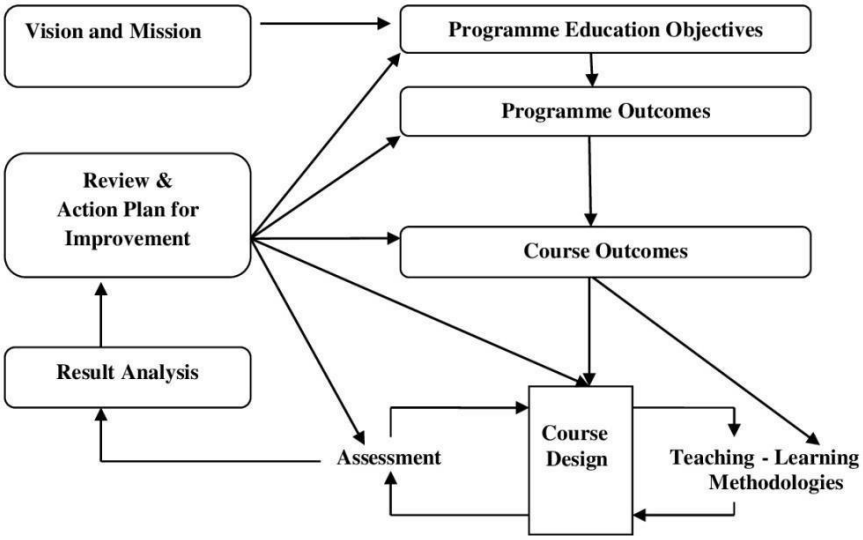
PO-PEO Mapping Matrix

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	PEO 1	PEO 2	PEO 3
PO1/PSO1	✓	✓	✓
PO2/PSO2	✓	✓	✓
PO3/PSO3	✓	✓	✓
PO4/PSO4	✓	✓	✓
PO5/PSO5	-	✓	-
PO6/PSO6	✓	✓	✓
PO7/PSO7	-	✓	✓
PO8/PSO8	-	-	✓

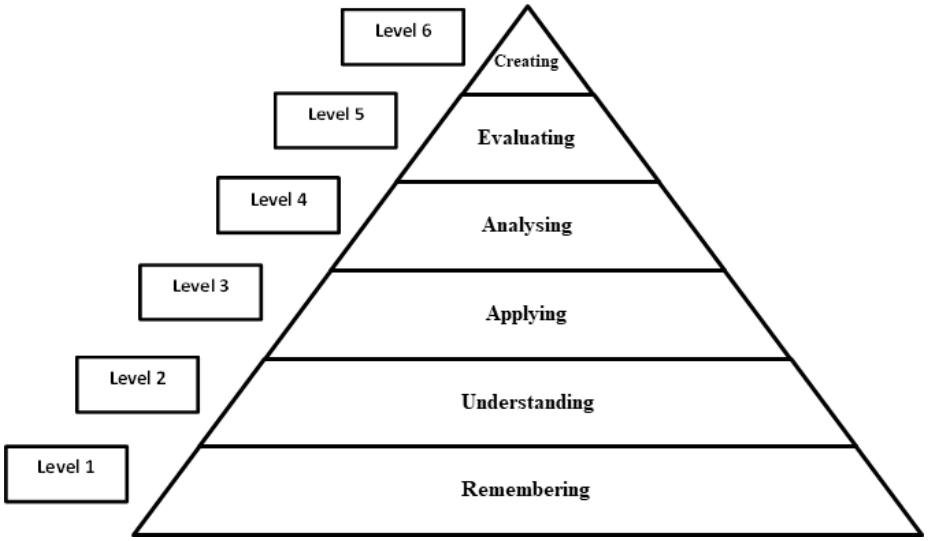
B.1.4 Course Outcomes (COs)

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 toany 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	External Examination	Total Marks
Theory	4	6	**100**
Project	6	4	**100**

B.2.1 Core Courses, Discipline Specific Elective Courses & Non Major Elective Course

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	25
Assignment	K5 Level	:	5
Seminar		:	10
Total		**:**	**40**

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
Periodic Test	:	30
Record and Performance	:	10
Total	**:**	**40**

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

Question Pattern for Periodic Test **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Max. Marks
A Q.No.(1 - 5)	Multiple Choice Questions	5	5	1	5
B Q.No.(6-10)	Internal Choice - Either Or Type	5	5	5	25
C Q.No.(11&12)	Internal Choice- Either Or Type	2	2	10	20
				Total	**50***

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

EXTERNAL EXAMINATION

Question Pattern **Duration: 3 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)	Multiple Choice Questions	5	5	1	5
B Q.No.(6-10)	Internal Choice- Either Or Type	5	5	5	25
C Q.No.(11-13)	Internal Choice- Either Or Type	3	3	10	30
				Total	**60**

B.2.2 Project

Project is compulsory for II PG Students in IV Semester.

Distribution of Marks

Mode of Evaluation		Marks
Internal Assessment	:	60
External Examination	:	40
Total	:	**100**

Evaluation Pattern (100 marks)					
Internal Assessment (60marks)				External Assessment (40 marks)	
One Periodic Test (20)	Project Report (20)	Pre-Submission Presentation (10)	One Open online Course related to the Project (10)	Project Presentation (30)	Viva Voce (10)

B.2.3 Online Course

Practice for SET/NET - General Paper

Internal Examination only

- Online Test with Multiple Choice Questions will be conducted in III Semester.
- Model Examination will be conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.4 Extra Credit Courses (Optional)

* The mode of evaluation is only internal for a maximum of 100 Marks.

Mode of Evaluation		Marks
100 Multiple Choice Questions	**:**	100 Marks

Question Pattern for Periodic Test **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Max. Marks
A Q.No.(1 - 100)	Multiple Choice	100	100	1	100
				Total	**100**

B.2.5 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

    4 weeks 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 60-75 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 – 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.

COAttainment

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.

Attainment Levels of COs

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

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixedas 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

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

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 attainment of 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/Extracurricular 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
Value >= 70%	Excellent
Value > = 60 % and Value < 70%	Very Good
Value > = 50 % and Value < 60%	Good
Value > = 40% and Value < 50%	Satisfactory
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	25 % of the class strength	30 % of the class strength
Progression to Higher Education	40 % 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
Value >= 70%	Excellent
Value > = 60 % and Value < 70%	Very Good
Value > = 50 % and Value < 60%	Good
Value > = 40% and Value < 50%	Satisfactory
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 PROGRAMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stake holders 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.

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

MASTER OF COMPUTER SCIENCE(7016)

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2020-2021

Components	**Semester**				**Total Number of Hours/ (Credits)**
	I	**II**	**III**	**IV**	
Core Course	5 (5)	5 (5)	6 (5)	6 (5)	22 (20)
Core Course	5 (5)	5 (5)	6 (5)	-	16 (15)
Core Course	5 (5)	5 (5)	-	-	10 (10)
Core Course Practical	5 (3)	5 (3)	6 (3)	6(3)	22 (12)
Core Course Practical	5(3)	5(3)	6 (3)	6(3)	22(12)
Discipline Specific Elective Course	5 (5)	5 (5)	-	-	10 (10)
Non Major Elective Course	-	-	5 (4)	-	5 (4)
Online Assessment (SET/NET Preparation- General Paper)	-	-	1 (1)	-	1 (1)
Project	-	-	-	12(6)	12(6)
Total	**30 (26)**	**30 (26)**	**30 (21)**	**30 (17)**	**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

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

SEMESTER I

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course1	Advanced Operating Systems	20PCSC11	5	5	3	40	60	100
2	Core Course 2	Data Structures using C++	20PCSC12	5	5	3	40	60	100
3	Core Course 3	Relational Database Management Systems	20PCSC13	5	5	3	40	60	100
4	Core Practical1	Data Structures using C++ Lab	20PCSC11P	5	3	3	40	60	100
5	Core Practical 2	RDBMS Lab	20PCSC12P	5	3	3	40	60	100
6	DSEC-1	Soft Computing and Machine Learning / Automata Theory / Neural Networks	20PCSE11 20PCSE12 20PCSE13	5	5	3	40	60	100
			Total	**30**	**26**				**600**

DSEC - Discipline Specific Elective Course

M.Sc. COMPUTER SCIENCE - 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	Advanced Computer Architecture	20PCSC21	5	5	3	40	60	100
2	Core Course 5	Digital Image Processing	20PCSC22	5	5	3	40	60	100
3	Core Course 6	Open Source Software	20PCSC23	5	5	3	40	60	100
4	Core Practical 3	MAT Lab	20PCSC21P	5	3	3	40	60	100
5	Core Practical 4	Open Source Software Lab	20PCSC22P	5	3	3	40	60	100
6	DSEC 2	Network Security and Cryptography/ Internet of Things / Grid Computing /	20PCSE21 20PCSE22 20PCSE23	5	5	3	40	60	100
			Total	**30**	**26**				**600**

DSEC - Discipline Specific Elective Course

M.Sc. COMPUTER SCIENCE - SEMESTER III

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course 7	Data Mining	20PCSC31	6	5	3	40	60	100
2	Core Course 8	Advanced Java Programming	20PCSC32	6	5	3	40	60	100
3	Core Practical 5	Advanced Java Programming Lab	20PCSC31P	6	3	3	40	60	100
4	Core Practical 6	ASP.Net using C# Lab	20PCSC32P	6	3	3	40	60	100
5	NMEC	Web Programming	20PCSN31	5	4	3	40	60	100
6	Online Course	Practice for SET/NET– General Paper	20PGOL31	1	1	-	100	-	100
			Total	**30**	**21**				**600**

NMEC – Non Major Elective Course

EXTRA CREDIT COURSES OFFERED IN III SEMESTER

Code	Title of the Paper	Credits	Exam Hours	Total Marks
20PCSO31	Computer Essentials for Competitive Examination	2	2	100

M.Sc. COMPUTER SCIENCE - SEMESTER IV

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1.	Core Course 9	Data Analytics	20PCSC41	6	5	3	40	60	100
2.	Core Practical 7	R Programming Lab	20PCSC41P	6	3	3	40	60	100
3.	Core Practical 8	Advanced Web Programming Lab	20PCSC42P	6	3	3	40	60	100
4.	Core Course 10	Project	20PCSC41PR	12	6		40	60	100
			Total	**30**	**17**				**400**

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

REVISED PROGRAMME CONTENT

SEMESTER I

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course1	Advanced Operating Systems	20PCSC11	5	5	3	40	60	100
2	Core Course 2	Data Structures using C++	20PCSC12	5	5	3	40	60	100
3	Core Course 3	Relational Database Management Systems	20PCSC13	5	5	3	40	60	100
4	Core Practical1	Data Structures using C++ Lab	20PCSC11P	5	3	3	40	60	100
5	Core Practical 2	RDBMS Lab	20PCSC12P	5	3	3	40	60	100
6	DSEC-1	Soft Computing and Machine Learning / Automata Theory / Neural Networks	20PCSE11 20PCSE12 20PCSE13	5	5	3	40	60	100
			Total	**30**	**26**				**600**

DSEC - Discipline Specific Elective Course

M.Sc. COMPUTER SCIENCE - 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	Advanced Computer Architecture	20PCSC21	5	5	3	40	60	100
2	Core Course 5	Digital Image Processing	20PCSC22N	5	5	3	40	60	100
3	Core Course 6	Open Source Software	20PCSC23N	5	5	3	40	60	100
4	Core Practical 3	MAT Lab	20PCSC21PN	5	3	3	40	60	100
5	Core Practical 4	Open Source Software Lab	20PCSC22PN	5	3	3	40	60	100
6	DSEC 2	Network Security and Cryptography/ Internet of Things / Grid Computing /	20PCSE21 20PCSE22 20PCSE23	5	5	3	40	60	100
			Total	**30**	**26**				**600**

DSEC - Discipline Specific Elective Course

M.Sc. COMPUTER SCIENCE - SEMESTER III

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course 7	Data Mining	20PCSC31	6	5	3	40	60	100
2	Core Course 8	Advanced Java Programming	20PCSC32	6	5	3	40	60	100
3	Core Practical 5	Advanced Java Programming Lab	20PCSC31P	6	3	3	40	60	100
4	Core Practical 6	ASP.Net using C# Lab	20PCSC32P	6	3	3	40	60	100
5	NMEC	Web Programming	20PCSN31	5	4	3	40	60	100
6	Online Course	Practice for SET/NET– General Paper	20POLG31	1	1	-	100	-	100
			Total	**30**	**21**				**600**

NMEC – Non Major Elective Course

EXTRA CREDIT COURSES OFFERED IN III SEMESTER

Code	Title of the Paper	Credits	Exam Hours	Total Marks
20PCSO31	Computer Essentials for Competitive Examination	2	2	100

M.Sc. COMPUTER SCIENCE - SEMESTER IV

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
5.	Core Course 9	Data Analytics	20PCSC41	6	5	3	40	60	100
6.	Core Practical 7	R Programming Lab	20PCSC41PN	6	3	3	40	60	100
7.	Core Practical 8	Advanced Web Programming Lab	20PCSC42PN	6	3	3	40	60	100
8.	Core Course 10	Project - Research Methodology & Ethics	22PCSC41PR	12	6		60	40	100
			Total	**30**	**17**				**400**

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

(2020-2021 onwards)

Semester I	**ADVANCED OPERATING SYSTEMS**	Hours/Week: 5	
Core Course 1		Credits: 5	
Course Code **20PCSC11**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe the functions, design approaches, design issues, synchronization mechanisms and classification of failures for distributed operating system. [K2]

CO2: observe the concepts of distributed file system, virtualization, distributed resource management and virtual machine. [K2]

CO3: determine the agreement problem on distributed system, process of deadlocks, various deadlock detection algorithms, memory and I/O management in virtual environment, failure recovery algorithms and fault tolerance protocols. [K3]

CO4: analyze the centralized deadlock detection algorithms, issues in distributed file system, error recovery in distributed system, different scheduling algorithms, mutual exclusion algorithms, critical section problems in distributed operating systems and issues of processor in virtual environment. [K4]

CO5: assess the deadlock detection algorithms, deadlock avoidance algorithms, recovery algorithms and features of hypervisor virtualization platforms. [K5]

UNIT I

Process Synchronization: Overview: Introduction– Functions of an Operating System – Design Approaches – Types of Advanced Operating System. **Synchronization Mechanisms:** Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems. **Process Deadlocks:** Preliminaries – Models of Deadlocks – Models of Resources – A Graph-Theoretic Model of a System State – Necessary and Sufficient conditions for a Deadlock – Systems with Single-Unit Requests – System with only Consumable Resources – System with only Reusable Resources.

