V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS

(with effect from Academic Year 2023 - 2024)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes (Aided), 15 UG Programmes (SF), 15 PG Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the and University Grants Commission (UGC) & Tamil Nadu State Council for Higher Education (TANSCHE) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

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

A. CHOICE BASED CREDIT SYSTEM (CBCS)

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

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

UG PROGRAMMES

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

Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration

PG PROGRAMMES

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

* AICTE approved Programmes

OUTLINE OF CHOICE BASED CREDIT SYSTEM- PG

1. Core Courses
2. Elective Courses
    - Discipline Specific Elective Courses (DSEC)
    - Generic Elective Courses
    - Non-Major Elective Course (NMEC)
3. Skill Enhancement Courses
4. Self Study Course (Online)
5. Extension Activity
6. Extra Credit Courses (Optional)

List of Non Major Elective Courses (NME)
(2023-2024 onwards)

PG PROGRAMMES

Name of the Course	Course Code	Department
Tourism in Tamilnadu	23PHIN31	History
Functional English	23PENN31	English
தமிழும் பிற துறைகளும்	23PTAN31	Tamil
Taxation Concepts and Assessment	23PCON31	Commerce
Entrepreneurship	23PBAN31	Business Administration
Statistics for Life and Social Sciences	23PMTN31	Mathematics
Advanced Chemistry for Competitive Examination	23PCHN31	Chemistry
Nutrition and Health	23PHSN31	Home Science - Nutrition and Dietetics
Molecular Basis of Diseases and Therapeutic Strategies	23PBCN31	Biochemistry
Web Programming	23PCSN31	Computer Science
Fundamentals of Web Design	23PCAN31	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

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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 Applications

To impart knowledge of Computer Applications for bringing out competent computing professionals with virtuous values and social responsibilities.

Mission of the Department of Computer Applications

- To provide equitable access to high-grade and value-based education in computer applications for students.
- To nurture their skills to design and develop systems for real life problems.
- To facilitate consultancy service to the corporate and foster research.
- To develop skills knowledgeably to meet the ever-changing needs of society.

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.C.A Programme The Students will be able to

- develop technical competence in various functional domains of computer applications.
- analyze real life problems, design computing systems appropriate to its solutions thatare technically sound, economically feasible and socially acceptable.
- exhibit entrepreneurial skills and find novel solutions through technological based research.
- continue a lifelong professional development in computing that contributes innovative methodologies to solve complex problems for the betterment of the society

Key Components of Mission Statement	**PEO1**	**PEO2**	**PEO 3**	**PEO4**
high-grade, value-based education	√	-	√	-
design and develop systems	√	√	√	√
consultancy service and research	-	√	√	√
meet the ever-changing needs of society.	√	√	-	√

B.1.2 Programme Outcomes (POs)

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

Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

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

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

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

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

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

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

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

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

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

B.1.3 Programme Specific Outcomes (PSOs)

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

On Successful completion of M.C.A Programme, the students will be able to

PO 1: *Disciplinary Knowledge*

PSO 1.a: Apply in depth knowledge of Computer Applications to analyze and design system that can provide more economic and affordable solutions in multidisciplinary environments and productively engage in research..

PSO 1.b: Make use of their professional skills in Computer Applications in obtaining jobs thereby becoming responsible citizens.

PO2: *Communication Skills*

PSO 2a: Communicate efficiently the selected suitable data model, appropriate architecture and platform to implement a system with a range of audiences through well-organized, precise, and effective oral presentations.

PSO 2b: Communicate effectively with the computing community as well as society by being able to comprehend effective documentations with presentations.

PO3: *Scientific Reasoning and Problem Solving*

PSO 3: Identify and define problems and issues, recognizing their complexity, considering alternative viewpoints and solutions to the real world problems using latest techniques for sustainable environment.

PO4: *Critical thinking and Analytical Reasoning*

PSO 4: Investigate complex problems by employing analysis, interpretation and evaluation of data in the domain areas such as Machine learning, Digital Image Processing, IoT, Cloud Computing, Security, Business Intelligence and Big Data Analytics to provide valid conclusion for nation building.

PO5: *Research Related Skills*

PSO 5: Develop research capability by utilizing modern computer technologies, environments, and platforms in creating innovative career paths to be an entrepreneur, and contribute towards society.

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

PSO 6: Make use of latest ICT tools to develop effective e-content for problematic topics and engage in self-directed and lifelong learning with strong fundamentals in computer science, analytics, programming and problem solving.

PO7: *Cooperation/Team Work and Multicultural Competence*

PSO 7: Work professionally with positive attitude as an individual or in multidisciplinary teams and communicate effectively.

PO8: *Moral and Ethical awareness*

PSO 8: Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral and ethical values.

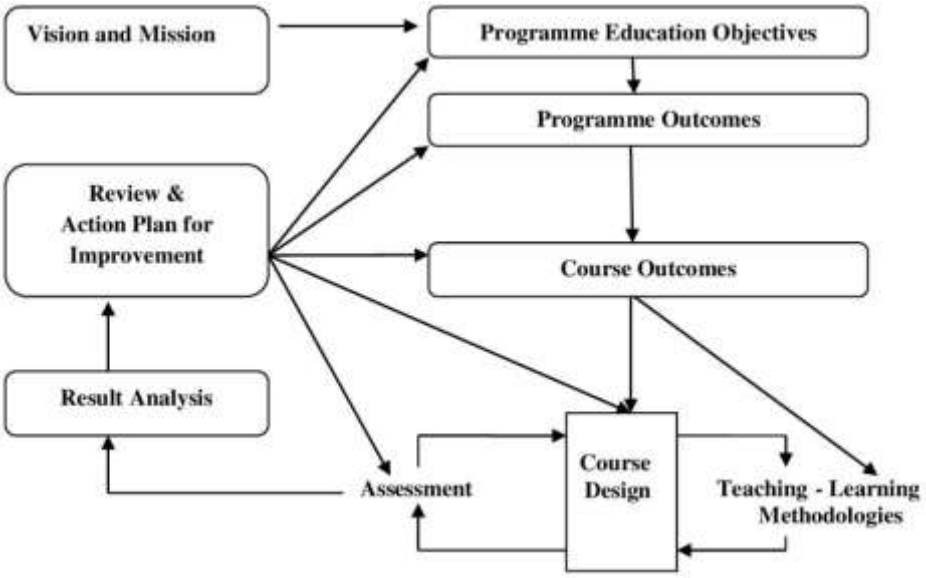
PO-PEO Mapping Matrix

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

PEOs / POs/PSOs	PEO1	PEO2	PEO3
PO1/PSO1	✓	✓	✓
PO2/PSO2	✓	✓	✓
PO3/PSO3	✓	✓	✓
PO4/PSO4	✓	✓	-
PO5/PSO5	-	✓	✓
PO6/PSO6	✓	✓	✓
PO7/PSO7	✓	✓	✓
PO8/PSO8	✓	✓	-

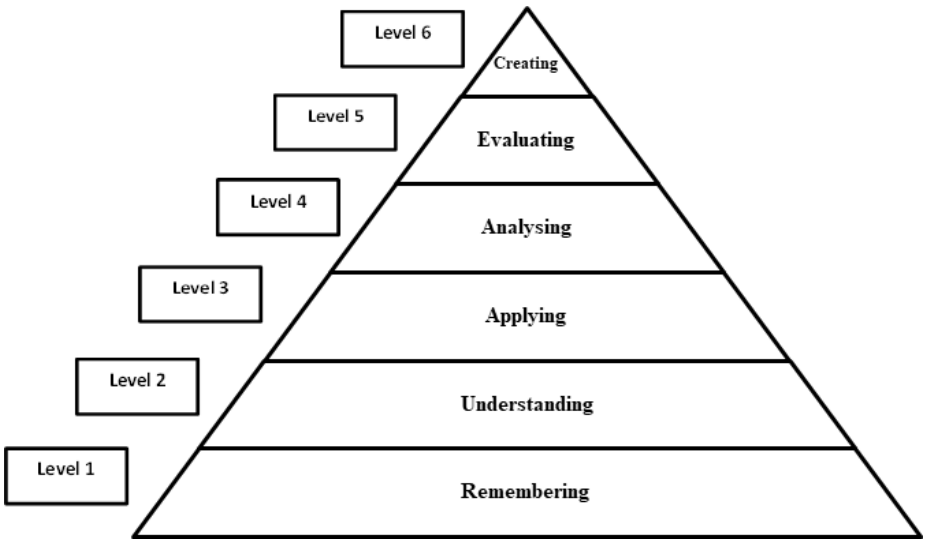
B.1.4 Course Outcomes (COs)

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



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

BLOOM'S TAXONOMY



CO - PO Mapping of Courses

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

CO-PO/PSO Mapping Table (Course Articulation Matrix

PO/PSOs / COs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO 5	PO6/ PSO 6	PO7/ PSO 7	PO8/ PSO 8
CO1								
CO2								
CO3								
CO4								
CO5								

ELIGIBILITY FOR ADMISSION

a) The candidate should have passed in BCA/ Bachelor Degree in Computer Science or equivalent Degree from any recognized University. Obtained atleast 50% marks (45% in case of candidate belonging to reserved category) in the qualifying Examination.

(OR)

b) The candidate should have passed in B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level from any recognized University. Obtained atleast 50% (45% in case of candidate belonging to reserved category) in the qualifying Examination.

DURATION OF THE PROGRAMME

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

MEDIUM OF INSTRUCTION

English

B.2 EVALUATION SCHEME

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

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

INTERNAL ASSESSMENT
Distribution of Marks
Theory

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

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

Practical

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

Practical Test - Average of the two Practical Tests will be considered
Performance - Attendance and Record

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

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Multiple Choice Questions Only	5	5	1	5
B	6-9	Internal Choice – Either… or Type	4	4	5	20
C	10 - 11	Internal Choice – Either…. or Type	2	2	10	20
					Total	45*

*The total marks obtained in the Periodic Test will be calculated for 20 marks

SUMMATIVE EXAMINATION
External Assessment
Distribution of Marks

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

SUMMATIVE EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Multiple Choice Questions Only	5	5	1	5
B	6 - 10	Internal Choice - Either ….or Type	5	5	5	25
C	11 - 13	Internal Choice - Either …or Type	3	3	10	30
					Total	**60**

B.2.2 PROJECT

Individual Project is compulsory for II PG Students in IV Semester.

Distribution of Marks

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

Internal Assessment: Pre-submission Presentation - 10 Marks

Review Report - 20 Marks

One Open Online Course related to the Project - 10 Marks

External Examination: Project Report - 40 Marks

Viva Voce - 20 Marks

B.2.3. SKILL ENHANCEMENT COURSES

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation		Marks
Periodic Test	:	20
Assignment	:	5
Total	:	25

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

Two Assignments - Better of the two will be considered

Practical

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

Practical Test - Average of the two Practical Tests will be considered

Performance - Attendance and Record

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

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 4	Internal Choice – Either… or Type	4	4	5	20
B	5	Internal Choice – Either… or Type	1	1	10	10
					Total	30*

*The total marks obtained in the Periodic Test will be calculated for 20 marks

SUMMATIVE EXAMINATION

External Assessment

Distribution of Marks

Mode of Evaluation		Marks
Seminar Paper		10
Seminar Presentation	:	15
Summative Examination	:	50
Total	**:**	**75**

SUMMATIVE EXAMINATION

Question Pattern **Duration: 3 Hours**

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

B.2.3.1. Skill Enhancement Course - Professional Competency Skill

Types of Question – Multiple Choice Questions Only

INTERNAL ASSESSMENT

Distribution of Marks

Theory

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

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

Two Assignments - Better of the two will be considered

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

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Multiple Choice Questions Only	5	5	1	5
B	6-9	Internal Choice – Either… or Type	4	4	5	20
C	10 - 11	Internal Choice – Either…. or Type	2	2	10	20
	Total					**45***

*The total marks obtained in the Periodic Test will be calculated for 20 marks

SUMMATIVE EXAMINATION

External Assessment

Distribution of Marks

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

SUMMATIVE EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Multiple Choice Questions Only	5	5	1	5
B	6 - 10	Internal Choice - Either ….or Type	5	5	5	25
C	11 - 13	Internal Choice - Either …or Type	3	3	10	30
					Total	**60**

B.2.4. Self Study - Online Course

Practice for SET/NET-General Paper -Online

Internal Examination only

- Two Periodic Tests (Online) 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	:	25
Model Examination	:	75
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.5. Extension Activities

Assessment by Internal Examiner only

Distribution of Marks

Mode of Evaluation		**Marks**
Attendance	:	5
Performance	:	10
Report	:	10
Total	**:**	**25***

*The marks obtained will be calculated for 100 marks

B.2.6. EXTRA CREDIT COURSES (OPTIONAL)

2.6.1 Extra Credit Course offered by the Department.

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

Distribution of Marks

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

Question Pattern for Model Examination

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

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

- The Courses shall be completed within the first III Semesters of the Programme.
- The allotment of credits is as follows **(Maximum of 15 credits)**

4weeks Course - 1 credit

8 weeks Course - 2 credits

12 weeks Course - 3 credits

ELIGIBILITY FOR THE DEGREE

- The candidate will not be eligible for the Degree without completing the prescribed Courses of study and a minimum of 50% Pass marks in all the Courses.