(14 Hours)

UNIT II

Distributed Operating Systems: Architectures of Distributed Systems: Introduction – Issues in Distributed Operating System – Communication Primitives. **Distributed Mutual Exclusion:** Non-Token Based Algorithms – Lamport's Algorithm – Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm. **Distributed Deadlock Detection:** Issues in Deadlock Detection and Resolution –Centralized Deadlock Detection Algorithms – Distributed Deadlock Detection Algorithms. **Agreement Protocols**: A Classification of Agreement Problems –Solutions to the Byzantine Agreement Problem – Applications of Agreement Algorithms. (15 Hours)

UNIT III

Distributed Resource Management: Distributed File systems: Architecture – Mechanisms for building Distributed File System - Design Issues. **Distributed Shared Memory:** Architecture and Motivation – Algorithm for Implementing DSM - Coherence Protocols – Design Issues. **Distributed Scheduling**: Issues in Load Distributing – Components of Load Distributing algorithm– Load Distributing Algorithms.

(16 Hours)

UNIT IV

Failure Recovery and Fault Tolerance: Recovery: Basic Concepts – Classification of Failures –Backward Error Recovery: Basic Approaches– Recovery in Concurrent System – Synchronous Check pointing and Recovery - Asynchronous Check pointing and Recovery. **Fault Tolerance:** Issues –Commit Protocols – Nonblocking Commit Protocols – Voting Protocols.

(16 Hours)

UNIT V

Virtual Machines: Virtual Machine Concepts – Hypervisors – Container Virtualization – Processor Issues – Memory Management – I/O Management – VMware ESXi– Microsoft Hyper-V and Xen Variants. (14 Hours)

SELF STUDY

UNIT II: Solutions and application of distributed deadlocks.

TEXT BOOK

1. Mukesh Singhal and N. G. Shivaratri, 40th reprint (2016), *Advanced Concepts in Operating Systems*, First Edition , McGraw- Hill Publication, New Delhi.
2. William Stallings (2014), *Operating System: Internals and Design Principles*, Nineth Edition, Pearson Education, New Delhi.

UNIT	BOOK	CHAPTERS	SECTIONS
I	**T1**	**1**	**1.1-1.3, 1.5**
		2	**2.2-2.5**
		3	**3.2-3.9**
II	**T1**	**4**	**4.1, 4.5, 4.7**
		6	**6.5, 6.6, 6.10,6.11**
		7	**7.4, 7.6, 7.7**
		8	**8.3-8.5**
III	**T1**	**9**	**9.2-9.4**
		10	**10.2, 10.3, 10.5, 10.6**
		11	**11.3, 11.4, 11.6**
IV	**T1**	**12**	**12.2, 12.3, 12.5, 12.6, 12.8, 12.9**
		13	**13.2, 13.4-13.6**
V	**T2**	**14**	**14.1-14.8**

REFERENCE BOOKS

1. Abraham Silberschatz, Peter.B. Galvin, G. Gagne, *Operating System Concepts*, Sixth Edition, Addison Wesley Publishing Co, Boston.
2. Andrew S. Tanenbaum . (2014), *Modern Operating Systems,* Fourth Edition, Addison Wesley Publishing Co, Prentice Hall.
3. Sape Mullender. (2011), *Distributed Systems*, Addison Wesley Publishing Co, Boston.
4. Mike Ebbers, John Kettner (2011). Wayne O"Brien, Bill Ogden, *Introduction to the New Mainframe: z/OS Basics*, Third Edition, International Business Machines Corporation.

Course Code 20PCSC11	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	M	-	L	L	-	-	M	L	-	-
CO2	M	-	M	L	L	-	M	L	-	-
CO3	M	M	M	L	L	M	H	M	-	-
CO4	M	M	M	M	M	H	H	H	-	-
CO5	H	H	H	H	M	H	H	H	-	-

Mrs. P.Aruna Devi
Head of the Department

Ms. P.Raveena Lakshmi
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

(2020-2021 onwards)

Semester I	**DATA STRUCTURES USING C++**	Hours/Week: 5	
Core Course 2		Credits: 5	
Course Code **20PCSC12**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe the concepts of linear and non-linear data structure through ADT Class and its applications. [K2]

CO2: illustrate standard operations on various tree and graph data structures. [K2]

CO3: employ vector and STL on linear and non-linear data structures. [K3]

CO4: analyze various methods on stack, queue, tree, graph data structures, different types of sorting and hashing techniques. [K4]

CO5: evaluate stack applications, time complexity of sorting, hashing techniques, tree and graph operations. [K5]

UNIT I

Lists, Stacks and Queues: Abstract Data Types (ADTs) – The List ADT: Simple Array Implementation of Lists – Simple Linked Lists – Vector and List in the STL: Iterators – Example: Using erase on a List – const_iterators – Implementation of Vector – Implementation of List – The Stack ADT: Stack Model – Implementation of Stacks – Applications – The Queue ADT: Queue Model – Array Implementation of Queues – Applications of Queues – **Hashing:** General Idea – Hash Function – Separate Chaining – Hash Tables without Linked Lists: Linear Probing – Quadratic Probing – Double Hashing – Rehashing. (15 Hours)

UNIT II

Trees: Preliminaries: Implementation of Trees – Tree Traversals with an Application – Binary Trees: Implementation – An Example: Expression Trees – The Search Tree ADT – Binary Search Trees: contains – findMin and findMax – insert – remove – Destructor and Copy Assignment Operator – Average-Case Analysis – AVL Trees: Single Rotation – Double Rotation – Splay Trees: A simple Idea (That Does Not Work) – Splaying – Tree Traversals (Revisited) – B-Trees. (14 Hours)

UNIT III

Priority Queues (Heaps): Model – Simple Implementations – Binary Heap: Structure Property – Heap-Order Property – Basic Heap operations – Other Heap Operations – Applications of Priority Queues: The Selection Problem – Event Simulation. **Sorting:** preliminaries – Insertion Sort: The Algorithm – STL Implementation of Insertion Sort – Analysis of Insertion Sort – Shellsort: Worst-Case Analysis of Shellsort – Heapsort: Analysis of Heapsort – Mergesort: Analysis of Mergesort – Quicksort: Picking the Pivot – Partitioning Strategy – Small Arrays – Actual Quicksort Routines – Analysis of Quicksort – Bucket Sort. (15 Hours)

UNIT IV

Graph Algorithms: Definitions: Representation of Graphs – Topological Sort – Shortest-Path Algorithms : Unweighted Shortest Paths – Dijikstra's Algorithm – Graphs with Negative Edge Costs – Acyclic Graphs – All-Pairs Shortest Path – Shortest Path Example – Network Flow Problems : A Simple Maximum-Flow Algorithm – Minimum Spanning Tree : Prim's Algorithm – Kruskal's Algorithm – Applications of Depth-First Search : Undirected Graphs – Biconnectivity – Euler Circuits – Directed Graphs – Finding Strong Components. (16 Hours)

UNIT V

Advanced Data Structures and Implementation: Top-Down Splay Trees – Red-Black Trees: Bottom-Up Insertion – Top-Down Red-Black Trees – Top-Down Deletion – Deterministic Skip Lists – AA-Trees – Treaps. (15 Hours)

SELF STUDY

UNIT I: Linear Probing

TEXT BOOK

Mark Allen Weiss, Fifteenth Impression (2014), *Data Structures and Algorithm Analysis in C++*,Third Edition, New Delhi: Pearson Publication.

UNIT	CHAPTERS	SECTIONS
I	**3**	**3.1 – 3.7**
	5	**5.1 – 5.5**
II	**4**	**4.1 - 4.7**
III	**6**	**6.1 – 6.4**
	7	**7.1 – 7.2, 7.4 – 7.6, 7.7.1 - 7.7.5, 7.10**
IV	**9**	**9.1 – 9.6**
V	**12**	**12.1 – 12.5**

REFERENCE BOOKS

1. P.Rizwan Ahmed. (2014). *Programming in C++ and Data Structure***,** First Edition, Margham Publications.
2. Malik.D. S. (2009). *Data Structures using C++*, Second Editon, Cengage Learning Publications.
3. Debasis Samantha. (2009), *Classic Data Structures*, Second Edition, New Delhi: Prentice Hall of India Private Ltd.
4. Ellis Horowitz, Sartaj Sahni. (2005). *Fundamentals of Computer Algorithms*, New Delhi: Galgotia Publications.

Course Code 20PCSC12	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	H	L	M	L	L	-	M	L	-	-
CO2	H	M	M	L	L	L	M	L	-	-
CO3	H	M	M	L	L	-	H	M	-	-
CO4	H	H	H	M	M	M	H	H	-	-
CO5	H	H	H	H	M	M	H	H	-	L

Mrs. P.Aruna Devi
Head of the Department

Mrs. R.Sabitha
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
(2020-2021 onwards)

Semester I	**RELATIONAL DATABASE MANAGEMENT SYSTEMS**	Hours/Week: 5	
Core Course 3		Credits: 5	
Course Code **20PCSC13**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: relate Queries, basic operations, set operations and views in SQL, indexing in B+ Tree and hashing. [K2]

CO2: review ACID property in transaction, protocols that handle concurrency in transaction, distributed databases and parallelism approaches in parallel databases. [K2]

CO3: implement relational operations, view constraints in SQL, decomposing algorithms using functional dependencies, ordered indices and hashing technique in B+ Tree, serializability in transaction, serializability in distributed databases and I/O parallelism. [K3]

CO4: analyze aggregate and set theory operations in SQL, normal forms, B+ tree index files, multiple key access and working of parallelism in parallel databases, transaction management in distributed databases. [K4]

CO5: assess the usage of subqueries and constraints in SQL, deadlock handling in transactions, commit protocols in distributed databases, multivalued dependencies for decomposition, operations on B+ Tree and relational operations on parallel databases. [K5]

UNIT I

Introduction to the Relational Model: Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations. **Introduction to SQL:** Overview of the SQL Query Language – SQL Data Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null Values – Aggregate Functions – Nested Subqueries – Modification of the Database.

(14 Hours)

UNIT II

Intermediate SQL: Join Expressions – Views – Transactions – Integrity Constraints – SQL Data Types and Schemas –Authorization. **Relational Database Design**: Features of Good Relational Designs – Atomic Domains and First Normal Form – Decomposition using Functional Dependencies: Keys and Functional Dependencies– Functional Dependency Theory – Algorithms for Decomposition – Decomposition using Multi Valued Dependencies: Multivalued Dependencies – Fourth Normal Form – 4NF Decomposition – Project-Join Normal Form (PJNF) – Domain-Key Normal Form (DKNF).

(16 Hours)

UNIT III

Indexing and Hashing: Basic Concepts – Ordered Indices – B^+ Tree Index Files – B^+ Tree Extension – Multiple-Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing – Bitmap Indices. (16 Hours)

UNIT IV

Transactions: Transaction Concept – A Simple Transaction Model – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Transaction Isolation and Atomicity. **Concurrency Control:** Lock-Based Protocols – Deadlock Handling – Multiple Granularity – Timestamp-Based Protocols – Validation-Based Protocols – Multiversion Schemes. (15 Hours)

UNIT V

Parallel Databases: Introduction – I/O Parallelism – Interquery Parallelism – Intraquery Parallelism – Intraoperation Parallelism – Interoperation Parallelism – Query Optimization – Design of Parallel Systems. **Distributed Databases:** Homogeneous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control in Distributed Databases – Distributed Query Processing – Heterogeneous Distributed Databases. (14 Hours)

SELF STUDY

UNIT I : Schema Diagrams

TEXT BOOK

Abraham Silberschatz, Henry F.Korth, S.Sudarshan. (2013). *Database System Concepts,* Sixth Edition, New Delhi: MC Graw Hill Publication.