- No Pass minimum for Internal Assessment for other Courses.
- Pass minimum for External Examination is 27 marks out of 60 marks for Core Courses, Discipline Specific Elective Courses and Non-Major Elective Course.
- Pass minimum for Practice for SET/NET - General Paper is 50 Marks.

- Attendance
  - The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.
  - The students who have only 60-75days (66% -84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amountand fulfilling other conditions according to the respective cases.
  - The students who have attended the classes for 59 days and less – upto 45 days (50% - 65%) can appear for the Summative Examinations only after getting special permission from the Principal.
  - The students who have attended the classes for 44 days or less (<50%) cannot appear for the Summative Examinations and have to repeat the whole semester.
  - These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2020-2021 onwards.
  - For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

B.2 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 implementedusing an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

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

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

Indirect Assessment - Done through Course Exit Survey.

CO Assessment Rubrics

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

CO Attainment

Direct CO Attainment

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

Target Setting for Assessment Method

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

Formula for Attainment for each CO

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

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

Attainment Levels of COs

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

Indirect CO Attainment

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

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

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

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

B.3.2 Assessment Process for Overall PO Attainment

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

PO Assessment Tools

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

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Average Direct PO Attainment									
Direct PO Attainment in percentage									

Indirect Attainment of POs for all Courses

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

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Direct Attainment(Weightage - 75%)								
Indirect Attainment(Weightage - 25%)								
Overall PO Attainment								

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

Expected Level of Attainment for each of the Programme Outcomes

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

Level of PO Attainment

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

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 3 years of completion of the Programme only through Indirect methods.

Target for PEO Attainment

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

Attainment of PEOs

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

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

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

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

Expected Level of Attainment for each of the Programme Educational Objectives

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

Level of PEO Attainment

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

C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

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

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VIRUDHUNAGAR
Quality Education with Wisdom and Values

MASTER OF COMPUTER APPLICATIONS (8019)

Outcome Based Education with Choice Base Credit System

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2023-2024

Components	Semester				Total Number of Hours (Credits)
	I	II	III	IV	
Core Course	5 (4)	5 (5)	6 (4)	6 (5)	22 (18)
Core Course	5 (5)	5 (5)	6 (4)	-	16 (14)
Core Course	5 (5)	5 (4)	6 (4)	-	16 (13)
Core Course Practical	5 (3)	5 (3)	5 (3)	6 (4)	21 (13)
Core Course Practical	5 (3)	5 (3)	-	-	10(6)
Project	-	-	-	6 (5)	6(5)
Elective Course (DSEC)	5 (4)	5 (4)	-	6 (4)	16 (12)
Elective Course (NME)	-	-	5 (3)	-	5 (3)
Skill Enhancement Course/ Professional Competency Skill	-	-	2 (2)	6 (3)	8 (**5**)
Self Study Course	-	-	0 (1)	-	0 (1)
Total	**30 (24)**	**30 (24)**	**30 (21)**	**30 (21)**	**120 (90)**
Extra Credit Course(Optional) - Offered by the Department	-		0(2)	-	0(2)
Extra Credit Course(Optional) - MOOC	-	-	-	-	Limited to a maximum of 15 credits

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MASTER OF COMPUTER APPLICATIONS (M.C.A.)

Programme Code – 8019

PROGRAMME CONTENT

SEMESTER I

2023-2024 onwards

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-1	Discrete Mathematics	23PCAC11	5	4	3	25	75	100
2	Core Course-2	Python Programming	23PCAC12	5	5	3	25	75	100
3	Core Course-3	Linux and Shell Programming	23PCAC13	5	5	3	25	75	100
4	Core Course Practical-1	Database Management Practical	23PCAC11P	5	3	3	40	60	100
5	Core Course Practical-2	Python Programming Practical	23PCAC12P	5	3	3	40	60	100
6	Discipline Specific Elective -1	Relational Database Management Systems / Computer Security / Business Intelligence	23PCAE11/ 23PCAE12/ 23PCAE13	5	4	3	25	75	100
Total				**30**	**24**				**600**

DSEC: Discipline Specific Elective Course

SEMESTER II

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-4	Data Structures	23PCAC21	5	5	3	25	75	100
2	Core Course-5	Big Data Analytics	23PCAC22	5	5	3	25	75	100
3	Core Course-6	Internet of Things	23PCAC23	5	4	3	25	75	100
4	Core Course Practical-3	Data Structures using C++ Practical	23PCAC21P	5	3	3	40	60	100
5	Core Course Practical-4	Data Analytics using R Practical	23PCAC22P	5	3	3	40	60	100
6	Discipline Specific Elective -2	Data Communication and Networking / Cloud Computing / Microprocessor and Interfacing	23PCAE21/ 23PCAE22/ 23PCAE23	5	4	3	25	75	100
Total				**30**	**24**				**600**

DSEC: Discipline Specific Elective Course

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MASTER OF COMPUTER APPLICATIONS (M.C.A.)

Programme Code – 8019

PROGRAMME CONTENT

2023 - 2024

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	Advanced Java Programming	23PCAC31	6	4	3	25	75	100
2	Core Course-8	Web Technology	23PCAC32	6	4	3	25	75	100
3	Core Course-9	Advanced Machine Learning	23PCAC33	6	4	3	25	75	100
4	Core Course Practical-5	Advanced Java Programming Practical	23PCAC31P	5	3	3	40	60	100
5	Elective Course (NME)	Fundamentals of Web Design	23PCAN31	5	3	3	25	75	100
6	Skill Enhancement Course-1	Web Technology Practical	23PCAS31P	2	2	3	40	60	100
7.	Self Study Course	Practice for SET/ NET - General Paper -Online	23PGOL31	-	1	2	100	-	100
			Total	**30**	**21**				**700**

Extra Credit Course (Optional) - **Offered in III Semester**

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Extra Credit Course	E-Commerce	23PCAO31	-	2	3	100	-	100

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MASTER OF COMPUTER APPLICATIONS
SEMESTER IV

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-10	Cryptography and Network Security	23PCAC41	6	5	3	25	75	100
2	Core Course Practical-6	Industry Dynamics Technology-Data Visualisation Practical	23PCAC41P	6	4	3	40	60	100
3	Project	Project with Viva Voce	23PCAC41PR	6	5	-	40	60	100
4	Elective Couse DSEC-3	Social Networks Practical / High Performance Computing Practical	23PCAE41P / 23PCAE42P	6	4	3	40	60	100
5	SEC- 2 Professional Competency Skill	Practice for SET/NET – Paper II Computer Science	23PCAS41	6	3	3	25	75	100
Total				**30**	**21**				**500**

DSEC – Discipline Specific Elective Course

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M.C.A.
(2023-24 onwards)

Semester I	**DISCRETE MATHEMATICS**	Hours/Week: 5	
Core Course-1		Credits: 4	
Course Code **23PCAC11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the basic concepts ofrelations, functions, Mathematical logic, Matrices and Graphs. [K2]

CO2 : apply the knowledge gained in functions to other fields.[K3]

CO3 : solve problems in matrices, mathematical logic and graphs. [K3]

CO4 : analyze the concepts of relations & functions in set theory. [K4]

CO5 : analyze the concepts of mathematical logic, matrices and graphs in interdisciplinary level. [K4]

UNIT I

Relations: Relations-Representation of Relations-Operations on Relations-Equivalence Relations. **Functions:** Functions and Operators-One-to-One, Onto Functions-Special types of Functions-Invertible Functions-Composition of Functions. **(15 Hours)**

UNIT II

Logic: Well – Formed (Statement) Formulae – The Truth Table of a Formula – Tautology – Tautological implications and Equivalence of formulae – Replacement Process – Functionally complete sets of connectives and duality law – normal forms – Principal normal forms. **(15 Hours)**

UNIT III

Recurrence Relations and Generating Functions: Recurrence Relations-Solution of finite order homogeneous (Linear) Relations- Solutions of Non- Homogeneous Relations – Generating Functions-Some common Recurrence Relations **(15 Hours)**

UNIT IV

Matrices: Introduction – Matrix Operations – The inverse of a square matrix – Elementary Operations and Rank of a matrix- Simultaneous linear equations –Inverse by Partitioning - Eigen values and Eigen Vectors. (Problems only) **(15 Hours)**

UNIT V

Graph Theory: Matrix representation of graphs – Trees – Spanning Trees - Shortest path problem. **(15 Hours)**

TEXT BOOK

M.Venkataraman, N.Sridharan and N.Chandrasekaran, ,Discrete Mathematics, The National Publishing Company, 2009

REFERENCE BOOKS

1. S.Arumugam and A. ThangapandiIsaac, Modern Algebra, Scitech publications 2005.
2. S.Arumugam and S. Ramachandran, Invitation to Graph Theory, Scitech Publications, 2005, Chennai.
3. Tremblay and Manohar, Discrete Mathematical Structures with applications to Computer Science -, McGraw Hill, 1997.

Course Code 23PCAC11	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	2	1	1	1	3	2	2	1	2	1
CO2	2	1	1	1	3	2	2	1	1	-
CO3	2	2	1	1	3	2	2	1	2	-
CO4	2	1	1	2	3	2	2	1	1	1
CO5	2	2	2	2	3	2	1	2	1	1

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

K. Anitha
Head of the Department

G. Nagalakshmi
Course Designer

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M.C.A.
(2023-24 onwards)

Semester I	**PYTHON PROGRAMMING**	Hours/Week: 5	
Core Course-2		Credits: 5	
Course Code **23PCAC12**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : comprehend the programming skills in python and develop applications using conditional branches and loop. [K2]

CO2 : design python applications with strings and functions. [K3]

CO3 : understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism. [K3]

CO4 : evaluate the use of Python packages to perform numerical computations. [K4]

CO5 : analyze the importance of data visualization. [K4]

UNIT I

Introduction: Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop. **(15 Hours)**

UNIT - II

Strings and Text Files: Accessing Characters and substrings in strings - Data encryption- Strings and Number systems- String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions. **(15 Hours)**

UNIT - III

Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism – Graphical User Interfaces - The Behavior of terminal - Based programs and GUI - Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events. (15 Hours)

UNIT – IV

Data Handling using Numpy – Data and its purpose – Data Science and its applications – The numpy module – Creating numpy arrays – Array attributes – Converting 2D numpy array into 1D array – Array slicing: Accessing subarrays – Reshaping of Arrays – Array concatenation and splitting – How numpy broadcasting works – Performing mathematical operations on numy arrays – Transposing arrays – Inserting and deleting array elements – Find the index of a value – Sorting a numpy array – Normalize array – Array subsets. (15 Hours)

UNIT -V

Python Pandas – Data frame – Pandas data frame functions and attributes – Pivoting data frame – Sorting – Missing data – Combining data frame – Descriptive statistics – Summarizing or describing data – Function application – Aggregation – Transform function in Python – Reindexing in Pandas dataframe – Altering column labels – Data wrangling – Time series data structures. Plotting Graphs – Importance of data visualization – Bar Chart – Plotting Histrograms – Frequency Polygon – Box plot – Scatter plot. (15 Hours)

TEXT BOOK

1. K.A. Lambert, " Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018 **(Unit - I, II and III)**
2. Dr. Reema Thareja, "Data Science and Machine Learning using Python", McGraw Hill Education (India) Private Limited, 2023 **(Unit IV & V)**

REFERENCE BOOKS

1. Michael Knapp, Python: Programming For Beginners: Learn The Fundamentals of Python in 7 Days, Kindle Edition, 2017.
2. Richard Ozer, Beginner Python Programming: The Insider Guide to Basic Python Programming Fundamentals, 2017.

Course Code 23PCAC12	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	3	3	2	-	1	-	-	-	-
CO2	2	3	2	2	2	1	-	2	-	1
CO3	-	2	3	-	2	1	-	-	-	-
CO4	2	-	-	2	3	2	2	2	-	-
CO5	3	2	3	3	3	3	-	3	-	-

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

B. Subashini
Course Designer

N. Santhi
Head of the Department

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M.C.A.
(2023-24 onwards)

Semester I	**LINUX AND SHELL PROGRAMMING**	Hours/Week: 5	
Core Course-3		Credits: 5	
Course Code **23PCAC13**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the concepts and methodology of Linux shell programming. [K2]

CO2 : apply fundamentals of control structure and script controls. [K3]

CO3 : Illustrate the functions, graphical desktop interface and editors. [K3]

CO4 : examine the concepts and methodology of regular expression. [K4]

CO5 : analyze the advanced sed and gawk. [K4]

UNIT I

Basic bash Shell Commands: Interacting with the shell - Traversing the file system - Listing files and directories - Managing files and directories - Viewing file contents. **Basic Script Building**: Using multiple commands - Creating a script file-Displaying messages - Using variables - Redirecting input and output - Pipes- Performing math - Exiting the script. **Using Structured Commands**: Working with the if-then statement - Nesting ifs- Understanding the test command - Testing compound conditions - Using double brackets and parentheses - Looking at case. (15 Hours)

UNIT II

More Structured Commands: Looping with for statement - Iterating with the until statement - Using the while statement - Combining loops - Redirecting loop output. **Handling User Input**: Passing parameters - Tracking parameters - Being shifty - Working with options -Standardizing options - Getting user input. **Script Control**: Handling signals -

Running scripts in the background - Forbidding hang-ups - Controlling a Job - Modifying script priority -Automating script execution. (15 Hours)

UNIT III

Creating Functions: Basic script functions - Returning a value - Using variables in functions - Array and variable functions - Function recursion - Creating a library - Using functions on the command line. **Writing Scripts for Graphical Desktops**: Creating text menus - Building text window widgets - Adding X Window graphics. (15 Hours)

UNIT IV

Introducing sed and gawk: Learning about the sed Editor - Getting introduced to the gawk Editor - Exploring sed Editor basics. **Regular Expressions**: Defining regular expressions - Looking at the basics - Extending our patterns - Creating expressions. (15 Hours)

UNIT V

Advanced sed: Using multiline commands - Understanding the hold space - Negating a command - Changing the flow - Replacing via a pattern - Using sed in scripts - Creating sed utilities. **Advanced gawk**: Reexamining gawk - Using variables in gawk - Using structured commands - Formatting the printing - Working with functions. (15 Hours)

TEXT BOOK

Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting BIBLE", Wiley Publishing, 3rd Edition, 2015.

REFERENCE BOOKS

1. Clif Flynt, Sarath Lakshman, Shantanu Tushar, "Linux Shell Scripting Cookbook ", Packt Publishing, 3rd Edition, 2017.
2. Stephen G.Kochan, Patrick Wood, "Shell Programming in Unix, Linux, and OS X", Addison Wesley Professional, 4th Edition, 2016.
3. Robert Love, "Linux System Programming", O'Reilly Media, Inc, 2013
4. W.R. Stevens, "Advanced Programming in the UNIX environment", 2nd Edition, Pearson Education, 2013

5. Graham Glass, King Ables, "UNIX for Programmers and Users", 3rd Edition, Pearson Education, 2003.

Course Code 23PCAC13	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	2	-	-	-	-	-	1	-	-
CO2	3	-	-	-	3	2	-	2	1	1
CO3	2	2	2	3	3	2	1	-	1	1
CO4	2	3	2	2	-	3	2	2	1	1
CO5	2	3	3	2	1	3	3	3	1	1

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

N. Santhi
Head of the Department

N. Santhi
Course Designer

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M.C.A.
(2023-24 onwards)

Semester I	**DATABASE MANAGEMENT PRACTICAL**	Hours/Week: 5	
Core Course Practical-1		Credits: 3	
Course Code **23PCAC11P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : understand the scripting knowledge in MongoDB and perform basic operations in shell prompt. [K2]

CO2 : write MongoDB scripts to do data manipulations and query operations and visualize using DbVisualizer. [K2]

CO3 : key in the programs, execute the programs with required input and get expected outputs with neat formatting and prepare the record work. [K3]

CO4 : illustrate the given program written using MongoDB features and answer questions related with that program. [K3]

CO5 : analyze for applications created in MongoDB. [K4]

1. Write a script to create a MongoDB database and perform insert operation.
2. Write a MongoDB script to perform query operations.
3. Write a MongoDB script to delete single document.
4. Write a MongoDB script to delete multiple documents.
5. Write a MongoDB Script to perform update operations on single document.
6. Write a MongoDB Script to perform update operations on multiple documents.
7. Write a MongoDB Script to update documents with aggregation pipeline.
8. Write a MongoDB script to perform string aggregation operations.
9. Design a Data Model for MongoDB using DbVisualizer.
10. Perform CRUD operations using DbVisualizer.

Course Code 23PCAC11P	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	3	3	2	-	-	-	2	-	-
CO2	3	2	3	3	-	-	-	-	1	-
CO3	2	2	-	2	3	2	-	2	-	1
CO4	2	-	2	2	2	1	1	2	-	-
CO5	2	-	1	3	3	2	2	-	-	-

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

N. Santhi
Head of the Department

N. Santhi
Course Designer

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M.C.A.
(2023-24 onwards)

Semester I	**PYTHON PROGRAMMING PRACTICAL**	Hours/Week: 5	
Core Course Practical-2		Credits: 3	
Course Code **23PCAC12P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : comprehend the programming skills in python and write codings using object oriented concepts. [K2]

CO2 : write python applications with elementary data items, lists, dictionaries and tuples and numpy and to visualize the data. [K2]

CO3 : key in the programs, execute the programs with required input and get expected outputs with neat formatting and prepare the record work. [K3]

CO4 : illustrate the given program written using python features and answer questions related with that program. [K3]

CO5 : analyze for applications created in Python. [K4]

Implement the following in Python:

1. Program using elementary data items, lists
2. Program using dictionaries
3. Program using tuples
4. Program using conditional branches, loops
5. Program implementing manipulation of matrices
6. Program using functions
7. Program using classes and objects
8. Program using files
9. Program using inheritance
10. Program using polymorphism

11. Program using Numpy
12. Program for data frame manipulation.
13. Program for data preprocessing (Missing values, categorical values, inconsistencies, scaling and normalization)
14. Program for summarizing, aggregating and grouping data.
15. Program using Pandas
16. Program using Matplotlib

Course Code 23PCAC12P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	3	2	-	-	-	3	-	-
CO2	3	2	3	-	-	-	-	-	1	-
CO3	3	2	-	3	3	2	-	2	-	1
CO4	2	-	2	2	2	1	2	1	-	-
CO5	2	-	1	3	3	2	2	-	-	-

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

N. Santhi
Head of the Department

B. Subashini
Course Designer

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M.C.A.
(2023-24 onwards)

Semester I	**RELATIONAL DATABASE MANAGEMENT SYSTEMS**	Hours/Week: 5	
DSEC-1		Credits: 4	
Course Code **23PCAE11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : Outline database system, relational model, atomic domains, functional dependency and normal forms, demonstrate transaction, concurrency, and object based databases. [K2]

CO2 : identify database languages and database users, solve relation operations and concurrency problems.[K3]

CO3 : determine database system, relational model and functional dependency, solve various normal forms, utilize protocols to ensure serializability, apply object based concepts in SQL. [K3]

CO4 : analyze the database systems and improve its design by normalization, approaches to handle objects persistence. [K4]

CO5 : test the relation operations, normal forms, serializability of schedule and object orientation in object-based databases. [K4]

UNIT I

Introduction: Database System Applications – Purpose of Database Systems – View of Data – Database languages - Relational Databases - Database Design - Data Storage and Querying - Transaction Management - Database Architecture. (13 Hours)

UNIT II

Relational Model: Structure of Relational Databases – Database Schema - Keys - Schema Diagrams - Relational Query Languages - Relational Operations. **Relational Database Design**: Features of Good Relational Designs – Atomic Domains and First Normal Form –

Decomposition Using Functional Dependencies – Functional Dependency Theory – Algorithms for Decomposition - Decomposition Using Multivalued Dependencies.

(17 Hours)

UNIT III

Transactions: Transaction Concept – A Simple Transaction Model - Storage Structure Transaction Atomicity and Durability - Transaction Isolation - Serializability - Transaction Isolation and Atomicity - Transaction Isolation Levels - Implementation of Isolation Levels - Transactions as SQL Statements. (15 Hours)

UNIT IV

Concurrency Control: Lock-Based Protocols – Deadlock Handling - Multiple Granularity - Timestamp-Based Protocols – Validation-Based protocols – Snapshot Isolation - Insert Operations, Delete Operations and Predicate Reads - Weak Levels of Consistency in Practice - Concurrency in Index Structures. (15 Hours)

UNIT V

Object Based Databases: Overview – Complex Data Types – Structured Types and Inheritance in SQL – Table Inheritance – Array and Multiset Types in SQL – Object-Identity and Reference Types in SQL – Implementing O-R Features - Persistent Programming Languages - Object-Relational Mapping - Object-Oriented versus Object-Relational.

(15 Hours)

TEXT BOOK

Abraham Silberschatz, Henry F. Korth, S.Sudarshan, (2011). Database System Concepts, Sixth Edition, Tata McGraw Hill International Edition.

REFERENCE BOOKS

1. Alexis Leon Mathews Leon, Database Management Systems, Vikas Publishing House Pvt. Ltd, 2006.
2. Database Management Systems, Raghu Ramakrishnan & Johannes Gehrke, 2nd Edition, McGraw Hill International Edition, 2000.
3. Modern Database Management, Fred R.McFadden, Jeffery A.Hoffer and Marry B.Prescott, 5th Edition Pearson Education Asia, 2001.

Course Code 23PCAE11	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	2	-	-	-	-	-	1	-	-
CO2	3	-	-	-	3	2	-	2	1	1
CO3	2	2	2	3	3	2	1	-	1	1
CO4	2	3	2	2	-	3	2	2	1	1
CO5	2	3	3	2	1	3	3	3	1	1

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

N. Santhi
Head of the Department

S. Aarthi Prasanna
Course Designer

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

M.C.A.
(2023-24 onwards)

Semester I	**COMPUTER SECURITY**	Hours/Week: 5	
DSEC-1		Credits: 4	
Course Code **23PCAE12**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain about network and security requirements, general purpose and trusted OS, unintentional oversights, summarize security features of OS, network attacks, firewall and IDS. [K2]

CO2 : illustrate the topologies, protected objects, points of attack, network technology, articulate about threats, apply the use of cryptography in program security. [K3]

CO3 : Make use of security features in programming, Firewalls and IDS. [K3]

CO4 : categorize the network devices, controls, differentiate malicious and non-malicious codes, examine the security of operating systems & network and analyze types of IDS. [K4]

CO5 : analyze various routing protocols, security tools, kinds of malicious codes, firewalls and IDS, requirements and methods of protecting network communication, programming and operating system. [K4]

UNIT I

Network definition – Need for computer networks - Components - Types of Networks – Network Topologies - Transmission Modes – Transmission Media – Network Devices - collision and broadcast domains - OSI Layer model - Functions of each Layer – Datalink Layer: framing, error control, flow control – MAC Layer: CSMA protocols – Network Layer: Routing – congestion control – IPV4 – Transport Layer: Connection establishment & release – error and flow control – congestion control – TCP – UDP – Application Layer: DNS

(15 Hours)

UNIT II

Computer security Overview: Computer security concepts – Threats, attacks and assets – **Cryptographic Tools:** Confidentiality with symmetric encryption – Message Authentication and Hash functions – Public key encryption – Digital signature & Key management – **User Authentication:** Electronic user authentication principles – Password based authentication – Biometric authentication. (15 Hours)

UNIT III

Access Control: Access control principles – Subject, Object & Access rights – Discretionary Access control – **Malicious Software:** Types of malicious software – Propagation (Infected Content Viruses, Vulnerability exploit-worms, Social engineering-spam, email, Trojans) – Payload attack agent (Zombie, Bots) – Pay Load Information Theft (Key loggers, Phishing, spyware) – Payload stealthing (Backdoors, rootkits) - **Denial of Service Attacks:** Denial Of Service Attacks – Flooding Attacks – Distributed Denial of Service Attacks – Defense against DOS Attacks. (15 Hours)

UNIT IV

Intrusion Detection: Intruders – Intrusion Detection – Analysis Approaches – Host based Intrusion Detection System – Network based Intrusion Detection System – Honeypots – **Firewalls & Intrusion Prevention Systems: -** Need for firewall – Firewall characteristics & access policy – Types of Firewalls – Firewall basing – Firewall location & configuration – Intrusion prevention system. (15 Hours)

UNIT V

Symmetric encryption & Message confidentiality: Symmetric encryption principles – Data Encryption Standard (DES) – Advanced Encryption Standard (AES) – Stream cipher & RC4 – Cipher block modes of operation – Key distribution – Public Key cryptography & Message Authentication: Secure HASH Functions – HMAC – RSA Algorithm – Diffie Hellman and other asymmetric algorithms. (15 Hours)

TEXT BOOK (e Book)

William Stallings, Lawrie Brown. (Reprint 2015), *Computer Security Principles and Practice*, 3rd edition, Pearson Education Inc.

REFERENCE BOOKS

1. Behrouz A. Forouzan. (2008), *Cryptography and Network Security*, The McGraw Hill.
2. William Stallings. (2008), *Cryptography and Network Security*, PHI.
3. Cram101 Textbook reviews, *Security in Computing*, 4th Edition.
4. https://nptel.ac.in/courses/106/105/106105031/

Course Code 23PCAE12	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	2	2	-	-	1	-	-	-	-
CO2	3	2	3	2	2	1	-	-	-	1
CO3	2	2	-	2	3	1	-	2	-	-
CO4	-	2	3	2	3	3	2	2	-	-
CO5	2	3	3	2	3	2	-	3	-	-

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

N. Santhi — Head of the Department

B. Subashini — Course Designer

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M.C.A.
(2023 -24 onwards)

Semester I	**BUSINESS INTELLIGENCE**	Hours/Week: 5	
DSEC-1		Credits: 4	
Course Code **23PCAE13**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the fundamentals of business intelligence, user types, CCR Model and its business intelligence Applications. [K2]

CO2 : relate data mining with Knowledge delivery, efficiency and business intelligence. [K3]

CO3 : apply various modeling techniques and methods to various situations Ad Hoc Querying, role of mathematical models, Logistic and Production models, Emerging Technologies. [K3]

CO4 : compare data analysis and knowledge delivery stages, Logistic and Production Models, cycle of a business intelligence analysis and Marking model Future Beyond Technology and Emerging Technologies. [K4]

CO5 : analyze parameterized reports and self-service reporting, virtual inputs and outputs, text analytics. [K4]

UNIT I

Business intelligence: - Effective and timely decisions – Data, information and knowledge – Role of mathematical models. **Business intelligence architectures:** – Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence. (15 Hours)

UNIT II

Knowledge Delivery:- The business intelligence user types, standard reports, Interactive analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications. **Visualization:** Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message. (15 Hours)

UNIT III

Efficiency: Efficiency measures – The CCR model: Definition of target objectives – Peer groups – identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – other models, Pattern matching – cluster analysis, outlier analysis. (15 Hours)

UNIT IV

Business Intelligence Applications: Marking models – Logistic and Production models – Case studies. (15 Hours)

UNIT V

Future of Business Intelligence: Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology. (15 Hours)

TEXT BOOK:

Efrain Turban, Ramesh Sharda, DursunDelen. (2013), *Decision Support and Business Intelligence Systems*, 9th Edition, Pearson.