UNIT	CHAPTERS	SECTIONS
I	**2**	**2.1 – 2.6**
	3	**3.1 – 3.9**
II	**4**	**4.1 - 4.6**
	8	**8.1 – 8.7**
III	**11**	**11.1 – 11.9**
IV	**14**	**14.1,14.2, 14.4– 14.7**
	15	**15.1 – 15.6**
V	**18**	**18.1 – 18.8**
	19	**19.1 – 19.5,19.7,19.8**

REFERENCE BOOKS

1. M V Salvi & J G Mante. (2013). *Relational Database Management System*, Nirali Prakashan.
2. SafaHamdare, Asim Kumar Sen & BhaveshPandya. (2015). *Database Management System,* Vikas Publishing.
3. PoojaSharma & D.S. Sehrawat. (2014). *Relational Database Management System,* Second Edition, S.K. Kataria & Sons.
4. Elmsari & Navathe. (2008). *Fundamentals of Database Systems*, Fifth Edition, Pearson Education.

Course Code 20PCSC13	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	M	M	L	-	-	-	M	L	-	-
CO2	M	M	M	L	-	L	M	M	-	-
CO3	M	M	M	M	L	L	H	M	-	L
CO4	M	H	H	M	M	M	H	H	-	M
CO5	H	H	H	M	M	M	H	H	-	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. T.Chitra
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

(2020-2021 onwards)

Semester I	**DATA STRUCTURES USING C++ LAB**	Hours/Week: 5	
Core Practical 1		Credits: 3	
Course Code **20PCSC11P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write proper syntax to create a class, declaration of function and the data structures needed for the particular program. [K3]

CO2: write complete source code with its logic for linear and non-linear data structure for a specified problem. [K3]

CO3: execute various data structure operations for the specified problem and evaluate the performance and the completion of their record work. [K3]

CO4: explore the performance of stack, queue, linked list, trees and graphs methods. [K4]

CO5: modify the program with another possible data structure. [K5]

List of Programs:

1. Implementation of Singly linked list.
2. Implementation of Doubly linked list.
3. Implementation of Vector.
4. Implementation of Stack using array data structure.
5. Implementation of Stack using Linked list data structure.
6. Implementation of Infix to Postfix Conversion using Stack.
7. Implementation of Queue using array data structure.
8. Implementation of Queue using Linked list data structure.
9. Implementation of Separate Chaining Hash Table.
10. Implementation of Binary tree traversals.
11. Implementation of Binary search tree.
12. Implementation of AVL Tree.
13. Implementation of Binary Heap.

14. Implementation of Insertion Sort.
15. Implementation of Shell sort.
16. Implementation of Heap sort.
17. Implementation of Merge sort.
18. Implementation of Quick sort.

Course Code 20PCSC11P	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	M	L	M	-	-	-	M	L	L	L
CO2	M	L	M	-	-	-	M	M	L	L
CO3	H	M	M	M	M	L	H	M	L	M
CO4	H	H	H	M	M	M	H	H	M	M
CO5	H	H	H	H	H	M	H	H	M	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. R.Sabitha
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
(2020-2021 onwards)

Semester I	**RDBMS LAB**	Hours/Week: 5	
Core Practical 2		Credits: 3	
Course Code **20PCSC12P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write commands for table creation, insertion and updation with its proper syntax. [K3]

CO2: write PL/SQL programs to implement the concepts of exception handling, implicit and explicit cursors, functions, procedures, triggers, packages. [K3]

CO3: execute the PL/SQL program through procedures, functions, packages with different parameters to obtain the desired output and evaluate the performance and the completion of their record work. [K3]

CO4: point out the working of triggers, function and procedures, exception handling, implicit and explicit cursors in PL/SQL programs. [K4]

CO5: modify the PL/SQL program from implicit to explicit cursor, from function to procedure and vice versa. [K5]

List of Programs:

PL/SQL

1. Programs using Conditional controls, iterative controls and sequential controls.
2. Programs using exception handling.
3. Programs using explicit cursors and implicit cursors.
4. Programs using PL/SQL tables and record.
5. Programs using database triggers.
6. Programs to design procedures using in, out and inout parameter.
7. Programs to design procedures using functions.
8. Programs to design procedures using packages.

Forms & Report Writer

1. Inventory Control.
2. Banking.
3. Students Mark List.
4. Library maintenance.
5. Payroll.
6. ATM Systems.
7. Railway Reservation.
8. College Admission.

Course Code 20PCSC12P	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	M	L	M	L	-	-	M	M	L	L
CO2	M	M	M	L	L	-	M	M	L	L
CO3	M	M	H	M	M	M	H	M	L	M
CO4	M	H	H	M	M	M	H	H	M	H
CO5	H	H	H	M	M	M	H	H	M	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. T.Chitra
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
(2020-2021 onwards)

Semester I	**SOFT COMPUTING AND MACHINE LEARNING**	Hours/Week: 5	
DSEC 1		Credits: 5	
Course Code **20PCSE11**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: comprehend soft computing techniques like neural networks, fuzzy sets, fuzzy rules, fuzzy reasoning and basics of machine learning. [K2]

CO2: infer machine learning algorithms, supervised learning and unsupervised learning neural networks. [K2]

CO3: implement fuzzy inference system, apply least-squares methods for system identification, apply supervised and unsupervised learning algorithms, demonstrate machine learning algorithms. [K3]

CO4: analyze fuzzy system, genetic algorithm, machine learning paradigm, supervised learning and unsupervised learning networks. [K4]

CO5: assess fuzzy relations, SGD, supervised learning and unsupervised learning networks. [K5]

UNIT I

Soft Computing: Introduction to Neuro – Fuzzy and Soft Computing: Introduction – Soft Computing Constituents and Conventional Artificial Intelligence – Neuro-Fuzzy and Soft Computing Characteristics. **Fuzzy Sets**: Basic Definition and Terminology – Set-theoretic Operations – MF Formulation and Parameterization. **Fuzzy Rules and Fuzzy Reasoning** – Introduction – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning. **Fuzzy Inference Systems**: Mamdani Fuzzy Models. (15 Hours)

UNIT II

Least-Squares Methods for System Identification: System Identification: An Introduction – Basics of Matrix Manipulation and Calculus – Least-Squares Estimator. **Derivative-free Optimization:** Introduction – Genetic Algorithms – Downhill Simplex Search. **Adaptive Networks:** Introduction – Architecture – Back propagation for Feedforward Networks. (14 Hours)

UNIT III

Supervised Learning Neural Networks: Introduction – Perceptrons – Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks. **Unsupervised Learning Neural Networks:** Introduction – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning – The Hopfield Network. (15 Hours)

UNIT IV

Machine Learning: Introduction: What is Learning? – When Do We Need Machine Learning? – Types of Learning. **A Formal Learning Model:** PAC Learning– A More General Learning Model. **Stochastic Gradient Descent:** Gradient Descent– Subgradients –Stochastic Gradient Descent (SGD) – Variants – Learning with SGD.

(16 Hours)

UNIT V

Decision Trees: Sample Complexity – Decision Tree Algorithms – Random Forests. **Nearest Neighbor:** k Nearest Neighbors– Analysis – Efficient Implementation. **Clustering:** Linkage-Based Clustering Algorithms – k-Means and Other Cost Minimization Clusterings.

(15 Hours)

SELF STUDY

UNIT V: Random Forests.

TEXT BOOKS

1. J.S.R.Jang, C.T.Sun and E.Mizutani. (2012). *Neuro-Fuzzy and Soft Computing*, New Delhi: PHI Learning Private Limited.
2. ShaiShalev-Shwartz and Shai Ben-David. (2014). *Understanding Machine Learning from Theory to Algorithms* Cambridge New York: University Press.

UNIT	BOOK	CHAPTERS	SECTIONS
I	**T1**	**1**	**1.1 - 1.3**
		2	**2.1 - 2.4**
		3	**3.1 - 3.4**
		4	**4.2**
II	**T1**	**5**	**5.1 - 5.3**
		7	**7.1, 7.2, 7.5**
		8	**8.1 - 8.3**
III	**T1**	**9**	**9.1 - 9.5**
		11	**11.1 - 11.5, 11.7**
IV	**T2**	**1**	**1.1 - 1.3**
		3	**3.1, 3.2**
		14	**14.1 - 14.5**
V	**T2**	**18**	**18.1 - 18.3**
		19	**19.1 - 19.3**
		22	**22.1, 22.2**

REFERENCE BOOKS

1. S.N.Sivanandam and S.N.Deepa. (2011). *Principles of Soft Computing,* New Delhi: Wiley India Pvt. Ltd.
2. S.Rajasekaran and G.A.VijayalakshmiPai. (2006). *Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications,* New Delhi: Prentice Hall of India Pvt. Ltd.
3. Peter Flach. (2012). *Machine Learning: The Art and Science of Algorithms that Make Sense of Data,* UK: Cambridge University Press.
4. Jason Bell. (2014). *Machine Learning – Hands on for Developers and Technical Professionals,* New Delhi: Wiley Publication.

Course Code 20PCSE11	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	H	L	H	M	-	M	H	M	-	-
CO2	H	L	H	M	-	M	H	M	-	-
CO3	H	M	H	M	M	H	H	H	-	-
CO4	M	M	M	M	M	H	H	H	-	M
CO5	M	M	M	M	M	H	L	H	-	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. S.Veni
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
(2020-2021 onwards)

Semester I	**AUTOMATA THEORY**	Hours/Week: 5	
DSEC 1		Credits: 5	
Course Code **20PCSE12**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand automata theory, finite automata, regular expressions and turing machines. [K2]

CO2: describe context free grammars, pushdown automata. [K2]

CO3: determine regular expressions, deterministic and non-deterministic finite automata for any regular language. [K3]

CO4: explore the application of regular expressions and context free grammars. [K4]

CO5: validate grammars and automata (recognizers) for particular Languages. [K5]

UNIT I

Automata: The Methods and the Madness: Automata theory: Introduction to Finite automata – Structural Representations - The central concepts of Automata Theory. **Finite Automata:** An Informal Picture of Finite Automata - Deterministic Finite Automata – Non Deterministic Finite Automata – An Application: Text Search – Finite Automata with Epsilon Transitions. (14 Hours)

UNIT II

Regular Expressions and Languages: Regular Expressions – Finite Automata and Regular Expressions – Applications of Regular Expressions –Algebraic laws for Regular Expressions. (15 Hours)

UNIT III

Context Free Grammars and Languages: Context Free Grammars – Parse Trees – Applications of Context Free Grammars. (14 Hours)

UNIT IV

Pushdown Automata: Definition of the Pushdown Automaton –The languages of a PDA –Equivalence of PDA's and CFG's –Deterministic Pushdown Automata.

(16 Hours)

UNIT V

Introduction to Turing Machines: The Turing Machine – Programming Techniques for Turing Machines – Extensions to the Basic Turing Machine. (16 Hours)

SELF STUDY

UNIT I : An application: Text Search.

TEXT BOOK

John E.HopCroft, Rajeev Motwani and Jeffrey D.Ullman. (2013). *Introduction to Automata Theory, Languages and Computation,* Third Edition, Pearson Education.

UNIT	CHAPTERS	SECTIONS
I	1	1.1 .1, 1.1.2, 1.5
	2	2.1 - 2.5
II	3	3.1 - 3.4
III	5	5.1 - 5.3
IV	6	6.1 - 6.4
V	8	8.2 - 8.4

REFERENCE BOOKS

1. Jacques Sakarovitch. (2009). *Elements of Automata Theory*, Cambridge University Press.
2. Shyamalendukandar. (2013). *Introduction to Automata Theory, Formal Languages and Computation*, Pearson Education.
3. C.K. Nagpal. (2012). *Formal Languages and Automata Theory*, Oxford Publication.
4. Peter Linz. (2016). *An Introduction to formal Languages and automata*, Sixth Edition, Jones and Bartlett Learning Publication.

Course Code 20PCSE12	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	M	L	M	-	-	-	M	-	-	-
CO2	M	L	L	-	-	-	M	L	-	-
CO3	M	M	L	-	-	-	M	M	-	-
CO4	H	M	H	M	L	M	H	M	-	-
CO5	H	M	M	M	L	M	H	H	-	M

Mrs. P.Aruna Devi
Head of the Department

Ms. A.Dhivya
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
(2020-2021 onwards)

Semester I	**NEURAL NETWORKS**	Hours/Week: 5	
DSEC 1		Credits: 5	
Course Code **20PCSE13**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand ANS technology, mathematical foundations of backpropagation, self organizing maps and adaptive resonance theory. [K2]

CO2: discuss the architecture of adaline, madaline, counter propagation network, spatiotemporal network and necognitron. [K2]

CO3: express data processing in counter propagation network, self organizing maps and neocognitron. [K3]

CO4: investigate BAM, hopfield memory and simulated annealing. [K4]

CO5: validate backpropagation, self organizing maps and spatiotemporal network for application. [K5]

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, *Neural Networks Algorithms, Applications and Programming Techniques,* 2007 Edition, Pearson Education

UNIT	CHAPTERS	SECTIONS
I	1	1.1, 1.2
	2	2.2 - 2.4
II	3	3.1, 3.2, 3.4
	4	4.1 - 4.3
III	5	5.1, 5.2
	6	6.1, 6.2
IV	7	7.1 - 7.2
	8	8.1 - 8.3
V	9	9.2 - 9.4
	10	10.1 - 10.3

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 20PCSE13	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	M	L	M	-	-	-	M	-	-	-
CO2	M	L	L	L	-	-	M	-	-	-
CO3	M	M	H	M	L	M	M	M	-	-
CO4	H	M	L	M	M	M	H	L	-	-
CO5	H	H	M	M	H	M	M	L	-	M

Mrs. P.Aruna Devi
Head of the Department

Ms. A.Dhivya
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
(2020-2021 onwards)

Semester II	**ADVANCED COMPUTER ARCHITECTURE**	Hours/Week: 5	
Core Course 4		Credits: 5	
Course Code **20PCSC21**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: comprehend the computer models, program flow mechanism, multiprocessor system interconnects, processor and memory hierarchy. [K2]

CO2: understand the concepts of parallelism, cache memory, pipelining and synchronization mechanisms. [K2]

CO3: demonstrate various multiprocessors, multicomputers, multivector computer, network properties, vector processor, bus systems, shared memory organization, pipelining techniques and message passing mechanism. [K3]

CO4: classify various computer models, processor technologies, memory hierarchies and memory organization, pipeline processor and synchronization mechanisms. [K4]

CO5: assess the system performance through system attributes, hardware and software parallelism, memory allocation, memory replacement policies, pipeline performance, and cache coherence protocols. [K5]

UNIT I

Parallel Computer Models: The State of Computing: Computer Development Milestones – Elements of Modern Computers – Evolution of Computer Architecture – System Attributes to Performance. Multiprocessors and Multi computers: Shared- Memory Multiprocessors– Distributed- Memory Multicomputers – A Taxonomy of MIMD Computers. Multi vector and SIMD Computers: Vector Supercomputers – SIMD Supercomputers. PRAM and VLSI Models: Parallel Random-Access Machines – VLSI Complexity Model. (15 Hours)

UNIT II

Program and Network Properties: Conditions of parallelism: Data and Resource Dependences – Hardware and Software Parallelism – The Role of Compilers. Program Partitioning and Scheduling: Grain Sizes and Latency – Grain Packing and Scheduling – Static Multiprocessor Scheduling. Program Flow Mechanisms: Control Flow verses Data Flow – Demand-Driven Mechanisms – Comparison of Flow Mechanisms. System Interconnect Architecture: Network Properties and Routing – Static Connection Networks.

(15 Hours)

UNIT III

Processors and Memory Hierarchy: Advanced Processor Technology: Design Space of Processors – Instruction-Set Architectures – CISC Scalar Processors – RISC Scalar Processors. Superscalar and Vector Processors: Superscalar Processors – The VLIW Architecture. Virtual Memory Technology: Virtual Memory Models – TLB, Paging and Segmentation – Memory Replacement Policies. **Bus, Cache and Shared Memory:** Bus Systems: Backplane Bus Specification – Addressing and Timing Protocols – Arbitration, Transaction and Interrupt. Cache Memory Organizations: Cache Addressing Models – Direct Mapping and Associative caches. Shared-Memory Organizations: Interleaved Memory Organization – Bandwidth and Fault Tolerance – Memory Allocation Schemes**.**

(15 Hours)

UNIT IV

Pipelining and Superscalar Techniques: Linear Pipeline Processors: Asynchronous and Synchronous Models – Clocking and Timing Control – Speed up, Efficiency and Throughput. Non-Linear Pipeline Processors: Reservation and Latency Analysis – Collision-Free Scheduling. Instruction Pipeline Design: Instruction Execution Phases – Mechanism for Instruction Pipelining – Dynamic Instruction Scheduling – Branch Handling Techniques.

(15 Hours)

UNIT V

Multiprocessors and Multicomputers: Multiprocessor System Interconnects: Hierarchical Bus Systems – Crossbar Switch and Multiport Memory – Multistage and Combining Networks. Cache Coherence and Synchronization Mechanisms: The Cache Coherence Problem – Snoopy Bus Protocols – Directory-Based Protocols. Message Passing Mechanisms: Message Routing Schemes – Deadlock Virtual Channels – Flow Control Strategies. (15 Hours)

SELF STUDY

UNIT I: Evolution of Computer Architecture

TEXT BOOK

Kai Hwang & NareshJotwani, Ninth Reprint 2013, *Advanced Computer Architecture – Parallelism, Scalability, Programmability*, Second Edition, McGraw Hill Education (India) Private Limited.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1–1.4**
II	**2**	**2.1 – 2.3, 2.4.1, 2.4.2**
III	**4**	**4.1, 4.2.1, 4.2.2, 4.3**
	5	**5.1.1 – 5.1.3, 5.2.1, 5.2.2, 5.3**
IV	**6**	**6.1, 6.2.1, 6.2.2, 6.3**
V	**7**	**7.1, 7.2.1 – 7.2.3, 7.4.1 – 7.4.3**

REFERENCE BOOKS

1. Sajjan G. Shiva. (2006). *Advanced Computer Architectures,* First Editon, CRC Press Publications.
2. John L.Hennessy and David A.Patterson. (2013). *Computer Architecture a Quantitative Approach,* Fifth Editon, Morgan Kaufmann Publications.
3. John Hayes. (2002). *Computer Architecture and Organization*, Third Edition, McGraw Hill.
4. Hesham El-Rewini & MostafaAbd-El-Barr. (2005). *Advanced Computer Architecture and Parallel Processing,* First Edition, Wiley Publications.

Course Code 20PCSC21	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	H	-	H	-	-	-	M	L	-	-
CO2	H	L	H	L	L	-	H	M	-	-
CO3	H	L	H	M	M	L	H	H	-	-
CO4	H	L	M	M	M	M	H	H	-	-
CO5	H	-	M	H	M	H	M	H	-	L

Mrs. P.Aruna Devi
Head of the Department

Mrs. P.Aruna Devi
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
(2020-2021 onwards)

Semester II	**DIGITAL IMAGE PROCESSING**	Hours/Week: 5	
Core Course 5		Credits: 5	
Course Code **20PCSC22**		Internal 40	External 60

COURSE OUTCOMES

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

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

CO2: discuss various filters in spatial and frequency domain, color image processing, image segmentation, image restoration and reconstruction. [K2]

CO3: demonstrate image smoothing and sharpening filters, color model conversion, intensity transformation on images, histograms, various algorithms for image restoration, reconstruction and compression methods. [K3]

CO4: examine image acquisition, image segmentation, compression techniques, functionalities of Spatial and Frequency filters for image enhancement, color models. [K4]

CO5: assess histogram processing, image restoration, reconstruction, segmentation and compression techniques. [K5]

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 20PCSC22	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	H	M	H	L	L	-	M	L	-	-
CO2	H	M	H	L	L	L	H	M	-	-
CO3	H	M	H	M	M	H	H	H	-	L
CO4	H	M	M	M	M	H	H	H	-	L
CO5	H	M	M	M	M	H	M	H	-	-

Mrs. P.Aruna Devi
Head of the Department

Mrs. S.Veni
Course Designer

V.V. VANNIAPERUMAL COLLEGE FOR WOMEN

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
(Belonging to Virudhunagar Hindu Nadars)
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
Virudhunagar - 626 001

M.Sc. COMPUTER SCIENCE
(2022 – 2023 onwards)

Semester II	**DIGITAL IMAGE PROCESSING**	Hours/Week: 5	
Core Course 5		Credits: 5	
Course Code **20PCSC22N**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe digital image fundamentals, relationship between pixels, image compression, Discrete Fourier Transform and Object recognition. [K2]

CO2: discuss various filters in spatial and frequency domain, color image processing, image segmentation, image restoration and reconstruction. [K2]

CO3: demonstrate image smoothing and sharpening filters, color model conversion, intensity transformation on images, histograms, various algorithms for image restoration, reconstruction and compression methods. [K3]

CO4: examine image acquisition, image segmentation, compression techniques, functionalities of Spatial and Frequency filters for image enhancement, color models. [K4]

CO5: assess histogram processing, image restoration, reconstruction, segmentation and compression techniques. [K5]

UNIT I

Digital Image Fundamentals: 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 – Extension to Functions of Two Variables: The 2-D Discrete Fourier Transform and its inverse 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:IdealHighpass 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 – 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. **Image Compression:** Fundamentals: Image Compression Models – Some Basic Compression Methods: Huffman Coding – Arithmetic Coding. (15 Hours)

UNIT V

Image Compression: 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. **Object Recognition:** Patterns and Pattern Classes – Recognition Based on Decision-Theoretic Methods: Matching. (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	2.1.3, 2.2, 2.3, 2.4.1-2.4.2, 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, 4.4.1, 4.5.5, 4.8.1-4.8.3, 4.9.1-4.9.3, 4.10
IV	5	5.1, 5.3.1, 5.3.2, 5.7, 5.8
	10	10.2.1-10.2.5, 10.3.1, 10.3.2, 10.4
V	8	8.1.6, 8.2.1, 8.2.3
	8	8.2.6, 8.2.7
	9	9.2, 9.3, 9.5.1, 9.5.2
	12	12.1, 12.2.1

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 20PCSC22N	PO1		PO2	PO3	PO4	PO5		PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7	PSO 8
CO1	H	M	H	L	L	M	L	-	-	-
CO2	H	M	H	L	L	H	M	L	-	-
CO3	H	M	H	M	M	H	H	H	-	L
CO4	H	M	M	M	M	H	H	H	-	L
CO5	H	M	M	M	M	M	H	H	-	-

Mrs. P.Aruna Devi
Head of the Department

Mrs.S.Veni
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
(2020-2021 onwards)

Semester II	**OPEN SOURCE SOFTWARE**	Hours/Week: 5	
Core Course 6		Credits: 5	
Course Code **20PCSC23**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand PHP Basics and creation of a web page using forms in PHP, sequence, tuples, conditions and loops in Python. [K2]

CO2: infer OOP's concept, MySQL, exception handling in Python applications. [K2]

CO3: illustrate lists, tuples, dictionaries in Python, error handling, string expression operations, session handling, AJAX and object oriented in PHP. [K3]

CO4: analyze OOP concepts, form validation using advanced validation methods in PHP, mathematical operations and exception handing , file operations in Python. [K4]

CO5: select necessary operations for application using PHP and Python. [K5]

UNIT I

PHP Basics: Embedding PHP Code in Web Pages- Commenting Code – Outputting Data to the Browser – PHP's Supported Data Types – Identifiers – Variables – Constants – Expressions. **Functions:** Invoking a Function – Creating a Function. **Arrays:** Creating an Array - Outputting an Array - Adding and Removing Array Elements - Locating Array Elements - Traversing Arrays - Sorting Arrays -Merging, Slicing, Splicing, and Dissecting Arrays. **Object-Oriented PHP:** The Benefits of OOP - Key OOP Concepts - Constructors and Destructors – Static Class Member. (15 Hours)

UNIT II

Error and Exception Handling: Configuration Directives - Error Logging - Exception Handling. **Strings and Regular Expressions:** Regular Expressions - Other String-Specific Functions - Alternatives for Regular Expression Functions. **Date and Time** : The Unix Timestamp- PHP's Date and Time Library - Date Fu - Date and Time Enhancements for PHP Users. **Working with HTML Forms:** PHP and Web Forms - Validating Form Data - Taking Advantage of PEAR: HTML_QuickForm2.**Authenticating Users:** HTTP Authentication Concepts - Authenticating Your Users with PHP - User Login Administration.