REFERENCE BOOK:

1. Larissa T.Moss, S.Atre. (2003), *Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making*, Addison Wesley.
2. David Loshin Morgan, Kaufman. (2012), *Business Intelligence: The Savvy Manager's Guide*, 2nd edition. Addison Wesley.
3. http://seu1.org/files/level8/IT445/IT445%20BOOK%20EDIT.pdf
4. https://www.semanticscholar.org/paper/Business-Intelligence-Roadmap%3A-The-Complete-Project-Moss-Atre/4e9078005edbb68b0a89d0b2c0c493e09c7f2b87
5. https://www.pdfdrive.com/business-intelligence-books.html

Course Code 23PCAE13	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	2	2	2	3	-	1	-	-	-	-
CO2	2	2	3	2	2	1	-	-	-	1
CO3	2	3	3	-	2	1	-	2	-	-
CO4	-	3	-	2	2	2	2	2	1	-
CO5	-	3	-	2	3	2	2	2	-	-

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

N. Santhi
Head of the Department

B. Sakthi
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M.C.A.
(2023-24 onwards)

Semester II	**DATA STRUCTURES**	Hours/Week: 5	
Core Course-4		Credits: 5	
Course Code **23PCAC21**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand core concepts of linear data structures array, linked list, stack, queue and non-linear data structures trees, graphs, tables. [K2]

CO2 : illustrate linear and non-linear data structures operations. [K3]

CO3 : choose appropriate data structures to solve problems. [K3]

CO4 : compare and analyze the linear and non-linear data structures with respect to various operations and complexity. [K4]

CO5 : test and prioritize the various data structures in terms of its operations. [K4]

UNIT I

Introduction and Overview: Definition - Concept of Data Structures – Overview of Data Structures – Implementation of Data Structures. **Arrays**: Definition – Terminology. **Linked Lists:** Definition. Singly Linked list: Representation of Linked List in Memory – Operations on a Single Linked List - Circular Linked list – Double Linked list: Operations on a Double Linked List. Circular Double Linked List: Operations on Circular Double Linked List.

(15 Hours)

UNIT II

Stacks: Definition – Representation of Stack: Array Representation of Stacks – Linked List Representation of Stacks. Operations on Stacks. Applications of stacks: Evaluation of arithmetic expression-Quick Sort. **Queues:** Definition - Representation of Queues: Representation of Queue using an Array – Representation of Queue using Linked

List. Various Queue Structures: Circular Queue – Dequeue – Priority Queue. Applications of Queues: Round Robin Algorithm.

(15 Hours)

UNIT III

Trees: Basic Terminology: Definition and Concepts: Binary Trees – Properties of Binary Tree. Representation of Binary Tree: Linear Representation of a Binary Tree- Linked Representation of Binary Tree - Physical Implementation of Binary Tree in Memory. Operations on Binary Tree: Insertion – Deletion – Traversal – Merging of Two Binary Trees. **Types of Binary trees**: Binary Search Tree: Definition – Operations on Binary Search Tree: Search – Insertion – Deletion – Traversal.

(15 Hours)

UNIT IV

Types of Binary Trees: Expression Tree - Heap Tree: Representation of a Heap Tree – Operations on a Heap Tree: Insertion into a Heap Tree – Deletions of a node from Heap Tree. Height Balanced Binary Tree: Definition – AVL Rotations. **Weight balanced Binary tree**: Basic terms – Weighted path length – Implementation of Huffman Tree – Application of Huffman Tree.

(15 Hours)

UNIT V

Tables: Rectangular tables – Jagged tables – inverted tables – Hash tables: Hashing Techniques – Collision Resolution Techniques – Closed Hashing – Open Hashing – Comparison of Collision Resolution Technique. **Graphs**: Introduction – Graph Terminologies – **Representation of Graphs**: Set Representation – Linked Representation – Matrix Representation. **Operations on Graphs**: Operations on Matrix Representation of Graphs: Insertion – Deletion – Traversals.

(15 Hours)

TEXT BOOK

Debasis Samantha. (2009), *Classic Data Structures*, Second Edition, Prentice Hall of India Private Limited.

REFERENCE BOOKS

1. A. Chitra, D.T. Rajan. (2007), *Data Structures*, VNI Publication.

2. SartajSahni. (2005), *Data Structures, Algorithms and Applications in C++*, Second Edition, Silicon Press.
3. P.Rizwan Ahmed. (2014). *Programming in C++ and Data Structure*, 1st edition, Margham Publications.
4. Mark Allen Weiss. 15th Impression (2014), *Data Structures and Algorithm Analysis in C++*, 3rd edition, Pearson Publication, New Delhi.
5. Granville Barnett and Luca Del Tongo, *(e-Book)Data Structures and Algorithms: Annotated Reference with Examples*, First Edition, 2008.
6. https://nptel.ac.in/courses/106/106/106106145/
7. https://nptel.ac.in/courses/106/103/106103069/
8. https://nptel.ac.in/courses/106/102/106102064/
9. https://nptel.ac.in/courses/106/106/106106127/

Course Code 23PCAC21	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	2	2	-	-	-	3	-	-
CO2	3	2	3	-	-	-	-	-	1	-
CO3	3	2	-	3	3	2	-	2	-	1
CO4	3	-	2	2	2	2	2	1	-	-
CO5	2	-	1	1	3	3	2	-	-	-

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

N. Santhi
Course Designer

N. Santhi
Head of the Department

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M.C.A.
(2023-24 onwards)

Semester II	**BIG DATA ANALYTICS**	Hours/Week: 5	
Core Course-5		Credits: 5	
Course Code **23PCAC22**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the concepts of R, Big Data, Hadoop Ecosystem, Data analytics and its role in social media and mobile applications. [K2]

CO2 : illustrate an application using Map Reduce and HBase, and attain the results of applications using Big Data Analytics. [K3]

CO3 : Apply Hadoop Ecosystem elements to provide Big Data solutions in Text Mining, Sentiment Analysis, Opinion Mining and Mobile Analytics. Make use of Data manipulations functions available in R. [K3]

CO4 : examine the importance of Hadoop framework elements, Social Media Analytics and Mobile Analytical tools and compare Analysis and Reporting of Big Data. [K4]

CO5 : analyze the various Hadoop Ecosystem components, types of Analytics and Reporting, Social Media and Mobile Analytics tools, Data visualization using R. [K4]

UNIT I

Getting an Overview of Big Data: What is Big Data? – History of Data Management – Evolution of Big Data – Structuring Big Data – Elements of Big Data – Big Data Analytics – Careers in Big Data – Future of Big Data. **Understanding Hadoop Ecosystem:** Hadoop Ecosystem – Hadoop Distributed File System – MapReduce – Hadoop YARN – Introducing HBase – Hive – Pig and Pig Latin – Sqoop – ZooKeeper – Flume – Oozie.

(15 Hours)

UNIT II

Understanding MapReduce Fundamentals and HBase: The MapReduce Frame work – Techniques to optimize MapReduce Jobs – Uses of MapReduce – Role of HBase in Big Data Processing. **Processing Your Data with MapReduce:** Recollecting the Concept of MapReduce Framework – Developing Simple MapReduce Application – Points to Consider while Designing MapReduce.

(15 Hours)

UNIT III

Understanding Analytics and Big Data: Comparing Reporting and Analysis – Types of Analytics – Points to Consider during Analysis – Developing an Analytic Team – Understanding Text Analytics.

Social Media Analytics and Text Mining: Introducing Social Media – Introducing Key Elements of Social Media – Introducing Text Mining – Understanding Text Mining Process – Sentiment Analysis – Performing Social Media Analytics and Opinion Mining on Tweets.

(15 Hours)

UNIT IV

Mobile Analytics: Introducing Mobile Analytics – Introducing Mobile Analytics Tools – Performing Mobile Analytics – Challenges of Mobile Analytics.

Exploring R: Basic features of R - Handling basic expressions in R - Variables in R - Working with Vectors - Storing and calculating values in R - Creating and using Objects - Interacting with Users - Handling data in R Workspace - Executing scripts.

(15 Hours)

UNIT V

Reading datasets and exporting data from R: using the c() command - Using the scan() command - Reading multiple data values from large files - exporting data from R. **Manipulating and Processing data in R:** Creating data subsets - merging datasets in R - sorting data - putting your data into shape - managing data in R using matrices and data frames. **Perform graphical analysis in R:** Using Plots - saving graphs to external files.

(15 Hours)

TEXT BOOK

DT Editorial Services. (2016), *Big Data, Black Book,* Dream Tech Press, New Delhi.

REFERENCE BOOKS

1. RadhaShankarmani, M. Vijayalakshmi. (2016), *Big Data Analytics*, 2nd edition, Wiley.
2. ParagKulkarni, Sarang Joshi, Meta S. Brown, *Big Data Analytics*, Prentice Hall of India Pvt. Ltd.
3. Douglas Eadline. (2016), *Hadoop 2, Quick-Start Guide*, Pearson Education India.
4. https://nptel.ac.in/courses/106/104/106104189/
5. https://nptel.ac.in/courses/106/107/106107220
6. https://intellipaat.com/blog/big-data-tutorial-for-beginners/
7. https://www.tutorialspoint.com/big_data_tutorials.html.

Course Code 23PCAC22	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	2	2	-	-	-	3	-	-
CO2	3	2	-	2	-	-	-	-	1	1
CO3	3	2	-	3	3	2	1	2	1	1
CO4	3	-	2	-	2	2	2	1	-	1
CO5	2	-	1	1	3	3	2	-	-	-

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

N. Santhi
Head of the Department

N. Santhi
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M.C.A.
(2023-24 onwards)

Semester II	**INTERNET OF THINGS**	Hours/Week: 5	
Core Course-6		Credits: 4	
Course Code **23PCAC23**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : discuss the concepts of IoT, Framework of IoT, Machine-to-Machine connectivity, Design principles of Internet Connectivity. [K2]

CO2 : illustrate the applications of IoT, acquire the knowledge of Internet based communication protocols. [K3]

CO3 : manipulate data acquiring, organizing and processing the data. Apply sensor data communication protocols,, examine the case studies of IoT . [K3]

CO4 : analyze radio frequency identification technologies and web connectivity for connected devices network using gateway . [K4]

CO5 : examine sensor technologies, design complexity using cloud PaaS, web connectivity for connected devices network using Gateway, SOAP, REST, HTTP Restful and Web sockets. [K4]

UNIT I

Internet of Things An Overview : Internet of Things – IoT Conceptual Framework –IoT Architectural View – Technology behind IoT – Sources of IoT – M2M Communication –Examples of IoT. **Design Principles for Connected Devices:** Introduction – IoT/M2M System Layers and Design Standardizations – Communication Technologies – Data Enrichment, Data Consolidation and Device Management at Gateway – Ease of Designing and affordability.

(15 Hours)

UNIT II

Design Principles for Web Connectivity: Introduction – Web Communication Protocols for Connected Devices – Message Communication protocols for Connected Devices – Web Connectivity for Connected Devices Network using Gateway, SOAP, REST, HTTP RESTful and Web sockets. **Internet Connectivity Principles:** Introduction – Internet Connectivity – Internet Based Communication – IP addressing in the IoT – **Application** LayerProtocols: HTTP, HTTPS, FTP, TELNET and others.

(15 Hours)

UNIT III

Data Acquiring, Organizing, Processing and Analytics: Introduction – Data Acquiring and Storage – Organizing the data – Transactions, Business Process , Integration and Enterprise Systems **–**Analytics– Knowledge Acquiring**,**. Managing and Storing Process. **Data Collection, Storage and Computing Using a Cloud Platform :** Introduction – Cloud Computing Paradigm for Data Collection, Storage and Computing– Everything as a Service and Cloud Service Models – Cloud Computing Paradigm for Data Collection, Storage and Other Models

(15 Hours)

UNIT IV

Sensors, Participatory Sensing, RFIDs, and Wireless Sensor Networks: Introduction – Sensor Technology – Participatory Sensing, Industrial IoT and Automotive IoT – Actuator – Sensor Data Communication Protocols – Radio Frequency Identification Technology – Wireless Sensor Network Technology.