(15 Hours)

UNIT III

Session Handlers: Session Handling- Configuration Directives - Working with Sessions - Practical Session-Handling Examples - Creating Custom Session Handlers. **Creating Ajax-enhanced Features with jQuery and PHP:** Introducing Ajax - Introducing jQuery - Creating a Username Existence Validator. **Introducing MySQL** : Makes MySQL - The Evolution of MySQL. **Using PHP with MySQL :**Using the mysqli Extension - Interacting with the Database -Executing Database Transactions. **Introducing PDO :** Using PDO. (15 Hours)

UNIT IV

Lists and Tuples: Common Sequence Operations – Indexing – Slicing – Adding Sequences – Multiplication – Membership – Length, Minimum and Maximum. Lists: Python's workhorse – The list function – Basic List Operations – List Methods. Tuples: Immutable Sequences – The tuple function – Basic Tuple Operations. **Dictionaries: When Indices Won't Do –** Dictionary syntax – The dict function – Basic Dictionary Operations – String Formatting with Dictionaries – Dictionary Methods (clear, copy, fromkeys, get, has_key, items and iteritems, keys and iterkeys, pop, popitem, setdefault, update values and itervalues). **Conditionals, Loops, and Some Other Statements:** More About print and import- Printing with Commas - Importing Something As Something Else - Assignment Magic - Sequence Unpacking - Chained Assignments- Augmented Assignments- Blocks: The Joy of Indentation - Conditions and Conditional Statements- Boolean Values - Conditional Execution and the if Statement - else Clauses - elif Clauses - Nesting Blocks - More Complex Conditions - Assertions - Loops - while Loops - for Loops- Iterating Over Dictionaries - Some Iteration Utilities - Breaking Out of Loops - else Clauses in Loops- List

Comprehension—Slightly Loopy - And Three for the Road - Nothing Happened! - Deleting with del - Executing and Evaluating Strings with exec and eval. (15 Hours)

UNIT V

Exceptions: Exception – Making Things Go Wrong, Your Way – The raise Statement – Custom Exception Classes – Catching Exceptions – Look, Ma, No Arguments! – More than one except clause – catching two exceptions with One Block – Catching the Object – A real catchall – When All Is Well – And Finally – Exceptions and Functions – The Zen of Exceptions. **Files and Stuff:** Opening Files – The Mode Argument – Buffering – The basic File Methods – Reading and Writing – Reading and Writing Lines – Closing Your Files – Iterating Over File Contents – Doing It Byte by Byte – One Line at a Time - Reading Everything – Lazy Line iteration with file input and xreadlines- The New kids on the Block: File Iterators. (15 Hours)

SELF STUDY

UNIT IV: Common Sequence Operation.

TEXT BOOK

1. W.Jason Gilmore (2013), *Beginning PHP and MySQL: From Novice to Professional,* Fourth Edition,Apress.
2. Magnus Lie Hetland (2008)**.** *Beginning Python from Novice to Professional,* Apress.

UNIT	BOOK	CHAPTERS	PAGE NOS
I	**T1**	**3**	**41 – 75**
		4	**91 – 99**
		5	**103 – 116**
			119 – 134
		6	**135 – 157**
II	**T1**	**8**	**175 – 190**
		9	**191 – 226**
		12	**269 – 286**
		13	**287 – 300**

		14	**303 - 318**
III	**T1**	**18**	**367 – 384**
		22	**437 – 447**
		25	**477 – 484**
		30	**590 – 605**
		31	**607 – 625**
IV	**T2**	**2**	**31 – 51**
		4	**69 – 81**
		5	**83 – 111**
V	**T2**	**8**	**161 – 173**
		11	**261 - 274**

REFERENCE BOOKS

1. Tim Converse and Joyce Park. (2003). *PHP 6 and MySQL*, Wiley India Private Ltd.
2. Mark Pilgrim (2004). *Dive into Python*, First Edition, Apress.
3. Luke Welling & Laura Thomson. (2010). *PHP & MySQL Web Development*, Fourth Edition, Pearson Publication.
4. Steve Suehring, Tim Converse & Joyce Park. (2009). *PHP6 and MySQL6 Bible*, First Edition, Wiley Publishing, Inc.

Course Code 20PCSC23	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	H	M	H	L	L	L	L	L	-	-
CO2	H	M	H	L	L	L	M	M	-	-
CO3	H	H	H	M	M	H	M	H	-	-
CO4	H	H	H	H	H	H	H	H	-	M
CO5	H	H	H	H	H	H	H	H	-	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. R.Sabitha
Course Designer

V.V. VANNIAPERUMAL COLLEGE FOR WOMEN

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
(Belonging to Virudhunagar Hindu Nadars)
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
Virudhunagar - 626 001

M.Sc. COMPUTER SCIENCE
(2022 – 2023 onwards)

Semester II	**OPEN SOURCE SOFTWARE**	Hours/Week: 5	
Core Course 6		Credits: 5	
Course Code **20PCSC23N**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand PHP Basics and creation of a web page using forms in PHP, sequence, tuples, conditions and loops in Python. [K2]

CO2: apply OOP's concept, MySQL, exception handling in Python applications. [K2]

CO3: illustrate lists, tuples, dictionaries in Python, error handling, string expression operations, session handling, AJAX and object oriented in PHP. [K3]

CO4: analyze OOP concepts, form validation using advanced validation methods in PHP, mathematical operations and exception handing , file operations in Python. [K4]

CO5: select necessary operations for application using PHP and Python. [K5]

UNIT I

PHP Basics: Embedding PHP Code in Web Pages- Commenting Code – Outputting Data to the Browser – PHP's Supported Data Types – Identifiers – Variables – Constants – Expressions – Control Structures. **Functions:** Invoking a Function – Creating a Function. **Arrays:** Creating an Array - Outputting an Array - Adding and Removing Array Elements - Locating Array Elements - Traversing Arrays - Sorting Arrays -Merging, Slicing, Splicing, and Dissecting Arrays. (15 Hours)

UNIT II

Object-Oriented PHP: The Benefits of OOP - Key OOP Concepts - Constructors and Destructors – Static Class Member – **Advanced OOP Features:** Inheritance – Interfaces – Abstract

Classes. **Error and Exception Handling:** Error Logging - Exception Handling. **Strings and Regular Expressions:** Regular Expressions - Other String - Specific Functions - Alternatives for Regular Expression Functions. **Date and Time** : The Unix Timestamp - PHP's Date and Time Library – Date Fu - Date and Time Enhancements for PHP Users. (15 Hours)

UNIT III

Working with HTML Forms: PHP and Web Forms - Validating Form Data. **Session Handlers: S**ession Handling- Configuration Directives - Working with Sessions - Practical Session-Handling Examples - Creating Custom Session Handlers. **Creating Ajax-enhanced Features with jQuery and PHP:** Introducing Ajax - Introducing jQuery - Creating a Username Existence Validator. **Using PHP with MySQL:** Using the mysqli Extension - Interacting with the Database - Executing Database Transactions. (15 Hours)

UNIT IV

Lists and Tuples: Common Sequence Operations – Indexing – Slicing – Adding Sequences – Multiplication – Membership – Length, Minimum and Maximum. Lists: Python's workhorse – The list function – Basic List Operations – List Methods. Tuples: Immutable Sequences – The tuple function – Basic Tuple Operations. **Dictionaries: When Indices Won't Do –** Dictionary syntax – The dict function – Basic Dictionary Operations – String Formatting with Dictionaries – Dictionary Methods (clear, copy, fromkeys, get, has_key, items and iteritems, keys and iterkeys, pop, popitem, setdefault, update values and itervalues). **Conditionals, Loops, and Some Other Statements:** More About print and import- Printing with Commas - Importing Something As Something Else - Assignment Magic - Sequence Unpacking - Chained Assignments- Augmented Assignments- Blocks: The Joy of Indentation - Conditions and Conditional Statements- Boolean Values - Conditional Execution and the if Statement - else Clauses - elif Clauses - Nesting Blocks - More Complex Conditions - Assertions - Loops - while Loops - for Loops- Iterating Over Dictionaries - Some Iteration Utilities - Breaking Out of Loops - else Clauses in Loops- List Comprehension—Slightly Loopy - And Three for the Road - Nothing Happened! - Deleting with del - Executing and Evaluating Strings with exec and eval. (15 Hours)

UNIT V

Working with Strings: Basic String Operations – String methods. **Exceptions:** Exception – Making Things Go Wrong, Your Way – The raise Statement Custom Exception Classes – Catching Exceptions – Look, Ma, No Arguments! – More than one except clause – catching two exceptions with One Block – Catching the Object – A real catchall – When All

Is Well – And Finally – Exceptions and Functions – The Zen of Exceptions. **Files and Stuff:** Opening Files – The Mode Argument – Buffering – The basic File Methods – Reading and Writing – Reading and Writing Lines – Closing Your Files – Iterating Over File Contents – Doing It Byte by Byte – One Line at a Time - Reading Everything – Lazy Line iteration with file input and xreadlines- The New kids on the Block: File Iterators. (15 Hours)

SELF STUDY

UNIT IV: Common Sequence Operation.

TEXT BOOK

1. W.Jason Gilmore (2013), *Beginning PHP and MySQL: From Novice to Professional,* Fourth Edition,Apress.
2. Magnus Lie Hetland (2008)**.** *Beginning Python from Novice to Professional,* Apress.

UNIT	BOOK	CHAPTERS	PAGE NOS
I	T1	3	41 – 75
			80 – 91
		4	91 – 99
		5	103 – 116
			119 – 134
II	T1	6	135 – 157
		7	163 – 171
		8	179 – 190
		9	191 – 226
		12	269 – 286
III	T1	13	287 – 296
		18	367 – 384
		22	437 – 447
		30	590 – 605
IV	T2	2	31 – 51
		4	69 – 81
		5	83 – 111
V	T2	3	53, 60 – 66
		8	161 – 173
		11	261 - 274

REFERENCE BOOKS

1. Tim Converse and Joyce Park. (2003). *PHP 6 and MySQL*, Wiley India Private Ltd.
2. Mark Pilgrim (2004). *Dive into Python*, First Edition, Apress.
3. Luke Welling & Laura Thomson. (2010). *PHP & MySQL Web Development*, FourthEdition, Pearson Publication.
4. Steve Suehring, Tim Converse & Joyce Park. (2009). *PHP6 and MySQL6 Bible*, FirstEdition, Wiley Publishing, Inc.

Course Code 20PCSC23N	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	H	M	H	L	L	L	L	L	-	-
CO2	H	M	H	L	L	L	M	M	-	-
CO3	H	H	H	M	M	H	M	H	-	-
CO4	H	H	H	H	H	H	H	H	-	M
CO5	H	H	H	H	H	H	H	H	-	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. T.Chitra
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

(2020-2021 onwards)

Semester II	**MAT LAB**	Hours/Week: 5	
Core Practical 3		Credits: 3	
Course Code **20PCSC21P**		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. [K3]

CO2: write MATLAB programs using various geometric transformation operations, thresholding and stretching techniques, filtering operations and morphological operations. [K3]

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

CO4: examine implementation of various logical operations, filtering operations, histogram calculation and equalization operations. [K4]

CO5: modify brightness of the image for various mean value, low pass filter into high pass filter & vice versa and mask window size. [K5]

List of Programs:

1. Perform various operations on vector and matrixes.
2. Write program 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
    iv. Convert given color image into gray-scale image
    v. Convert given color/gray-scale image into black & white image
    vi. Separate color image in three R G & B planes
    vii. Create color image using R, G and B three separate planes

3. To write and execute image processing programs to
    i. Obtain Negative image
    ii. Obtain Flip image
    iii. Apply Thresholding
    iv. Apply Contrast stretching
4. 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
5. 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
6. To write a program for histogram calculation and equalization
    i. Standard MATLAB function
    ii. Program without using standard MATLAB functions
7. To write and execute program for geometric transformation of image
    i. Translation
    ii. Scaling
    iii. Rotation
8. To understand various image noise models and to write programs for
    i. image restoration
    ii. Remove Salt and Pepper Noise
    iii. Minimize Gaussian noise
    iv. Median filter and Weiner filter
9. Write and execute programs to remove noise using spatial filters
    i. Understand 1-D and 2-D convolution process
    ii. Use 3x3 Mask for low pass filter and high pass filter
10. 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

11. Write and execute program for image morphological operations erosion and dilation.
12. Use the metric for image – PSNR & MSE
13. Apply some basic image operation on MAT lab GUI Environment.

Course Code 20PCSC21P	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	M	M	L	-	-	-	M	M	-	-
CO2	M	M	M	L	L	-	M	M	L	-
CO3	M	M	M	L	L	-	M	M	L	-
CO4	H	H	M	M	M	M	H	H	M	-
CO5	H	H	H	H	M	M	H	H	H	L

Mrs. P.Aruna Devi
Head of the Department

Ms. P.Raveena Lakshmi
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

(2022 – 2023 onwards)

Semester II	**MAT LAB**	Hours/Week: 5	
Core Practical 3		Credits: 3	
Course Code **20PCSC21PN**		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.[K3]

CO2: write MATLAB programs using various geometric transformation operations, thresholding and stretching techniques, filtering operations, histogram processing, morphological operations, edge detection and object recognition. [K3]

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

CO4: examine implementation of various logical operations, filtering operations, histogram equalization operations and edge detection. [K4]

CO5: modify brightness of the image for various mean value, low pass filter into high pass filter & vice versa and mask window size. [K5]

List of Programs:

14. To Perform various operations on vector and matrixes.
15. To read and display digital image using MATLAB

viii. Become familiar with MATLAB Basic commands

ix. Read and display image in MATLAB

x. Resize given image

16. 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 HS&Iplanes
    v. Convert given color/gray-scale image into black & white image
17. To convert image between different color spaces
    i. RGB to Grayscale conversion with and without using function
    ii. RGB to HIS conversion
18. To write and execute image processing programs to
    v. Obtain Negative image
    vi. Obtain Flip image
    vii. Apply Thresholding
    viii. Apply Contrast stretching
19. To write and execute programs for image arithmetic operations
    v. Addition of two images
    vi. Subtract one image from other image
    vii. Calculate mean value of image
    viii. Different Brightness by changing mean value
20. To write and execute programs for image logical operations
    v. AND operation between two images
    vi. OR operation between two images
    vii. Calculate intersection of two images
    viii. Water Marking using EX-OR operation
21. To write a program for histogram processing.
22. To write a program for histogram equalization
    iii. Standard MATLAB function
    iv. Program without using standard MATLAB functions
23. To write and execute program for geometric transformation of image
    i. Translation
    ii. Scaling
    iii. Rotation

24. To perform smoothing operation using spatial filters
    i. Mean filter
    ii. Median filter
    iii. Rank filter
25. To understand various image noise models to sharpen image and to write programs for
    i. image restoration
    ii. Remove Salt and Pepper Noise
    iii. Minimize Gaussian noise
    iv. Median filter and Weiner filter
26. To apply filters on images using fspecial function.
27. To apply 1-D and 2-D convolution process.
28. 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
29. To perform edge detection on images using various algorithms
30. Write and execute program for image morphological operations erosion and dilation.
31. To recognize objects in an image.
32. Use the metric for image – PSNR & MSE
33. Apply some basic image operations on MAT lab GUI Environment.