(15 Hours)

UNIT V

IoT Privacy, Security and Vulnerabilities Solutions: Introduction – Vulnerabilities, System Requirements and Threat Analysis – Use Cases and Misuse Cases – IoT Security Tomography and Layered Attacker Model – Identity Management and Establishment, Access Control and Secure Message Communication – Security Models, Profiles and Protocols Management. **IoT Case Studies**: Introduction – Design Layers, Design Complexity and Designing using Cloud PaaS –Connected Car and its Applications and Services

(15 Hours)

TEXT BOOK

Raj Kamal. (2017), *Internet of Things Architecture and Design Principles*, McGraw Hill Education Private Limited.

REFERENCE BOOKS

1. Qusay F. Hassan, AttaurRehman Khan, Sajjad A. Madani. (2018), *Internet of Things: Challenges, Advances and Applications,* CRC Press.
2. NasreddineBouhai&ImadSaleh. (2017), *Internet of Things: Evolutions and Innoations*, John Wiley & Sons Publications.
3. RajkumarBuyya, Amir VahidDastjerdi. (2016), *Internet of Things: Principles and Paradigms*, Elsevier.
4. https://www.routledge.com/Internet-of-Things-Challenges-Advances-and-Applications/Hassan-Khan-Madani/p/book/9780367572365
5. https://onlinecourses.nptel.ac.in/noc22_cs53/
6. https://nptel.ac.in/courses/108/108/108108179/
7. https://nptel.ac.in/courses/106/105/106105166/

Course Code 23PCAC23	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	2	2	-	-	-	-	-	-	-
CO2	3	-	3	2	-	-	-	2	-	-
CO3	3	3	-	1	2	-	1	-	-	1
CO4	3	-	2	-	2	3	-	3	2	-
CO5	3	2	2	3	-	1	-	2	-	-

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

N. Santhi
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V. Queen Jemila
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M.C.A.
(2023-24 onwards)

Semester II	**DATA STRUCTURES USING C++ PRACTICAL**	Hours/Week: 5	
Core Course Practical-3		Credits: 3	
Course Code **23PCAC21P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : understand linear, non-linear data structures and perform operations. [K2]

CO2 : write programs for implementing the various operations of linear and non-linear data structures. [K2]

CO3 : key in and execute programs with required input and get expected outputs with neat formatting and prepare the record work. [K3]

CO4 : Illustrate the given program and answer questions related with that program. [K3]

CO5 : analyze for applications created using various data structures. [K4]

Write a C++ program to

1. Create and implement Array operations.
2. Create and implement insertion operation on a Single linked list.
3. Create and implement deletion operation on a Single linked list.
4. Create and implement search operations on a Single linked list.
5. Create and implement copy and merge operations on a Single linked list.
6. Create and implement insertion operation on a Circular linked list.
7. Create and implement deletion operation on a Circular linked list.
8. Create and implement search operation on a Single linked list.
9. Create and implement insertion operation on a Double linked list.
10. Create and implement deletion operation on a Double linked list.

11. Create and implement search operation on a Double linked list.
12. Implement Stack data structure using array.
13. Implement Stack data structure using linked list.
14. Implement Queue data structure using array.
15. Implement Queue data structure using linked list.
16. Implement Quick sort using stack data structure.
17. Evaluate arithmetic expression using stack data structure.
18. Create and traverse binary tree.
19. Create and traverse binary search tree.
20. Perform insertion operation on a binary search tree.
21. Create and implement insertion operation on Max and Min heaps.
22. Create and implement deletion operation on a Max heap and Min heaps.
23. Represent a graph and insert a vertex and an edge in an undirected graph.
24. Represent a graph and insert a vertex and an edge in a directed graph.
25. Represent a graph and delete a vertex and an edge in an undirected graph.
26. Represent a graph and delete a vertex and an edge in a directed graph.

Course Code 23PCAC21P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	2	2	2	1	-	3	-	-
CO2	3	2	-	-	2	2	1	2	1	1
CO3	3	2	1	1	3	1	2	2	-	-
CO4	3	2	2	2	-	2	2	-	-	-
CO5	3	2	3	3	-	3	2	1	-	-

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

N. Santhi
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M.C.A.
(2023-24 onwards)

Semester II	**DATA ANALYTICS USING R PRACTICAL**	Hours/Week: 5	
Core Course Practical-4		Credits: 3	
Course Code **23PCAC22P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : understand data manipulations functions, data frame, import/export data from/to various sources like excel, CSV, text, SQL, data visualizations and perform operations. [K2]

CO2 : write programs using R built-in functions, data frame, importing/exporting data from/to various sources like excel, CSV, text, SQL, data visualizations with plots. [K2]

CO3 : key in the programs, execute the programs with required input and get expected outputs with neat formatting and prepare the record work. [K3]

CO4 : illustrate the given program written using R features and answer questions related with that program. [K3]

CO5 : analyze the applications created in R. [K4]

Write R program for the following

1. Data Manipulation using functions available in R.
2. Read and retrieve data from dataset into Data Frame based on conditions.
3. Import Data from various external files (Text, Excel, XML and CSV).
4. Import a dataset and print data and Meta data details (Structure of a data, Print first, last n observations, summary data, no. of rows and columns, column names).
5. Import a dataset and subset dataset based on variable filter conditions (AND, OR, Numeric, Character and selected field).
6. Import a dataset and sort the dataset based on single and multiple variables.

7. Import a dataset, identify and remove overall duplicates and create a dataset with unique records.
8. Import two datasets and implement various Join (Inner, Outer, Left Outer and Right Outer).
9. Data Visualization in R using Line, Pie, Dot, and Bar Charts
10. Create a simple Histogram using R.
11. Create Boxplots using R.
12. Create Scatterplot using R
13. Implement Linear regression.
14. Implement Logistic Regression.
15. Implement Bubble Plot
16. Inventory Control using RMySQL.
17. PayRoll preparation using RMySQL.
18. Library Management Using RMySQL.
19. Bank Transaction Using RMySQL.
20. To perform basic data analytics on a public data set.
21. Perform correlation plot and visualize giving an overview of relationships among data on a public data set.

Course Code 23PCAC22P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	2	2	2	1	-	3	-	-
CO2	3	2	-	-	2	2	1	2	1	1
CO3	3	2	1	1	3	1	2	2	-	-
CO4	3	2	2	2	-	2	2	-	-	-
CO5	3	2	3	3	-	3	2	1	-	-

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

N. Santhi
Head of the Department

N.Santhi
Course Designer

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

M.C.A.
(2023-24 onwards)

Semester II	**DATA COMMUNICATION AND NETWORKING**	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code **23PCAE21**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : describe the basics of Data communication, OSI model, transmission media, function of network, transport layers & need for DNS. [K2]

CO2 : relate various reference models, guided and unguided transmission media and to know more about routing protocols and identify the QoS improving techniques at transport layer, various types of records of DNS. [K3]

CO3 : illustrate addressing at various layers, framing techniques, address mapping, congestion control and dynamic DNS. [K3]

CO4 : analyze the functions of each layer, compare various multiple access protocols, forwarding and routing, services provided by TCP and UDP, categorize components of email. [K4]

CO5 : test the various addressing methods, flow & error control at datalink layer, routing protocols and optimum file transfer mechanism. [K4]

UNIT I

Introduction: Data Communications – Networks– The Internet – Protocols and Standards. **Network Models:** Layered Tasks – The OSI Model – Layers in the OSI model – TCP/IP Protocol Suite – Addressing.

(15 Hours)

UNIT II

Physical Layer and Media: Transmission Media: Guided Media – Unguided Media. **Switching:** Circuit Switched Networks – Datagram Networks – Virtual Circuit

Networks. **Data Link Layer: Data Link Control**: Framing – Flow and Error Control. **Multiple Access**: Random Access.

(15 Hours)

UNIT III

Network Layer: Logical Addressing: IPV_4 Addresses – IPV_6 Addresses. **Address Mapping, Error Reporting and Multicasting:** Address Mapping – ICMP. **Delivery, Forwarding and Routing:** Delivery - Forwarding – Unicast Routing Protocols.

(15 Hours)

UNIT IV

Transport Layer: Process – to – Process Delivery: Process to process delivery – User Datagram Protocol (UDP) – TCP. **Congestion Control and Quality:** Data Traffic – Congestion – Congestion Control – Quality of Service – Techniques to improve Quality of Service. Integrated Service: Signaling- Flow specification- Admission-Service Classes-RSVP-Problem with Integrated Services.

(15 Hours)

UNIT V

Application Layer: Domain Name System : Name space – Domain Name Space – Distribution of Name Spaces – DNS in the Internet – Resolution – DNS Messages – Types of records – Registrars – Dynamic Domain Name System (DDNS) – Encapsulation. **Remote Logging, Electronic Mail and File Transfer:** Electronic Mail – File Transfer. WWW and HTTP: Architecture-Web documents.

(15 Hours)

TEXT BOOK

Behrouz A. Forouzan. (2016), *Data Communications and Networking*, 4th edition, McGraw Hill Higher Education Private Limited.

REFERENCE BOOKS

1. I.A. Dhotre, V.S. Bagad. (2011), *Data Communication*, Technical Publications.
2. Wayne Tomasi. (2015), *Introduction to Data Communication and Networks,* Pearson Limited.
3. AndrewSTanenbaum. (2015), *Data Communication Networking***,** Pearson Limited.
4. William Stallings. (2019), *Data and Computer Communications*, Pearson Limited.
5. https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf

6. https://theswissbay.ch/pdf/Gentoomen%20Library/Networking/Prentice%20Hall%20-%20Computer%20Networks%20Tanenbaum%204ed.pdf
7. https://nptel.ac.in/courses/106/105/106105183/
8. https://nptel.ac.in/courses/106/101/106101209/
9. https://nptel.ac.in/courses/117/105/117105148/

Course Code 23PCAE21	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	2	2	3	-	1	-	-	-	-
CO2	3	2	2	3	2	1	-	2	-	-
CO3	2	3	-	3	3	1	-	2	-	1
CO4	2	3	2	2	3	2	2	2	-	-
CO5	2	-	3	3	3	3	-	3	-	-

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

N. Santhi
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B. Subashini
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M.C.A.
(2023-24 onwards)

Semester II	**CLOUD COMPUTING**	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code **23PCAE22**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the fundamentals of cloud computing and its architecture, cloud computing models, cloud infrastructure and platforms. [K2]

CO2 : Illustrate applications using cloud computing, acquire knowledge on cloud data center, security issues and platforms. [K3]

CO3 : make use of cloud benefits, cloud computing architecture, models and services. [K3]

CO4 : examine the factors that affect cloud computing, models of cloud computing and its services. [K4]

CO5 : analyse the various cloud models, cloud services and security in cloud environments and cloud computing platforms. [K4]

UNIT I

Introduction to Cloud Computing: What is cloud? – History of cloud computing – List of computing techniques – Revolution and maturity of cloud computing – Characteristics of a cloud – Need for cloud computing – Cloud Architecture. **Principles and Working of Cloud Computing:** Principles behind cloud computing – Internet and web 2.0 – Virtualization technology – Distributed technology – Thin Client technology – Working and Migration of cloud computing – web technology and cloud technology.

(15 Hours)

UNIT II

Classification of Cloud: Types of cloud – Private cloud – Public Cloud – Hybrid cloud – Community Cloud – Cloud Management. **Services of Cloud:** Service Oriented Architecture – Services of Cloud – Platform as a service – Infrastructure as a service –

software as service – cloud cube model. **Cloud in Action:** Migration Towards cloud platform – cloud hosting – virtual data center – Inter cloud – applications of cloud – Application models of cloud – Advantages of cloud computing – Disadvantages of cloud computing.

(15 Hours)

UNIT III

Real Time Cloud and its application: Amazon cloud and its product – Google cloud and its product – Microsoft cloud and its product – Apple cloud – Vmware cloud and its product – Dropbox – Rackspace cloud – Salesforce cloud platform – Cloud operating system.

(15 Hours)

UNIT IV

Linux and Open source cloud: Linux Architecture – Linux and Cloud computing – List of open source cloud – Openstack cloud – C-DAC and its product – BOSS operating system – MEGHDOOT cloud – Hadoop. **Mobile cloud computing:** Overview of mobile cloud computing – Mobile cloud vs Regular cloud – Mobile cloud apps Vs Native Apps – Mobile cloud computing (MCC) Architecture – Advantages of MCC – Applications of MCC – Bring your own device (BYOD) – Issues for mobile cloud adoption.

(15 Hours)

UNIT V

Business Cloud Computing: Enterprise cloud computing – Cloud computing in Business unit – Business processing as a service – Corporate companies cloud and their usage – Future of computing – Projects and Research in cloud computing. **Issues and Risk in Cloud computing:** Issues in cloud computing – Security issues in cloud – Security management in cloud – Security surveys in cloud computing.

(15 Hours)

TEXT BOOK

Dr. S. Anandamurugan, T. Priya, M.C. ArvindBabu. (2017). *Cloud Computing*, University Science Press, An Imprint of Laxmi Publications Pvt. Ltd.

REFERENCE BOOKS

1. Erl Thomas, Puttini Ricardo, MahmoodZaigham, *Cloud Computing: Concepts, Technology & Architecture*, 1st edition, Pearson Publication Ltd.