Course Code 20PCSC21PN	PO1		PO2	PO3	PO4	PO5		PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7	PSO 8
CO1	M	M	L	-	-	M	M	-	-	-
CO2	M	M	M	L	L	M	M	-	L	-
CO3	M	M	M	L	L	M	M	-	L	-
CO4	H	H	M	M	M	H	H	M	M	-
CO5	H	H	H	H	M	H	H	M	H	L

Mrs. P.Aruna Devi
Head of the Department

Mrs. S.Veni
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

(2020-2021 onwards)

Semester II	**OPEN SOURCE SOFTWARE LAB**	Hours/Week: 5	
Core Practical 4		Credits: 3	
Course Code **20PCSC22P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write the tags for designing the web pages with header and body section in PHP and give the correct library functions, proper indentation for the Python programs. [K3]

CO2: write a PHP/Python programs with accurate logic that helps to obtain the expected result. [K3]

CO3: build web pages using PHP programs and execute basic operations in Python program and evaluate the performance and the completion of their record work. [K3]

CO4: point out the working of form elements, exception handling in PHP and various data structures in Python. [K4]

CO5: alter the PHP and Python programs with the specified modifications. [K5]

List of Programs

1. Student Mark Sheet.
2. Employee Pay bill Preparation using single inheritance.
3. Student Mark Processing using Multilevel inheritance.
4. Registration Form.
5. Form Validation using CAPTCHA (Session).
6. Tourist Spots of Tamilnadu.
7. File Operations.
8. File Concatenation.
9. Drawing different Shapes.
10. Watermarking.

11. Image Filtering.
12. Query Builder (Library Database).
13. Inventory Details (Insert, Delete, Update, Display).
14. Bank Transaction (Insert, Delete, Update, Display).
15. Page Visitor Count.
16. Creating and Displaying Cookie Details.
17. Write a Python Program to perform the List operations (Create a list,
18. Access elements from a list(List Index, Negative Indexing), Slice the lists, Change or add elements to a list, Delete or remove elements from a list).
19. Write a Python Program to perform the Dictionary operations (Create a dictionary, Access elements from a dictionary, Change or add elements in a dictionary, Delete or remove elements from a dictionary, Dictionary Methods).
20. Write a Python function that accepts a string and calculate the number of upper case letters and lower case letters.
21. Write a Python program to count the frequency of words in a file.
22. Write a Python program to remove duplicates from Dictionary.
23. Exception Handling (User Defined Exceptions) in python.

Course Code 20PCSC22P	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	H	M	M	L	L	-	M	L	L	-
CO2	H	M	M	L	L	-	M	L	M	-
CO3	H	H	H	M	M	H	H	H	H	H
CO4	H	H	H	M	M	M	H	H	H	M
CO5	H	H	H	M	M	M	H	H	H	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. R.Sabitha
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
(2022 – 2023 onwards)

Semester II	**OPEN SOURCE SOFTWARE LAB**	Hours/Week: 5	
Core Practical 4		Credits: 3	
Course Code **20PCSC22PN**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write the tags for designing the web pages with header and body section in PHP and give the correct library functions, proper indentation for the Python programs. [K3]

CO2: write a PHP/Python programs with accurate logic that helps to obtain the expected result. K3]

CO3: build web pages using PHP programs and execute basic operations in Python program and evaluate the performance and the completion of their record work. [K3]

CO4: point out the working of form elements, exception handling in PHP and various data structures in Python. [K4]

CO5: alter the PHP and Python programs with the specified modifications. [K5]

List of Programs

1. Student Mark Sheet.
2. Employee Pay bill Preparation using single inheritance.
3. Student Mark Processing using Multilevel inheritance.
4. Registration Form.
5. Form Validation using CAPTCHA (Session).
6. File Operations.
7. File Concatenation.
8. Query Builder (Library Database).

9. Inventory Details (Insert, Delete, Update, Display).
10. Bank Transaction (Insert, Delete, Update, Display).
11. Page Visitor Count.
12. Creating and Displaying Cookie Details.
13. Write a Python Program to perform the List operations (Create a list, Access elements from a List (List Index, Negative Indexing), Slice the lists, Change or add elements to a list, Delete or remove elements from a list).
14. Write a Python Program to perform the Dictionary operations (Create a dictionary, Access elements from a dictionary, Change or add elements in a dictionary, Delete or remove elements from a dictionary, Dictionary Methods).
15. Write a Python function that accepts a string and calculate the number of upper case letters and lower case letters.
16. Write a Python program to count the frequency of words in a file.
17. Write a Python program to remove duplicates from Dictionary.
18. Write a Python program to perform different arithmetic operations on numbers.(Numpy)
19. Write a python program to define a module and import the module to another program.
20. Write a Python program to print all of the unique words in the file in alphabetical order.
21. Exception Handling (Built-In Exceptions) in python.
22. Exception Handling (User Defined Exceptions) in python.

Course Code 20PCSC22PN	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	H	M	M	L	L	-	M	L	L	-
CO2	H	M	M	L	L	-	M	L	M	-
CO3	H	H	H	M	M	H	H	H	H	H
CO4	H	H	H	M	M	M	H	H	H	M
CO5	H	H	H	M	M	M	H	H	H	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. T.Chitra
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
(2020-2021 onwards)

Semester II	**NETWORK SECURITY AND CRYPTOGRAPHY**	Hours/Week: 5	
DSEC 2		Credits: 5	
Course Code **20PCSE21**		Internal 40	External 60

COURSE OUTCOMES

On completion of course, the learners will be able to

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

CO2: express authentication principles, key management, network & IP Security. [K2]

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

CO4: analyze various encryption algorithms, hash functions, digital signature algorithm, authentication protocols and security policies. [K4]

CO5: evaluate the performance of encryption standard algorithms, hash algorithms, message authentication functions and authentication services for security. [K5]

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 – The RSA 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.

TEXT BOOK

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

UNIT	CHAPTER	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 20PCSE21	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	L	-	M	-	-	-	L	-	-	-
CO2	L	-	M	-	-	-	L	-	-	-
CO3	M	L	H	L	-	L	M	L	-	-
CO4	M	M	H	M	M	M	M	M	-	L
CO5	M	M	H	M	L	M	H	M	-	L

Mrs. P.Aruna Devi
Head of the Department

Ms. P.Raveena Lakshmi
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
(2020-2021 onwards)

Semester II	**INTERNET OF THINGS**	Hours/Week: 5	
DSEC 2		Credits: 5	
Course Code **20PCSE22**		Internal 40	External 60

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: summarize IoT system management, logical design of IoT using Python, IoT design methodology, physical servers and cloud offering in IoT. [K2]

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

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

CO5: choose appropriate Python packages for IoT System and IOT System Management protocols. [K5]

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 SpecificIOTs: 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 Platforms Design Methodology:** Introduction –IOT Design Methodology –Case Study on IOT System for Weather Monitoring –Motivation for Using Python. (16 Hours)

UNIT IV

IOTSystems -Logical Design Using Python : Introduction –Python Data Types and Data Structures - Contol 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: Raspbeery 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 RESTful Web API – Amazon Web Services for IOT –SkyNetIOT 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*, First 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 20PCSE22	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	L	-	M	-	-	-	L	-	-	-
CO2	L	L	M	-	-	-	M	-	-	-
CO3	L	L	H	L	-	L	M	L	-	-
CO4	M	L	L	L	L	M	L	M	-	M
CO5	M	M	L	L	L	H	M	M	-	M

Mrs. P.Aruna Devi
Head of the Department

Ms. A.Dhivya
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
(2020-2021 onwards)

Semester II	**GRID COMPUTING**	Hours/Week: 5	
DSEC 2		Credits: 5	
Course Code		Internal	External
20PCSE23		40	60

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, Open Grid Service Architecture (OGSA) services, deployment and management issues of grid computing. [K3]

CO4: analyze the supporting standards of Open Grid Services Infrastructure (OGSI) & OGSA, service relationships and security of grid computing. [K4]

CO5: compare the constituent elements, Globus Toolkit systems, grid standards and grid services of grid computing. [K5]

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

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1,1.2,1.4 - 1.6**
	2	**2.1 – 2.6**
II	**3**	**3.2 – 3.4**
III	**4**	**4.2 – 4.6**
IV	**5**	**5.2 – 5.6**
V	**6**	**6.1 – 6.4**

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 20PCSE23	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	L	-	M	-	-	-	M	-	-	-
CO2	L	-	M	-	-	-	M	-	-	-
CO3	L	-	M	M	L	-	M	-	-	M
CO4	M	L	H	M	L	L	H	L	-	M
CO5	M	L	H	M	M	L	H	L	-	-

Mrs. P.Aruna Devi
Head of the Department

Mrs. T.Chitra
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
(2020-2021 onwards)

Semester III	**DATA MINING**	Hours/Week: 6	
Core Course 7		Credits: 5	
Course Code **20PCSC31**		Internal 40	External 60

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: describe associations, correlations, classification, mining frequent patterns, clustering and outlier detection methods. [K2]

CO3: illustrate the usage of data preprocessing, mining frequent patterns, WEKA functionalities, classification, clustering, outlier detection algorithms and data mining in WEKA. [K3]

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

CO5: justify data mining algorithms for particular data set. [K5]

UNIT I

Introduction: Data mining – Kinds of data mined – Kinds of Patterns mined – Technologies used– Applications. **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. (19 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. (18 Hours)

UNIT III

Mining frequent patterns, Associations and Correlations: Basic Concepts and Methods Basic Concepts – Frequent Itemset Mining Methods. **Classification: Basic Concepts:** Basic Concepts – Decision Tree Induction. (17 Hours)

Case Study: Mining Customer Value: From Association Rules to Direct Marketing.

UNIT IV

Classification: Advanced Methods: Classification by Back Propagation – Lazy learners (or learning from your neighbors) – Other classification methods. **Cluster Analysis:** Cluster Analysis – Partitioning Methods – Hierarchical Methods – Density - Based Methods – Grid Based Methods. (19 Hours)

Case Study: KDD for Insurance Risk Assessment

UNIT V

Outlier Detection: Outliers and Outlier Analysis – Outlier Detection Methods. **Data Mining Trends and Research Frontiers:** Other Methodologies of Data Mining – 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. (17 Hours)

SELF STUDY:

UNIT V: Data Mining Trends and Research Frontiers.

TEXT BOOK

1. Jiawei Han and Micheline Kamber, Jian Pei. (2016). *Data Mining Concepts and Techniques*, New Delhi: Morgan Kaufmann Publishers, An imprint of Elsevier, Third Edition, Reprinted 2016.
2. Material will be provided for **Data Mining with WEKA** in Unit V.

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**	**6.1,6.2**
	8	**8.1,8.2**
IV	**9**	**9.2,9.5,9.6**
	10	**10.1 - 10.5**
V	**12**	**12.1,12.2**
	13	**13.2,13.3**

Data Mining with WEKA - Material

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 20PCSC31	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	M	-	M	-	-	-	L	L	-	-
CO2	M	L	M	-	-	-	L	L	-	-
CO3	H	H	H	L	M	M	M	M	-	-
CO4	H	H	H	H	M	H	H	H	-	L
CO5	H	H	H	H	H	H	M	H	-	L

Mrs. P.Aruna Devi
Head of the Department

Mrs. T.Chitra
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
(2020-2021 onwards)

Semester III	**ADVANCED JAVA PROGRAMMING**	Hours/Week: 6	
Core Course 8		Credits: 5	
Course Code **20PCSC32**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the concepts of database connectivity and networking in Java, Applets, Servlets, Swing and Collections Framework. [K2]

CO2: discuss Remote Method Invocation, Servlets, JSP and applets in Java. [K2]

CO3: implement Remote Method Invocation, applications with database access and collection classes, JSP, Servlets, Swing applications and Applets. [K3]

CO4: contrast applets with Java application programs, different classes in Swing and Collections framework, server side scripting programs using JSP with Servlet, analyse RMI and Networking concepts in Java. [K4]

CO5: assess Java Database Connectivity, Remote Method Invocation, purpose of Collection classes, Swing and Servlets. [K5]

UNIT I

The Java Database Connectivity (JDBC): Creating an ODBC Data source – Simple Database Access – Modifying the Database Contents – Transactions – Meta Data – Using a GUI to access a Database – Scrollable Result Sets in JDBC 2.0 – Modifying Databases via Java Methods – Using the Data Source Interface. **The Applet Class:** Two Types of Applets – Applet Basics – Applet Architecture – An Applet Skeleton – Simple Applet Display Methods – Requesting Repainting – Using the Status Window – The HTML APPLET Tag – Passing Parameters to Applets – getDocumentBase() and getCodeBase(). (17 Hours)

UNIT II

Networking: Networking Basics – The networking classes and interfaces – InetAddress – Inet4Address & INet6Address – TCP/IP Client Sockets – URL – URL Connection – The HTTP URL Connection – The URI Class – Cookies – TCP/IP Server sockets – Datagrams. **Remote Method Invocation (RMI):** The Basic RMI Process – Implementation Details – Compilation and Execution – Using RMI Meaningfully – RMI Security. (17 Hours)

UNIT III

Introducing Swing: The origin of Swing – Swing is built on the AWT – Two Key Swing Features – The MVC Connection – Components and Containers – The Swing Packages – A simple Swing Application – Event Handling – Create a Swing Applet – Painting in Swing. **Exploring Swing:** JLabel and Image Icon – JTextField – The Swing Buttons – JTabbedPane – JScrollPane – JList – JComboBox – Trees – JTable – Continuing Your Exploration of Swing. (18 Hours)

UNIT IV

The Collections Framework: Collections Overview – Recent Changes to Collections – The Collection Interfaces – The Collection Classes – Accessing a Collection via an Iterator – Storing User - Defined Classes in Collections – The Random Access Interface – Working with Maps – Comparators – The Collection Algorithms – Arrays – Generic Collections – The Legacy Classes and Interfaces – Parting Thoughts on Collections. (19 Hours)

UNIT V

Java Server Pages (JSPs): The Rationale behind JSPs – Compilation and Execution – JSP Tags – Implicit JSP Objects – Collaborating with Servlets – JSPs in action – Error Pages – Using JSPs to Access Remote Databases. **Servlets:** Background – The Life Cycle of a Servlet – Using Tomcat for Servlet Development – A Simple Servlet – The Servlet API – The javax.Servlet Package – reading Servlet Parameters – The javax.Servlet.HTTP Package – Handling HTTP Requests and Responses – Using Cookies – Session Tracking.

(19 Hours)

SELF STUDY:

UNIT V: Implicit JSP Objects

TEXT BOOKS

1. Herbert Schildt (2007). *Java The Complete Reference*, Mumbai: Tata McGraw Hill Edition, Seventh Edition.

2. Jan Graba (2010). *Introduction to Network Programming with Java*, United States: Springer International Edition.

UNIT	BOOK	CHAPTERS	PAGES
I	T1	7	179 - 192, 195 - 222
	T2	21	617 - 636
II	T2	20	599 - 616
	T1	5	129 - 147
III	T2	29	859 - 878
		30	879 - 906
IV	T2	17	437 - 502
V	T1	9	269 - 286
	T2	31	907 - 928

REFERENCE BOOKS

1. Joseph L.Webber. (May 2000). *Special Edition Using Java2 Platform*, New Delhi: Prentice Hall of India, Fifth Printing.
2. Dr.Satyaraj Pantham .(2002). *Pure JFC Swing*, New Delhi: Tech media Publications.
3. Phil Hanna. *The Complete Reference JSP 2.0,* Mumbai: Tata McGraw Hill Edition.
4. H.M. Deital, P.J. Deital. *Java, How to Program*, New Delhi: Pearson Education, Sixth Edition.
5. Herbert Schildt. *Swing A Beginners Guide*, Mumbai: Tata McGraw Hill Edition.

Course Code 20PCSC32	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	H	H	H	L	L	-	H	H	-	-
CO2	H	H	H	L	L	-	H	H	-	-
CO3	H	H	H	M	M	L	H	M	-	L
CO4	M	M	H	M	M	L	H	M	-	M
CO5	M	M	H	H	H	-	H	H	-	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. S.Veni
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
(2020-2021 onwards)

Semester III	**ADVANCED JAVA PROGRAMMING LAB**	Hours/Week: 6	
Core Practical 5		Credits: 3	
Course Code **20PCSC31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write coding for importing required packages and creating main method class in all Java application programs. [K3]

CO2: write Java programs to implement the concepts of Networking protocols TCP/IP and UDP, Database connectivity, RMI, Applets, Swing Servlets and JSP. [K3]

CO3: develop Java console application programs, Applets and Web applications proficiently and evaluate the performance and the completion of their record work. [K3]

CO4: analyze the appropriate usage of various data structures for a given problem. [K4]

CO5: modify networking protocols used in the Java application program, Servlets to JSP programs and vice-versa. [K5]

List of programs:

1. Process student's marks details using JDBC.
2. Process payroll using JDBC.
3. Send data from client to server using TCP, UDP.
4. Sending email using session, Properties.
5. Program to create and process an ArrayList, LinkedList, HashSet.
6. Program to create and process LinkedHashSet, TreeSet.
7. Program to implement PriorityQueue, ArrayQueue.
8. Program using Iterator Class, Map Classes.

9. Shutting down the system using RMI.
10. Shutting down a system in a network using RMI.
11. Banking transaction between client and server using RMI.
12. Perform inventory processing using RMI.
13. Program for EB-Bill preparation using JSP.
14. Program to find day of the date using JSP.
15. Program to display session details using JSP.
16. Inventory control using Servlets.
17. Library management using Servlets.

Course Code 20PCSC31P	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	H	H	H	L	L	-	H	H	H	-
CO2	H	H	H	L	L	L	H	H	H	L
CO3	H	H	H	L	L	L	H	H	H	L
CO4	M	L	H	M	M	L	H	H	L	L
CO5	M	L	M	M	M	-	L	H	L	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. S.Veni
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
(2020-2021 onwards)

Semester III	**ASP.NET USING C# LAB**	Hours/Week: 6	
Core Practical 6		Credits: 3	
Course Code **20PCSC32P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write ASP.NET programs with appropriate controls and its properties. [K3]

CO2: write programs by using List Box, Dropdown List, Image Map, Site Map, Tree View, Database Connectivity, AD Rotator and Timer control in ASP.NET. [K3]

CO3: execute ASP.NET programs by placing the needed tools for that program and prepare records and evaluate the performance and the completion of their record work.. [K3]

CO4: examine the control properties used in ASP.NET programs. [K4]

CO5: use bulleted list instead of list box control, Site Map instead of Tree View control and vice versa in programs. [K5]

List of Programs:

1. Check whether the given number is Palindrome or not.
2. Perfect Numbers Generation Using List Box.
3. Prime Numbers Generation Using List Box.
4. Creating Multiplication Table Using Dropdown List.
5. Display courses offered in our college Using Bulleted List.
6. Display Images Using Image control.
7. Creating a class library with function Factorial.
8. Display details of Tourist Places in Tamilnadu Using Image Map.
9. Display Bio- Data using Wizard Control.

10. Display details of Input / Output devices Using Tree View Control.
11. Form Validation Using Validation Control.
12. Display Android Versions Using Site Map.
13. Display Advertisements Using AD-Rotator.
14. Display Random Images Using Timer.
15. Student Mark detail using Database connectivity.
16. Inventory Details using Database connectivity.
17. EB Bill Calculation using Database connectivity.
18. Employee Payroll details using Database connectivity.
19. Report Generation for Student Mark Details.
20. Report Generation for Inventory Details.
21. Department Website Creation using Master page.
22. Display Date Using Calendar control and Master page.
23. Flower animation Creation using AJAX Enabled Website.
24. Report for Student Personal Details using Detail View and Form View Control.

Course Code 20PCSC32P	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	H	H	M	L	L	-	H	H	M	L
CO2	H	H	M	L	L	-	H	H	M	L
CO3	H	H	H	M	M	M	M	M	-	-
CO4	H	M	M	M	M	H	M	M	M	-
CO5	H	H	M	M	M	H	H	H	M	L

Mrs. P.Aruna Devi
Head of the Department

Ms. A.Dhivya
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
(2020-2021 onwards)

Semester III	**PRACTICE FOR SET/NET – GENERAL PAPER**	Hours/Week:1
Course Code		Credit: 1
20PGOL31		Internal **100**

COURSE OUTCOMES

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

CO1: discuss various concepts related to higher education system, teaching, communication, research, ICT and environmental studies. [K2]

CO2: apply the skills of communication, mathematical, internet and research aptitude in competitive examinations. [K3]

CO3: analyze the circumstances, instances, contents and arrive at / choose the best option. [K4]

CO4: interpret the data using ICT tools and logical reasoning. [K5]

CO5: build self learning activities to face challenges in their life. [K6]

UNIT I Teaching & Research Aptitude

Teaching: concept, objectives, levels of teaching, factors affecting teaching, Methods of teaching of Higher learning, Evaluation systems.

Research: Meaning, Types, Methods of Research, Steps of Research, Thesis and Article writing, Application of ICT in research.

UNIT II Communication and Higher Education System

Communication, Meaning, types, characteristics of communication, Verbal and non – verbal, Barriers to communication.

Higher Education System: Professional, Technical, skilled Based education, Value education, Policies, Governance and Administration.

UNIT III Comprehension

A passage of text will be given. Answers should be given according to the questions from the passage.

UNIT IV Mathematical, Logical Reasoning and Data Interpretation

Mathematical Logical Reasoning: Number series, letter series, Analogies, Venn diagram and Mathematical Aptitude.

Data Interpretation: Graphical representation and mapping of Data, Data and Governance.

UNIT V ICT and Environmental Studies

ICT: General abbreviations, Basics of Internet, E – mail, Digital initiatives in higher education.

Environmental Studies: Pollution, Impacts of Pollutants, Natural and energy sources, Natural disasters and environmental protection Act.

TEXT BOOK

Madan KVS (2019), *NTA – UGC NET/SET/JRF- Teaching and Research Aptitude*, Pearson India Education Services Pvt. Ltd., Noida.

REFERENCE BOOKS

1. Rashmi Singh and Asim Khan (2019), *UGC-NET Paper- I*, Disha Publication, New Delhi.
2. Dr.Usha Rani Jain (2018),*UGC-NET,* Mital Books India Ltd., New Delhi.

Course Code 20PGOL31	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	H	H	-	-	M	L	-	L
CO2	H	H	L	M	H	M	-	M
CO3	H	M	M	H	H	M	-	M
CO4	H	M	H	H	H	H	-	L
CO5	H	L	M	L	L	H	-	L

Tmty.K.Anitha
Tmty.S.Malathi
Course Designers

Dr.A.Uma Devi
Head of the Department

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
(2020-2021 onwards)

Semester III	**COMPUTER ESSENTIALS FOR COMPETITIVE EXAMINATION**	Hours: 0
Extra Credit Course		Credits: 2
Course Code **20PCSO31**		Internal **100**

COURSE OUTCOMES

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

CO1: comprehend the basic concepts of computer essentials for competitive exams. [K2]
CO2: use current technologies, skills, and tools necessary for computing practices. [K3]
CO3: apply design, coding and testing principles in Computer Aptitude. [K3]
CO4: investigate problems to provide accurate reasoning. [K4]
CO5: select proper methods to find solution. [K5]

UNIT I

Digital Logic: Number Systems – Boolean Algebra and Minimization of Functions – Combinational Circuits – Sequential Circuits.

UNIT II

Programming and Data Structures: Programming in C – Functions – Arrays, Pointers and Structures – Linked Lists, Stacks and Queues – Trees.

UNIT III

Databases: ER Model and Relational Model – Structured Query Language – Normalization – Transaction and Concurrency.

UNIT IV

Operating System: Process and Threads – Interprocess Communication, Concurrency and Synchronization – Deadlock and CPU Scheduling – Memory Management and Virtual Memory – File Systems, I/O Systems, Protection and Security.

UNIT V

Network: OSI Layers – Routing Algorithms – TCP/UDP – IP(v4) – Network Security.

TEXT BOOK

Trishna Knowledge Systems (2019), *GATE(Graduate Aptitude Test in Engineering) Computer Science and Technology 2020*, Pearson India Education, Chennai.

UNIT	CHAPTERS
I	**Unit I: 1,2,3,4**
II	**Unit III: Part A: 1,2,3,4,5**
III	**Unit IV: 1,2,3,4**
IV	**Unit VII: 1,2,3,4,5**
V	**Unit VIII: Part A: 1,2,3,4,5**

REFERENCE BOOKS

1. S.Pandikumar (2019), *Computer Science Question Bank for Competitive Exams*, First Edition, Naplin Publications, Madurai.
2. Jushta Jaiswal, *Objective Computer Science and Information Technology for Competitive examination*, Source Books (A Unit of Viva Books Private Limted), New Delhi.
3. *GATE 2019, Computer Science & Information Technology Masterpiece with 10 Practice Sets*, Sixth Edition, Disha Publication, New Delhi.