2. KailashJayaswal, JagannathKallakurchi, Donald J. Houde (2014), *Cloud Computing Black Book*, Dreamtech Publication.

3. https://nptel.ac.in/courses/106/105/106105223/
4. https://nptel.ac.in/courses/106/104/106104182/
5. https://nptel.ac.in/courses/106/105/106105167/

Course Code 23PCAE22	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	2	2	2	-	1	-	-	-	-
CO2	2	3	2	3	2	1	-	2	-	1
CO3	3	2	2	-	2	1	-	2	1	-
CO4	-	2	-	2	3	3	2	2	-	-
CO5	2	-	2	2	3	2	2	3	-	-

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

N. Santhi
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V.G. Jyothimani
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M.C.A.
(2023-24 onwards)

Semester II	**MICROPROCESSOR AND INTERFACING**	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code **23PCAE23**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : summarize the key concepts of 8085 architecture, instructions and interfacing devices. [K2]

CO2 : classify the instruction set of 8085 and distinguish the use of different instructions. [K3]

CO3 : realize the interfacing of memory and I/O devices, stack and subroutines, code conversions, interrupts, serial communications. [K3]

CO4 : compare the instructions, addressing modes and interfacing I/O devices used in 8085. [K4]

CO5 : analyze various instructions, addressing modes and peripheral devices with 8085 microprocessor for its applications. [K4]

UNIT I

8085 Architecture and Memory interfacing: The 8085 MPU – Example of an 8085-Based Microcomputer – Memory Interfacing – Interfacing the 8155 Memory Segment.

Interfacing I/O devices: Basic Interfacing concepts – Interfacing Output Displays – Interfacing Input Devices – Memory-mapped I/O.

(15 Hours)

UNIT II

Introduction to 8085 Instructions: Data transfer operations - Arithmetic operations - Logic operations - Branch operations - Writing and Debugging a Assembly language programs.

Programming techniques with additional instructions: Programming Techniques: Looping, Counting, Indexing - Additional Data Transfer and 16-bit Arithmetic Instructions - Arithmetic operations related to memory - Logic operations: Rotate, Compare.

(15 Hours)

UNIT III

Counters and Time delays - Stack and Subroutines. Code conversion, BCD Arithmetic, and 16-bit Data operations: Binary to BCD Conversion – BCD to Seven Segment LED Code conversion – Binary to ASCII and ASCII to Binary Code Conversion – BCD Addition – BCD Subtraction – Introduction to advanced instructions and applications – Multiplication – Subtraction with Carry.

(15 Hours)

UNIT IV

Interrupts: The 8085 Interrupt – 8085 Vectored Interrupts. **Programmable Interface Devices:** Basic concepts in programmable devices - The 8155 Programmable I/O Ports and Timer – The 8279 Programmable Keyboard/Display interface.

General-Purpose Programmable Peripheral Devices: The 8255A Programmable Peripheral Interface - 8254 Programmable Interval Timer- 8259A Programmable Interrupt Controller – Direct Memory Access and 8237 DMA Controller.

(15 Hours)

UNIT V

Serial I/O and Data Communication: Basic concepts in Serial I/O – Software-controlled Asynchronous serial I/O – **The 8085 Serial I/O Lines:** SOD and SID – Hardware-Controlled Serial I/O using programmable chips.

Extending 8-bit Microprocessor concepts to Higher-Level Processors and Microcontrollers: 8-bit Microprocessors contemporary to the 8085 – 16-bit Microprocessors – High end high performance processors – Single chip Microcontrollers.

(15 Hours)

TEXT BOOK

Ramesh Gaonkar. Fifth Edition 2010, *Microprocessor Architecture, Programming, and Applications with the 8085*, Penram International Publishing (India) Private Limited, 2010.

REFERENCE BOOKS

1. Aditya P. Mathur (Third Edition 2011), *Introduction to Microprocessors*, Tata McGraw Hill Education Private Limited, New Delhi.
2. Yu-cheng Liu and Glenn A.Gibson (Second Edition 2010), *Microcomputer Systems: The 8086/8088 Family Architecture, Programming, and Design*, PHI Learning Private Limited, New Delhi.
3. Triebel& Singh (2010), *The 8088 & 8086 Microprocessors-Programming, interfacing, Hardware & Applications*, PHI, New Delhi.

Course Code 23PCAE23	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	2	2	2	3	-	1	-	-	-	-
CO2	2	2	3	2	2	1	-	-	-	-
CO3	2	3	3	-	2	1	-	2	-	-
CO4	-	3	-	2	2	2	2	2	-	-
CO5	-	3	-	2	3	2	2	2	-	-

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

N. Santhi
Head of the Department

R. Nancy Beaulah
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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M.C.A.
(For those who join in 2023-2024)

Semester III	**ADVANCED JAVA PROGRAMMING**	Hours/Week: 6	
Core Course-7		Credits: 4	
Course Code **23PCAC31**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the concepts of classes, methods, inheritance, exceptions, strings, Java Bean, Networking and Database connectivity. [K2]

CO2 : apply the fundamentals of classes, methods, inheritance, exceptions, Strings and I/O Streams. [K3]

CO3 : Illustrate about Java Bean, Networking and JDBC. [K3]

CO4 : examine the concepts classes, methods, inheritance and exceptions.[K4]

CO5 : analyse about I/O streams, Java Bean, Networking and JDBC. [K4]

UNIT I

Data Types, Variables, and Arrays: Java is strongly Typed Language - The Primitive Types - Integers - Floating-Point Types - Characters - Booleans - A closer look at Literals - Variables - Type Conversion and Casting- Arrays. **Introducing Classes:** Class fundamentals - Declaring Objects - Assigning Object Reference Variables - Introducing Methods - Constructors - The this keyword - Garbage Collection - The finalize() method.

(18 Hours)

UNIT II

String Handling: The String Constructors - String Length - Special String Operations - Character Extraction - String Comparison - Searching Strings - Modifying a String - Data Conversion using valueOf() - Changing the case of characters within a String - Joining Strings - Additional String Methods - StringBuffer - StringBuilder. **Input/Output:** The I/O Classes and Interfaces – File - The Stream Classes - The Byte Streams - The Character Streams. (18 Hours)

UNIT III

The Applet Class: Two Types of Applets - Applet Basics - Applet Architecture - An Applet Skeleton - Simple Applet Display methods - Requesting and Repainting - The HTML APPLET Tag - Using the Status Window - Passing Parameters to Applets - getDocumentBase() and getCodeBase() - AppletContext() and showDocument() - The AudioClip Interface - The AudioStub Interface - Outputting to the Console. **Introducing Swing:** The origins 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.

(18 Hours)

UNIT IV

Java Beans: Introduction - Advantages of Beans - Introspection - Bound and Constrained Properties - Persistence - Customizers - The JavaBeans API - The A Bean Example. **Introducing Servlets:** Background - The Life Cycle of a Servlet - A Simple Servlet -The javax.servlet Package - Reading Servlet Parameters - The javax.servlet.http Package - Handling HTTP Requests and Responses - Using Cookies - Session Tracking.

(18 Hours)

UNIT V

Network Programming: Networking Basics - The Networking Classes and Interfaces - InetAddress - INet4Address and INet6Address - TCP/IP Clients Sockets - URL - URLConnection - TCP/IP Server Sockets - Datagrams. **Databases:** Introduction to Database Management Systems - JDBC - SQL - Using a DBMS - Java DB - Tables, Rows and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets.

(18 Hours)

TEXT BOOKS:

1. Herbert Schildt, "Java the Complete Reference", 9th edition, McGraw Hill Publication, 2017.
2. Tony Goddis, "Starting out with Java from Control Structures Through Objects", 6th Edition, Pearson Education Limited, 2016.

REFERENCE BOOKS:

1. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", TMGH Publishing Company Ltd, New Delhi, 2013

2. John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Solving Approach", TMGH Publishing Company Ltd, New Delhi, 2012.

Course Code 23PCAC31	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	3	3	3	-	-	1	-	-
CO2	3	3	3	3	3	2	2	2	1	1
CO3	3	3	3	3	2	2	2	-	1	1
CO4	2	2	3	3	2	3	3	2	1	1
CO5	3	2	2	2	1	3	3	3	1	1

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

Dr. N. Santhi
Head of the Department

Mrs. R. Nancy Beaulah
Course Designer

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Semester III	**WEB TECHNOLOGY**	Hours/Week: 6	
Core Course-8		Credits: 4	
Course Code **23PCAC32**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the fundamentals of the web and thereby develop web applications using HTML, XHTML, XML, CSS, Javascript, PHP, Angular JS, jQuery. [K2]

CO2 : apply HTML and XHTML documents with presentations using CSS. [K3]

CO3 : apply Javascript, PHP, Angular JS, jQuery to create interactive web applications. [K3]

CO4 : examine the concepts and methodology of HTML, XHTML, XML, CSS, Javascript, PHP, Angular JS, jQuery. [K4]

CO5 : analyse HTML and XHTML, Javascript and Angular JS. [K4]

UNIT I

Web Fundamentals and HTML: A Brief Introduction to the Internet - The World Wide Web - Web Browsers - Web Servers - URLs, MIME, HTTP, Security - **Introduction to HTML/XHTML:** Origins and Evolution of HTML and XHTML - Basic Syntax - Standard HTML Document Structure - Basic Text Markup - Images - Hypertext Links - Lists - Tables - Forms - Syntactic differences between HTML and XHTML. (18 Hours)

UNIT II

Cascading Style Sheets(CSS): Introduction - Levels of style sheets - Style specification formats - Selector forms, Property value forms - Font properties - List properties - Color - Alignment of Text - The Box Model - Background Images - The and tags - Conflict resolution. (18 Hours)

UNIT III

The Basics of JavaScript: Overview of JavaScript - Object orientation and JavaScript - General Syntactic Characteristics - Primitives - Operations and Expressions - Screen output and Keyboard input - Control statements - Object creation and modification - Arrays - Functions - Constructors - Pattern matching using regular expressions - Errors in Scripts - **JavaScript and HTML Documents**: The JavaScript Execution Environment - The Document Object Model - Elements Access in Java Script - Events and Event Handling - Handling Events from Body Elements - Handling Events from Text Box and password Elements . (18 Hours)

UNIT IV

Dynamic Documents with Java Script and XML: Introduction - Positioning Elements - Moving Elements - Element Visibility - Changing Color and Fonts - Dynamic Content - Stacking Elements - Locating the Mouse Cursor - Reacting to a Mouse Click - **Introduction to XML:** Introduction - Syntax of XML - XML Document Structure - Document type definitions. (18 Hours)

UNIT V

PHP, Angular JS and jQuery:

PHP: Overview of PHP - General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements - Arrays - Functions - Form Handling - **Angular JS:** Introduction - History - Understanding MVC - Advantages of using AngularJS – Setting up development environment - **jQuery**: Introduction – First jQuery powered web page – Plain Javascript vs. jQuery. (18 Hours)

TEXT BOOKS:

1. Robert W. Sebesta, “Programming the World Wide Web”, Seventh Edition, Pearson Education, 2015.
2. Felix Alvaro, ANGULARJS: Easy AngularJS For Beginners, Your Step-By-Step Guide to AngularJS Web Application Development (AngularJS Series Book 1) Kindle Edition, 2016.
3. Jonathan Chaffer, Karl Swedberg, John Resig, Learning jQuery, Third Edition: Create better interaction, design, and web development with simple JavaScript techniques

REFERENCE BOOKS:

1. Dayley Brad, Dayley Brendan, ”AngularJS, JavaScript, and JQuery All in One”, Sams Teach Yourself 1st Edition, Kindle Edition, 2015.
2. M. Srinivasan: Web Programming Building Internet Applications, 3rdEdition, Wiley India, 2009.
3. Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7thImpression, 2012.
4. Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
5. Raj Kamal: Internet and Web Technologies, McGraw Hill Education.

Course Code 23PCAC32	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	2	-	-	-	-	-	1	-	-
CO2	3	-	-	-	3	2	2	2	1	1
CO3	2	2	2	3	3	2	2	-	1	1
CO4	2	3	2	2	-	3	2	2	1	1
CO5	2	3	3	2	1	3	3	3	1	1

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

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Semester III	**ADVANCED MACHINE LEARNING**	Hours/Week: 6	
Core Course-9		Credits: 4	
Course Code **23PCAC33**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the concepts of Machine Learning and its methods. [K2]

CO2 : apply KNN and Naive Bayes algorithms to solve real-world problems. [K3]

CO3 : make use of regression methods for constructing model trees. [K3]

CO4 : analyse the performance of machine learning models to improve their accuracy. [K4]

CO5 : compare Convolutional Neural Networks (CNNs) with Recurrent Neural Networks (RNNs). [K4]

UNIT I

Introducing Machine Learning: The Origins of Machine Learning, Uses and Abuses of Machine Learning - Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning - Choosing a Machine Learning Algorithm - Using Machine Learning concepts - **Managing and Understanding Data:** Data Structures, Vectors and Factors: Lists, Data frames, Matrixes, and arrays - Managing Data - Exploring and Understanding Data: Exploring the Structure of Data, Exploring Numeric variables - Exploring Categorical Variables- Exploring Relationships between Variables.