Course Code 20PCSO31	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	H	-	M	L	L	-	L	L	-	-
CO2	H	-	M	L	L	-	M	M	-	-
CO3	H	-	H	M	M	L	M	M	-	L
CO4	H	-	M	M	M	M	M	M	M	L
CO5	H	-	M	M	M	M	H	H	M	L

Mrs. P.Aruna Devi
Head of the Department

Mrs. S.Veni
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
(2020-2021 onwards)

Semester IV	**DATA ANALYTICS**	Hours/Week: 6	
Core Course 9		Credits: 5	
Course Code **20PCSC41**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: infer basics of R, dataset, types of anova, tests to apply on data and graphs for various datasets. [K2]

CO2: comprehend basics data management, statistics, regression, power analysis and plots. [K2]

CO3: handle various kinds of plots, graphs, regression diagnostics techniques on datasets. [K3]

CO4: investigate appropriate data structure, data management techniques, graphs, statistical tests and variance in R. [K4]

CO5: choose appropriate data structure, regression methods, plots and graphs for any data sets. [K5]

UNIT I

Introduction to R: Usage of R – Working with R – Getting Started – The Work space – Input and Output – Packages – Using Output as Input : Reusing Results – Working With Large Datasets. **Creating Dataset:** Understanding Datasets – Data Structures – Data Input – Annotating Datasets – Useful functions for working with data objects. **Getting started with graphs:** Working with graphs – A Simple example – Graphical Parameters – Adding text, customized axes and legends – Combining graphs. (11 Hours)

UNIT II

Basic Data Management: Creating new variables – Recoding variables – Renaming variables – Missing values – Data values – Type Conversions – sorting data– Merging datasets – Subsetting datasets – Using SQL Statements to manipulate data. **Advanced Data Management:** Numerical & Character functions –Control flow – User Written functions – Aggregation and reshaping. (11 Hours)

UNIT III

Basic graphs: Bar Plots – Pie charts – Histograms – Kernel density plots – Box Plots – Dot plots. **Basic Statistics:** Descriptive Statics – Frequency and contingency tables – Correlation – T test. (9 Hours)

UNIT IV

Regression: The many faces of regression – OLS regression –Regression Diagnostics – Unusual observations – Corrective measures. **Analysis of Variance:** Fitting ANOVA Models – One way ANOVA – One way ANCOVA. (10 Hours)

UNIT V

Power Analysis: Implementing Power analysis with the pwr package – Creating power analysis plots. **Intermediate graphs:** Scatter plots – Line chars – Corrgrams– Mosaic plots. (9 Hours)

SELF STUDY

UNIT I: Working with R – Getting Started –The Work space.

TEXT BOOK

RobertI.Kabacoff (2015).*R in Action Data analysis and graphics with R*, New Delhi: Dreamtech press Second Edition.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1 , 1.3.1,1.3.3,1.3.4, 1.4, 1.6, 1.7**
	2	**2.1 – 2.5**
	3	**3.1 – 3.5**
II	**4**	**4.2– 4.11**
	5	**5.2, 5.4 – 5.6**
III	**6**	**6.1 – 6.6**
	7	**7.1 – 7.4**
IV	**8**	**8.1 – 8.5**
	9	**9.2 – 9.4**
V	**10**	**10.2, 10.3**
	11	**11.1 – 11.4**

REFERENCE BOOKS

1. Tony Fishchetti. (2015). *Data analysis with R*, United Kingdom: Packt Publishing Limited.
2. GergelyDarocZi. (2015). *Mastering Data Analysis with R*, United Kingdom: Packt Publishing Limited.
3. Dan Toomey. (2014). *R for Data Science*, United Kingdom: Packt Publishing Limited.

Course Code 20PCSC41	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	H	L	L	-	-	-	L	-	-	-
CO2	H	L	L	L	L	-	L	L	-	-
CO3	H	M	M	M	M	M	M	M	-	L
CO4	H	M	M	M	M	L	M	H	-	L
CO5	H	H	M	-	-	L	L	H	-	L

Mrs. P.Aruna Devi
Head of the Department

Ms. T.Jeya Priya
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

(2020-2021 onwards)

Semester IV	**R PROGRAMMING LAB**	Hours/Week: 6	
Core Practical 7		Credits: 3	
Course Code **20PCSC41P**		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. [K3]

CO2: write R programs with necessary data mining algorithms and plot the outputs. [K3]

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

CO5: test R program with different dataset and plot methods. [K5]

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. Create dataset.
10. Import dataset from various file formats.
11. Create various Scatter Plot.
12. Create Mosaic Plots.

Course Code 20PCSC41P	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	H	M	L	-	-	-	L	L	-	-
CO2	H	M	M	-	-	-	L	L	L	M
CO3	H	M	M	M	M	M	M	H	L	M
CO4	H	M	M	M	M	M	M	H	L	L
CO5	H	H	M	M	M	M	M	H	L	L

Mrs. P.Aruna Devi
Head of the Department

Ms. T.Jeya Priya
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
(2022 – 2023 onwards)

Semester IV	**R PROGRAMMING LAB**	Hours/Week: 6	
Core Practical 7		Credits: 3	
Course Code		Internal	External
20PCSC41PN		40	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. [K3]

CO2: write R programs with necessary data mining algorithms and plot the outputs. [K3]

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

CO5: test R program with different dataset and plot methods. [K5]

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 20PCSC41PN	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	H	M	L	-	-	-	L	L	-	-
CO2	H	M	M	-	-	-	L	L	L	M
CO3	H	M	M	M	M	M	M	H	L	M
CO4	H	M	M	M	M	M	M	H	L	L
CO5	H	H	M	M	M	M	M	H	L	L

Mrs. P. Aruna Devi
Head of the Department

Mrs. M. Sangeetha Alias Sheeba
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
(2020-2021 onwards)

Semester IV	**ADVANCED WEB PROGRAMMING LAB**	Hours/Week: 6	
Core Practical 8		Credits: 3	
Course Code **20PCSC42P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write the tags for designing the web pages and use Angular JS Directives, Filters, Controllers, Services and CSS as needed. [K3]

CO2: write Angular JS programs by using built-in functions of Angular JS framework. [K3]

CO3: build web pages using Angular JS programs and evaluation of performance and completion of record work. [K3]

CO4: explore Angular JS programs using Database, Filters, Forms and Events. [K4]

CO5: change Angular JS programs with the specified modifications. [K5]

List of Programs:

1. Generating Prime numbers using Javascript.
2. Changing background color of a web page using Javascript.
3. Displaying different images for different button clicks using Javascript.
4. Displaying current date and time by clicking a button using Javascript.
5. Login validation using Javascript.
6. Calculating Simple Interest and Compound Interest using Javascript.
7. Working with Angular JS Directives.
8. Applying CSS to Angular JS.
9. Implementing Angular JS built-in functions.
10. Applying Angular JS Filters.
11. Implementing Data Binding using Angular JS.

12. Illustrating Controllers and Services in Angular JS.
13. Implementing Angular JS $http.
14. Displaying Data in Angular JS Tables.
15. Working with Select Box, Radio Button and Check Box using Angular JS forms.
16. Fetching data from MySQL using Angular JS.
17. Working with DOM Elements using Angular JS.
18. Working with Angular JS Events.
19. Illustrating Validation in Angular JS.
20. Editing and Adding Contents to a web page using Angular JS.
21. Embedding an external file using Angular JS.
22. Illustrating Angular JS Routing.
23. Create an application (Shopping) using Angular JS.

Course Code 20PCSC42P	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	H	H	H	L	-	-	M	H	L	L
CO2	H	H	H	L	-	-	H	H	L	L
CO3	H	H	H	H	M	M	M	H	H	M
CO4	H	M	L	M	-	M	M	H	M	M
CO5	H	H	M	M	M	-	M	M	M	M

Mrs. P.Aruna Devi
Head of the Department

Mrs. S.Veni
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
(2022 – 2023 onwards)

Semester IV	**ADVANCED WEB PROGRAMMING LAB**	Hours/Week: 6	
Core Practical 8		Credits: 3	
Course Code **20PCSC42PN**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write tags for designing the web pages and use JS Directives, Filters, Controllers, Services and CSS as needed. [K3]

CO2: write programs by using built-in functions of JS framework.[K3]

CO3: build web pages using JS programs and evaluation of performance and completion of record work. [K3]

CO4: explore JS programs using Filters, Forms and Events. [K4]

CO5: change JS programs with the specified modifications. [K5]

List of Programs in JS:

1. Solve quadratic equation.
2. Find Armstrong number.
3. Create Countdown timer.
4. Displaying current date and time by clicking a button.

List of Programs in Angular JS:

5. Display Courses offered in the college using ng-repeat directive.
6. Display Book List based on user input using filter.
7. Create Department Website using ng-route module.
8. Convert Decimal to Octal and Hexadecimal using User defined service.

List of Programs in React JS:

9. Check for voting eligibility using function.
10. Create search filter.
11. Create slideshow.
12. Create counter.
13. Create check boxes with class based components.
14. Build accordion using React Hooks.
15. Create login form.
16. Create portfolio using React Router.

Course Code 20PCSC42PN	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	H	H	H	L	-	-	M	H	L	L
CO2	H	H	H	L	-	-	H	H	L	L
CO3	H	H	H	H	M	M	M	H	H	M
CO4	H	M	L	M	-	M	M	H	M	M
CO5	H	H	M	M	M	-	M	M	M	M

Mrs. P. Aruna Devi
Head of the Department

Ms. M. Porkalai Selvi
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
(2020-2021 onwards)

Semester IV	**PROJECT**	Hours/Week: 12	
Core Course 10		Credits: 6	
Course Code **20PCSC41PR**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: discover the problem in specified domain utilizing the disciplinary knowledge. [K3]

CO2: investigate the methodology and solutions to the problem area. [K3]

CO3: apply the selected methodology to the problem. [K3]

CO4: transform the ideas to solution for the specified problem. [K4]

CO5: validate the finding of the problem. [K5]

- Project will be done by the final year students individually in the fourth semester under the guidance of respective guides.
- For projects internal marks will be awarded by the respective guide and external marks will be awarded in the external examinations held at the end of the semester.
- The report of the project must be in the prescribed form. It should be typed neatly in MS word (12 pt, Times New Roman, 1.5 spacing)
- The project report should be written in 40 - 50 pages.
- Two copies of the project report with binding should be submitted.

Course Code 20PCSC41PR	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	H	H	H	M	M	H	H	H	M	H
CO2	H	H	H	M	M	H	H	H	M	H
CO3	H	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H	H

Mrs. P.Aruna Devi
Head of the Department

Mrs. P.Aruna Devi
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
(2022 – 2023 onwards)

Semester IV	Project - Research Methodology & Ethics	Hours/Week: 12	
Core Course 10		Credits: 6	
Course Code **22PCSC41PR**		Internal 60	External 40

COURSE OUTCOMES

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

CO1: discover the problem in specified domain utilizing the disciplinary knowledge. [K3]

CO2: investigate the methodology and solutions to the problem area. [K3]

CO3: apply the selected methodology to the problem based on research ethics [K3]

CO4: transform the ideas to solution for the specified problem based on ethics. [K4]

CO5: validate the finding of the problem. [K5]

UNIT I

Research Ethics: Introduction – Types of Research: Theoretical – Experimental – Applied – Qualitative and Quantitative Research – Components of a Research Paper: Title – Abstract – Introduction – Literature Review – Methodology – Results and Discussion – Conclusion – References.

UNIT II

Publication Ethics: Introduction – Style manual in writing: MLA and APA Style – Plagiarism: Introduction – Types of Plagiarism – Avoidance of Plagiarism – Antiplagiarism – Turnitin and Paper Writer – Journal Indexing – Google Scholar – Scopus – Web of Science – Citation Index – h-index – i-index.

Project Work and Viva-Voce

- Project will be done by the final year students individually in the fourth semester under the guidance of respective guides.
- Course comprises two units Research Methodology theory paper and Project Completion.

- An Internal Assessment for a maximum of 20 marks will be carried out for the theory paper.
- For projects internal marks will be awarded by the respective guide and external marks will be awarded in the external examinations held at the end of the semester.
- The report of the project must be in the prescribed form. It should be typed neatly in MS word (12 pt, Times New Roman, 1.5 spacing)
- The project report should be written in 40 - 50 pages.
- Two copies of the project report with binding should be submitted.

TEXT BOOK

Material prepared by the Faculty Members of Computer Applications, Computer Science and Information Technology Departments.

REFERENCE BOOK

C.R.Kothari (2014). *Research Methodology Methods and Techniques*, 2nd Revision Edition, New Age International Publishers, India.

Course Code 22PCSC41PR	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	H	H	H	M	M	H	H	H	M	H
CO2	H	H	H	M	M	H	H	H	M	H
CO3	H	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H	H

Evaluation Pattern (100 marks)					
Internal Assessment (60marks)				External Assessment (40 marks)	
One Periodic Test (20)	Project Report (20)	Pre-Submission Presentation (10)	One Open online Course related to the Project (10)	Project Presentation (30)	Viva Voce (10)

Mrs. P. Aruna Devi
Head of the Department

Mrs. P.Aruna Devi
Course Designer