(18 Hours)

UNIT II

Lazy Learning - Classification Using Nearest Neighbors: The kNN Algorithm - Diagnosing Breast Cancer with the kNN Algorithm - Probabilistic Learning - **Classification Using Naive Bayes:** Basic concepts of Bayesian Methods - The Naïve Bayes Algorithm -

Example - filtering Mobile Phone Spam with the Naive Bayes Algorithm - Divide and Conquer - **Classification Using Decision Trees and Rules:** Understanding Decision Trees - Example - Identifying Risky Bank Loans using C5.0 Decision Trees - Understanding Classification Rules - Example - Identifying Poisonous Mushrooms with Rule Learners

(18 Hours)

UNIT III

Forecasting Numeric Data - Regression Methods: Understanding Regression – Example - Predicting Medical Expenses using Linear Regression - Understanding Regression Trees and Model Trees - Example - Estimating the Quality of Wines with Regression Trees and Model Trees - **Black Box Methods Neural Networks and Support Vector Machines:** Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Backpropagation - Modeling the Strength of Concrete with ANNs - Understanding Support Vector Machines - Performing OCR with SVMs - Finding Patterns - **Market Basket Analysis Using Association Rules:** Understanding Association Rules - Example - Identifying Frequently Purchased Groceries with Association Rules. (18 Hours)

UNIT IV

Finding Groups of Data - Clustering with K-Means: Understanding Clustering - The k-means Algorithm for clustering - Finding teen market segments using k-means Clustering - **Evaluating Model Performance:** Measuring Performance for Classification - Beyond Accuracy - other Measures of Performance, Visualizing Performance Tradeoffs - **Improving Model Performance:** Tuning Stock Models for Better Performance - Using Caret for Automated Parameter Tuning - Creating a simple Tuned Model - Customizing the Tuning Process - Improving Model Performance with meta – learning - Understanding Ensembles – Bagging - Boosting- Random forests. (18 Hours)

UNIT V

Introduction to Deep Learning: Introduction to Deep Learning - Single Layer Perceptron Model (SLP) - Multilayer Perceptron Model (MLP) - Convolutional Neural Networks (CNNs) - Recurrent Neural Networks (RNNs) - Restricted Boltzmann Machines (RBMs) - **Convolutional Neural Networks (CNNs):** Structure and Properties of CNNs - Components of CNN Architectures - Convolutional Layer - Pooling Layer - Rectified Linear Units (ReLU) Layer - Fully Connected (FC) Layer - Loss Layer - Tuning Parameters, Notable

CNN Architectures – Regularization - **Recurrent Neural Networks (RNNs):** Fully Recurrent Networks - Training RNNs with Back - Propagation Through Time (BPPT) - Elman Neural Networks - Neural History Compressor - Long Short - Term Memory (LSTM) - Traditional and Training LSTMs - Structural Damping Within RNNs - Tuning Parameter Update Algorithm. (18 Hours)

TEXT BOOKS:

1. Brett Lantz, "Machine Learning with R", Addison-Wesley Packt Publishing, 2013.
2. TawehBeysolow, "Introduction to Deep Learning Using R: A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R", San Francisco, California, USA, 2017.

REFERENCE BOOKS:

1. Daniel T. Larose, Chantal D. Larose, "Data mining and Predictive analytics", Second Ed., Wiley Publication, 2015.
2. Bertt Lantz, "Machine Learning with R: Expert techniques for predictive modeling", 3rd Edition, April 15, 2019,
3. Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals", Wiley Publication,2015.

Course Code 23PCAC33	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	2	3	3	3	-	-	1	-	-
CO2	3	2	2	3	2	2	2	2	1	1
CO3	3	3	3	2	2	2	2	-	1	1
CO4	2	2	2	3	2	3	3	2	-	-1
CO5	2	2	2	2	1	3	3	3	1	1

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

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Mrs. V. Queen Jemila
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Semester III	**ADVANCED JAVA PROGRAMMING PRACTICAL**	Hours/Week: 5	
Core Course Practical-5		Credits: 3	
Course Code **23PCAC31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : identify the necessary packages, classes of Java needed for the given problem. [K2]

CO2 : write programs using the necessary Java concepts suitable to the problem. [K2]

CO3 : key-in the programs and test the programs with required input and get expected outputs with neat formatting and prepare the record work. [K3]

CO4 : explain the programs implemented and deduce the answers for any queries raised. [K3]

CO5 : analyse the applications created in Java. [K4]

List of Programs:

1. Implementation of Constructors and Destructors.
2. Implementation of String Functions.
3. Build a Swing application to implement metric conversion.
2. Use Grid Layout to design a calculator and simulate the functions of a simple calculator.
3. Create a Color palette with a matrix of buttons using Applet.
4. To invoke a servlet from HTML forms.
5. To invoke servlet from Applets.
6. To invoke servlet from JSP.
7. Implement message communication using Network Programming.
8. Write a program to connect databases using JDBC.
9. Implementation of Java Beans.

Course Code	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
23PCAC31P	**PSO 1.a**	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	-	2	-	1	1	-	-	-
CO2	3	3	2	-	3	1	2	2	1	1
CO3	2	2	3	2	3	2	2	2	1	1
CO4	2	2	2	-	2	2	3	2	1	1
CO5	1	1	3	3	2	3	3	3	1	1

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

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Semester III	**FUNDAMENTALS OF WEB DESIGN**	Hours/Week: 5	
Elective Course (NME)		Credits: 3	
Course Code **23PCAN31**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : gain knowledge on the basis of web, web pages, HTML tags, CSS and Java Script. [K1]

CO2 : understand the concepts of web page creation using HTML, CSS and Java Script. [K2]

CO3 : acquire knowledge of creating web pages. [K2]

CO4 : make use of HTML, CSS and Java Script to design web pages. [K3]

CO5 : analyse how the web works and the steps of creating a website using HTML, CSS and Java Script, examine G-Suite blog creation. [K4]

UNIT I

Internet Basics: Basic concepts – Communicating on the Internet – Internet domains – Internet server identities – Establishing connectivity on the Internet – Client IP address – Transmission control protocol. (15 Hours)

UNIT II

Introduction to HTML: HTML Tags – The structure of HTML program – Text formatting – Text styles – Other text effects. (15 Hours)

UNIT III

Lists: Types of lists - Adding graphics to HTML documents – Tables – Linking documents – Links – Images as hyperlinks – Frames. (15 Hours)

UNIT IV

Introduction to JavaScript: JavaScript in web pages – Basic programming techniques – Functions in JavaScript – Dialogue boxes. (15 Hours)

UNIT V

Forms used by a website – Form object – Dynamic HTML: Cascading style sheets – Class. (15 Hours)

TEXT BOOK

1. Web enabled commercial Application Development using HTML, JavaScript, DHTML and PHP by Ivan Bayross Fourth Revised Edition BPB Publications, Reprinted 2013.

REFERENCE BOOKS

1. Jennifer Niederst Robbins, Mathews Leon – Learning Web Design – A Beginners guide to HTML, CSS, JAVA SCRIPT and Web Graphics, 5th Edition.
2. Core Web programming Marty Hall, Larry Brown-The SUN Microsystem Press, Second edition, 2001
3. Web Technology: A Developer's Perspective, N.P. Gopalan, J. Akilandeswari, PHI, 2007.

Course Code 23PCAN31	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	-	-	-	2	-	-
CO2	3	3	-	-	-	2	-	1
CO3	3	2	-	-	-	2	-	-
CO4	2	2	1	1	-	1	-	-
CO5	2	2	1	1	1	1	2	1

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

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Semester III	**WEB TECHNOLOGY PRACTICAL**	Hours/Week: 2	
Skill Enhancement Course		Credits: 2	
Course Code **23PCAS31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : gain the knowledge of HTML, CSS, XML, PHP and AngularJS. [K1]

CO2 : understand programs using selection/looping statements and inbuilt functions. [K2]

CO3 : write programs using HTML, CSS, XML, PHP and AngularJS. [K2]

CO4 : explain the programs implemented using HTML, CSS, XML, PHP, AngularJS, JQuery and deduce the answers for any queries raised. [K3]

CO5 : analyse the created web applications. [K4]

List of Programs:

1. Develop a web page to display your education details in a tabular format.
2. Develop a web page to display your CV on a web page.
3. Design a Homepage having three links: About Us, Our Services and Contact us.
4. Create separate web pages for the three links.
5. Design a web page to demonstrate the usage of inline CSS, internal CSS and external CSS.
6. Design an XML document and create a style sheet in CSS & display the document in the browser.
7. Develop a web page to create image maps.
8. Design a simple web page using Angular Javascript.
9. Develop a web page in PHP to fetch details from the database.
10. Design a web page to hide paragraph using JQuery.
11. Create a web page and add Javascript to handle mouse events and form events.

Course Code 23PCAS31P	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	3	2	2	2	1	-	3	-	-
CO2	3	2	-	-	2	2	1	2	1	1
CO3	3	2	1	1	3	1	2	2	-	-
CO4	3	2	2	2	-	2	2	-	-	-
CO5	3	2	3	3	-	3	2	1	-	-

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

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Semester III	**PRACTICE FOR SET/NET – GENERAL PAPER**	Hours/Week: -
Self Study Course		Credits: 1
Course Code **23PGOL31**		Internal 100

COURSE OUTCOMES

On completion of the course, 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. [K3]

CO4: evaluate the data using ICT tools and logical reasoning.[K4]

CO5: develop self-learning activities to face challenges in their life.[K4]

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, Verbal and Non–verbal Communication and Barriers to Communication

Higher Education System: Professional, Technical, Skill Based Education, Value Education, Policies, Governance and Administration

UNIT III

PROSE COMPREHENSION

A text passage followed by a set of questions to be answered based on students' comprehensive ability

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 BOOKS

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

REFERENCES

Jain, Usha Rani. (2018), *UGC-NET* New Delhi: Mital Books India Ltd.

Singh, Rashmiand Asim Khan (2019), *UGC-NET Paper- I*, New Delhi:Disha Publication.

Course code 23PGOL31	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	-	-	2	1	-	1
CO2	3	3	1	2	3	2	-	2
CO3	3	2	2	3	3	2	-	2
CO4	3	2	3	3	3	3	-	1
CO5	3	1	2	1	1	3	-	1

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

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Heads of the Departments

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MCA
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Semester III	**E-COMMERCE**	Hours/Week: -	
Extra Credit Course		Credits: 2	
Course Code **23PCAO31**		Internal 100	External -

COURSE OUTCOMES

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

CO1 : understand the basis of E-Commerce and M-Commerce, know the legal framework of E-Commerce. [K2]

CO2 : apply payment systems in E-Commerce and M-Commerce. [K3]

CO3 : Explore the Infrastructure of E-Commerce and M-Commerce. [K3]

CO4 : compare the layered architecture of M-Commerce with E-Commerce. [K4]

CO5 : analyse the various ecommerce applications. [K4]

UNIT I

What is Electronic Commerce?: **-** Introduction – Types of E-Commerce: Business to customer E-Commerce – Customer to Customer E-commerce – Business to Business E-Commerce. Advantages and Disadvantages of E-Commerce – Supply Chain Management in E-Commerce. **Infrastructure for E-Commerce**: Introduction – Local Area Network: Interconnecting LAN Segments. Public Switched Telephone Network: Broadband Connection to Home PC – ISDN Service – Cable Network – Wireless Networks – Microwave and Satellite Network – Private Communication Networks.

UNIT II

Payment Systems in E-Commerce: Introduction – Requirements of e-payment Systems – Credit Card Payment: Credit Card Payment using Secure Socket Layer – Secure Electronic Transaction (SET) Protocol – Dual Signature Scheme. Electronic Funds Transfer: Automated Cheque Clearance – Electronic Clearing Service. Electronic Cheque Payment: Electronic Clearing of Pay order – E-cheque Format. Electronic Cash: E-Cash Issue and Spending –

Anonymous E-Cash – Smart Card-Based Cash Payment. Payment Gateways: Pay Pal. Micro-payments for Information Goods.

UNIT III

M-Commerce: Introduction – Layered Architecture for m-commerce: Mobile Phone–SMS System – Laptops using Wifi LAN Systems – WAP-Enabled Mobile Hand-held Systems – Location Dependent Services. Mobile Communication Infrastructure – Architecture of GSM Cellular Mobile Wireless System – General Packet Radio Service (GPRS) – CDMA 1xEVDO Rev.A – Short Message Service (SMS). Wireless Application Protocol: Mobile Network Operators – Mobile Handset Manufacturers – Service Provider. WAP Gateway: WAP and i-Mode. Wireless Markup Language: XHTML. Secure Wireless Connectivity: Security of Mobile Network-Internet Connection – WAP Gateway Managed by Sensitive Content Providers – WAP Gateway at Server End.

UNIT IV

M-Commerce: Mobile Payment Methods: SIM Card-enabled Payments – Payments based on SMS – Payment using WAP-enabled Mobile Hand-held Device - Mobile Banking. **E-Commerce of Multimedia**: Introduction – E-Publishing of Multimedia – Digitizing and Storing of Books, Audio and Video.

UNIT V

E-Commerce of Multimedia: – Distribution of e-books – Distribution of Audio – Video on Demand - Intellectual Property Issues. **Legal Framework of E-Commerce**: Information Technology Act 2000 – Information Technology (Amendment) Act 2008.

TEXT BOOK

1. V. Rajaraman. (2011), *Essentials of E-Commerce Technology*, PHI Publications.

REFERENCE BOOKS

1. Bharat Bhaskar, *Electronic Commerce – Frame Work Technologies and Applications*, Tata McGraw Hill.
2. Ravi Kalakota & A.B. Whinston, *Frontiers of Electronic Commerce*, Pearson Education.

3. P. T. Joseph. (2002), *E-Commerce: A Managerial Perspective*, PHI.
4. https://irp-cdn.multiscreensite.com/1c74f035/files/uploaded/introduction-to-e-commerce.pdf
5. https://backup.pondiuni.edu.in/storage/dde/dde_ug_pg_books/E-%20Commerce.pdf
6. https://nptel.ac.in/content/storage2/courses/106108103/pdf/PPTs/mod13.pdf
7. https://www.tutorialspoint.com/e_commerce/index.htm

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Semester IV	**CRYPTOGRAPHY AND NETWORK SECURITY**	Hours/Week: 6	
Core Course-10		Credits: 5	
Course Code **23PCAC41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the concepts of classical encryption techniques and advanced encryption standards. [K2]

CO2 : explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms. [K3]

CO3 : recognize different encryption and decryption techniques to solve problems related to confidentiality and authentication. [K3]

CO4 : analyse to use existing cryptographic utilities to build programs for secure communication. [K4]

CO5 : analyse the need for digital signatures to secure the document with key management. [K4]

UNIT I

Introduction: Security Goals - Attacks - Services and Mechanism - Techniques.**Traditional Symmetric Key Ciphers**: Introduction - Substitution Ciphers - Transposition Ciphers - Stream and Block Ciphers. **Introduction to Modern Symmetric Key Ciphers:** Modern Block Ciphers - Modern Stream Ciphers. (18 Hours)

UNIT II

Data Encryption Standard (DES): Introduction - DES Structure - DES Analysis - Multiple DES - Security of DES. **Advanced Encryption Standard (AES)**: Introduction - Transformations - Key Expansion - Ciphers. (18 Hours)

UNIT III

Asymmetric Key Cryptography: Introduction - RSA Cryptosystem - Rabin Cryptosystem - Elgamal Cryptosystem -Elliptic Curve Cryptosystem. **Message Integrity and Message Authentication:** Message Integrity - Random Oracle Model - Message Authentication.

(18 Hours)

UNIT IV

Cryptographic Hash Functions: Introduction - SHA512 - Whirlpool. **Digital Signatures:** Comparison - Process - Services - Attacks on Digital Signature - Digital Signature Schemes - Variations and Applications. **Entity Authentication**: Introduction - Passwords - Challenge Response - Zero Knowledge - Biometrics. (18 Hours)

UNIT V

Key Management: Symmetric Key Distribution - Kerberos - Symmetric Key Agreement - Public Key Distribution. **Security in the Application Layer**: Email - PGP - S/MIME.

(18 Hours)

TEXT BOOK

1. Behrouz A Forouzan, "Cryptography And Network Security", Tata McGraw Hill Publishing Company Limited 2008.

REFERENCE BOOKS

1. Bernard Menezes, "Network Security and Cryptography", Cengage,1st Edition, 2010.
2. William Stallings, "Cryptography and Network Security", Pearson Education India, Sixth Edition, 2016.
3. V.K. Jain, "Cryptography and Network Security", Khanna Book Publishing, New Delhi, 2016.
4. C.K. Shyamala, N. Harini, Dr. T. R. Padmanabhan, "Cryptography and Security", Wiley India Pvt. Ltd.,2011

Course Code 23PCAC41	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	2	1	2	1	1	1	-	1	-
CO2	3	3	2	1	3	1	2	2	1	1
CO3	2	2	3	2	3	2	2	2	1	1
CO4	2	2	2	1	2	2	3	2	1	1
CO5	2	2	3	3	2	3	3	3	1	1

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

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Semester IV	**INDUSTRY DYNAMICS TECHNOLOGY-DATA VISUALISATION PRACTICAL**	Hours/Week: 6	
Core Course Practical-6		Credits: 4	
Course Code **23PCAC41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : know the basic functions and operations of R and tableau. [K2]

CO2 : understand the functions of tableau for data process and deploy various charts for applications. [K2]

CO3 : key in the data, execute them to produce charts with neat formatting and prepare the record work. [K3]

CO4 : illustrate the charts using R and tableau features and answer questions related with the charts. [K3]

CO5 : analyze the designs created for real time applications. [K4]

List of Programs

Note: Use the following Dataset

http://www.tableau.com/sites/default/files/training/global_superstore.zip

Implement the following using R

1. Create Pie chart for Sales and Sales % by Country (sorted in descending order)
2. Create Bar chart for Sales by Country by Year (rounded to nearest thousand and sorted by Grand Total)
3. Create Line char for Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class)

4. Create Scatter chart for Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
5. Create heat map for Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)
6. Design and create the label for vendor list

Implement the following using Tableau

7. Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class)
8. Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
9. Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)

Course Code 23PCAC41P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	3	2	-	-	-	2	-	-
CO2	3	2	3	3	-	-	-	-	1	-
CO3	2	2	-	2	3	2	-	2	-	1
CO4	2	-	2	2	2	1	1	2	-	-
CO5	2	-	1	3	3	2	2	-	-	-

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

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Semester IV	**PROJECT WITH VIVA VOCE**	Hours/Week: 6	
Project		Credits: 5	
Course Code **23PCAC41PR**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : understand the requirements of software projects. [K2]

CO2 : apply the concepts learnt to module and develop the project. [K3]

CO3 : experiment the solution of the project using test data. [K3]

CO4 : analyze the solution of the project using different analytical tools. [K4]

CO5 : examine the functionality of the project. [K4]

Regulation for the Project

- 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.
- The project report should be written in 40 - 50 pages.
- Two copies of the project report with binding should be submitted.

Distribution of Marks

Internal Assessment:	Pre-submission Presentation	- 10 Marks
	Review	- 20 Marks
	One Open Online Course related to the Project	- 10 Marks
External Examination:	Project Report	- 40 Marks
	Viva Voce	- 20 Marks

Course Code 23PCAC41PR	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	2	-	-	2	-	-	-	1	-	-
CO2	2	3	-	-	2	1	2	2	-	1
CO3	2	2	-	-	2	-	2	-	-	-
CO4	3	2	2	-	2	2	2	2	-	-
CO5	3	2	3	2	3	2	3	-	1	-

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

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Semester IV	**SOCIAL NETWORKS PRACTICAL**	Hours/Week: 6	
DSEC-3		Credits: 4	
Course Code **23PCAE41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : know the fundamental techniques and tools of social networks. [K2]

CO2 : understand and develop the programs using the tools required to develop and manage social networks like Facebook, and LinkedIn. [K2]

CO3 : experiment with the functionality of social networking tools such as GitHub [K3]

CO4 : apply and review the fundamental principles for social network graphs. [K3]

CO5 : analyze the existing API for social networks. [K4]

List of programs

1. To estimate coefficients of an equation using a linear regression model.
2. To predict the the gender of a person if heigh,t, weight and shoe size are given using any four supervised learning algorithms.
3. To find noun, verb, and adjective in a given sentence
4. To calculate the frequency of each word in a file after removing stop words from it.
5. To analyze the behavior of tweets and plot the results. (i.e. check whether a tweet is of a positive, negative, or compound nature)
6. To predict the gender of a person from his/her name.
7. To make a prediction about a movie from its reviews.
8. To plot the image in PNG format using matplotlib for average, max, and min of the data taken from a CSV file.
9. To classify the text using NLTK.

10. To print trending and common trends tweets in the world,us and india.
11. To extract twitter entities such as hashtags, and screen names.
12. To visualize data using histogram, boxplot and scatter plot matrix.
13. Creating and Exploring Google+ API
14. To create and querying Human Language Data with TF-IDF
15. Creating and Exploring GitHub's API
16. To analyzing GitHub interest graph

Course Code 23PCAE41P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	2	1	2	-	-	-	1	-	-
CO2	3	3	-	-	2	1	2	2	-	1
CO3	2	2	-	-	2	-	2	-	-	1
CO4	3	2	2	-	2	2	-	2	1	-
CO5	3	3	3	2	2	2	3	-	1	-

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

Dr. N. Santhi
Head of the Department

Mrs. V. Queen Jemila
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

M.C.A.
(for those who join in 2023-2024)

Semester IV	**HIGH PERFORMANCE COMPUTING PRACTICAL**	Hours/Week: 6	
DSEC-3		Credits: 4	
Course Code **23PCAE42P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : know the concepts of High Performance Computing. [K2]

CO2 : understand techniques of OpenMP and OpenMPI. [K2]

CO3 : design and develop a MPI Programs. [K3]

CO4 : apply and develop programs using the programming concepts of OpenMP. [K3]

CO5 : analyze the efficiency of CUDA programming. [K4]

List of programs

(Implemented either PB, Slurm, OpenMP, OpenMPI, and CUDA)

1. Demo: - Access and best practices on HPC
2. Matrix multiplication with Job scheduling (PB or Slurm)
3. Vectors add with malloc shared
4. Vector add program with MPI
5. Hello world task for Multithreading with openMP
6. openMP shared memory on Host and Device
7. openMP Matrix Multiplication with parallelism and Barrier
8. openMP with Reduction on operands and aggregate functionality
9. Vector and Matrix multiplication on CUDA
10. 10.Feed forward computing on CUDA

Course Code 23PCAE42P	PO1		PO2		PO3	PO4	PO5	PO6	PO7	PO8
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	2	1	2	-	-	-	1	-	-
CO2	3	3	-	-	2	1	2	2	-	1
CO3	2	2	-	-	2	-	2	-	-	1
CO4	3	2	2	-	2	2	-	2	1	-
CO5	3	3	3	2	2	2	3	-	1	-

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

Dr. N. Santhi
Head of the Department

Mrs. R. Nagajyothi
Course Designer

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Semester IV	**PRACTICE FOR SET/NET – PAPER II COMPUTER SCIENCE**	Hours/Week: 6	
SEC- 2 Professional Competency Skill		Credits: 3	
Course Code **23PCAS41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the concepts computer System Architecture, Computer Graphics, Database management system, Object oriented programming, Computer Network. [K2]

CO2 : apply fundamentals of Data Structure, Networks Topology, Memory Hierarchy, Scheduling [K3]

CO3 : Illustrate the functions, graphical input and output, Network Models, Stack Organization. [K3]

CO4 : examine the importance of IP Protocol, Deadlock Algorithms, Software Model, Normalization. [K4]

CO5 : analyze the Communication Satellites , Linked list, 2d and 3d Translation, CPU Scheduling. [K4] ,

UNIT I

Computer System Architecture: Digital Logic: Digital Computers - Logic Gates - Boolean Algebra - Combinational Circuits - Flip-Flops - Sequential Circuits - Integrated Circuits - Decoders – Multiplexers - **Computer Organization and Design**: Instruction Codes - Computer Registers - Timing and Control - Input-Output Interrupt. Central Processing Unit: General Register Organization - Stack Organisation - Instruction Formats - Addressing Modes - Memory Hierarchy: Main Memory - Auxiliary Memory - Cache Memory.

(18 Hours)

UNIT II

Programming in C: Tokens - Identifiers - Data Types - Arrays - Structures - Union - String - Pointers - Functions - File Handling - Command Line Arguments - **Object Oriented Programming**: Class and Objects - Constructors and Destructors - Overloading - Inheritance - Virtual Functions - **Computer Graphics**: Raster-Scan and Random-Scan Systems - Input Devices - Points and Lines - Line Drawing Algorithms - Mid-point Circle and Ellipse Algorithms - Scan Line Polygon Fill Algorithm - Boudary-Fill and Flood Fill Algorithm - 2D Transforms and Viewing - 3D Transforms and Viewing.

(18 Hours)

UNIT III

Database Management Systems: Entity-Relationship Diagram - Relational Database Schemas - SQL - Normalization for Relational Databases - **Data Structures**: Stack - Queue - Linked Lists - Trees - Binary Tree - AVL Tree - B tree - B+ Tree.

(18 Hours)

UNIT IV

Operating System: System Calls - Process Management - Threads - CPU Scheduling - Deadlocks - Memory Management - Storage Management - File and Input / Output System - Disk Scheduling - **Software Engineering**: Software Process Models - Software Requirements - Software Design – Software Quality – Estimation and Scheduling of Software Projects – Software Testing.

(18 Hours)

UNIT V

Data Communication: Simplex, Half-Duplex and Duplex Modes of Communication, Analog and Digital Signals - Noiseless and Noisy Channels - Bandwidth, Throughput and Latency - Digital and Analog Transmission - Data Encoding and Modulation Techniques - Error handling - **Computer Network**: Network Topologies - Network Types - Reference Models - Transmission Media - Communication Satellites - Routing Algorithms - IP Address - IP Protocol.

(18 Hours)

TEXT BOOK

1. UGC NET/SET Computer Science & Applications , Surabhi Sharma, Kailash Chandra Gururrani.

Course Code 23PCAS41	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	3	3	3	-	-	2	1	-	1
CO2	3	3	3	3	1	2	3	2	-	2
CO3	3	3	2	2	2	3	3	2	-	2
CO4	3	3	2	2	3	3	3	3	-	1
CO5	3	3	1	1	2	1	1	3	-	1

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

Dr. N. Santhi
Head of the Department

Mrs. B. Sakthi
Course Designer