

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS),
SIVAKASI – 626 123.**

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

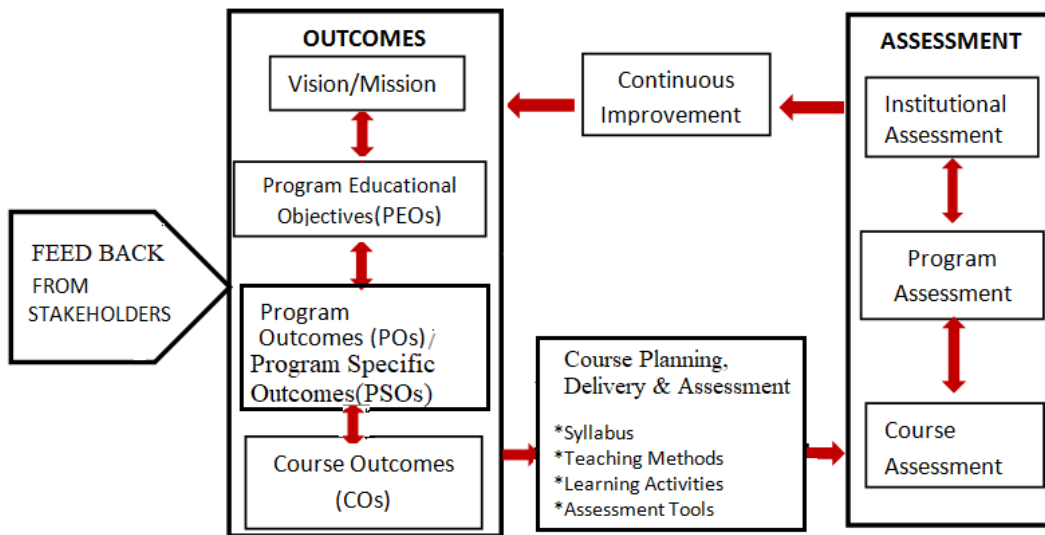
**DEPARTMENT OF COMPUTER APPLICATIONS
MASTER OF COMPUTER APPLICATIONS DEGREE PROGRAMME
GUIDELINES FOR OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(For those who have joined in June 2020 and later)**

I. A. PREAMBLE

The institutional vision is to emerge as a premier institution offering need-based, value conscious and career-oriented quality education to empower rural women with communicative competency and employment potential. With the advent of Autonomy in the year 2005, Choice Based Credit System (CBCS) is followed and it offers much flexibility to innovate and design the contents of each programme and align it with the institutional mission. Quality assurance developments in higher education have encouraged us to move towards outcomes-based approach to teaching, learning and assessment. Programme specifications define the students in terms of what they can do at the end of a programme or a particular level of study. This is a change from the more traditional approach where teachers tended to define courses in terms of what is taught, rather than what the student can do at the end of the course or programme. More directed and coherent curriculum, “more relevant” Graduates to industry and other stakeholders and Continuous Quality Improvement (CQI) are the benefits of OBE.

A student-centered paradigm in higher education entails a shift from a more input-oriented curricular design based on the description of course content, to outcomes-based education in which the course content is developed in terms of learning outcomes. The implementation of **Outcome Based Education with CBCS** as per the UGC guidelines from the academic year 2019-2020 will definitely mark a paradigm shift from traditional education.

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK



C. PROGRAMME EDUCATIONAL OBJECTIVES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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 should be consistent with the mission of the Institution. PEO's can be measured by a PO-PEO matrix. The PEO's should evolve through constant feedback from alumnae, students, industry, management etc.,. It is mandatory that each PEO should be mapped to atleast one of the POs.

The Graduates will

PEO1: emerge associally responsible professionals and value driven citizens ready for Industry, Government sectors and Consultancy firms.

PEO2: comprehend, analyze, design and construct computing solutions for the real-time problems with ethics and relate them with research through lifelong learning.

PEO3: act with creative, innovative and entrepreneurial potentials using latest technology and trends.

Programme Outcomes (PO):

Programme Outcomes are narrower statements that describe what students are expected to know and be able to do upon the graduation. These relate to the skills, knowledge and behaviour that students acquire in their study through the programmes.

PO1: Disciplinary knowledge

Apply the knowledge of Arts, Science and Humanities to address fundamental and complex questions appropriate to their programmes.

PO2: Critical thinking, Problem solving and Analytical reasoning

Make use of appropriate knowledge and skills to identify, formulate, analyze and solve problems in order to reach substantiated conclusions.

PO3: Research related skills and scientific reasoning

Critically analyze research processes, products and practices with a view of strategic use of data in their field.

PO4: Communication skills and Digital literacy

Demonstrate skills in oral and written communication and make use of ICT in various learning ambience.

PO5: Team work and Leadership quality

Interact productively with people from diverse backgrounds as both leaders/mentors and team members with integrity and professionalism.

PO6: Multicultural competence with Moral and ethical awareness

Defend the society against gender and environmental issues with moral and ethical awareness.

PO7: Self-directed and Life-long learning

Formulate their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Programme Specific Outcomes (PSO):

Programme Specific Outcomes denote what the students should be able to do at the time of graduation. They are programme specific. It is mandatory that each PO should be mapped to the respective PSO specified in the programme in order.

By the completion of the MCA programme, the learners will be able to

PSO1: apply knowledge and promote technological advances and crack competitive examinations.

PSO2: implement and evaluate a computer-based system, process or component to meet the stakeholder needs and become globally competent.

PSO3: use current technologies, skills and models in the computing discipline to enhance research.

PSO4: excel in leadership and managerial skills by adopting professional ethics through communicative technical information in both verbal and written format.

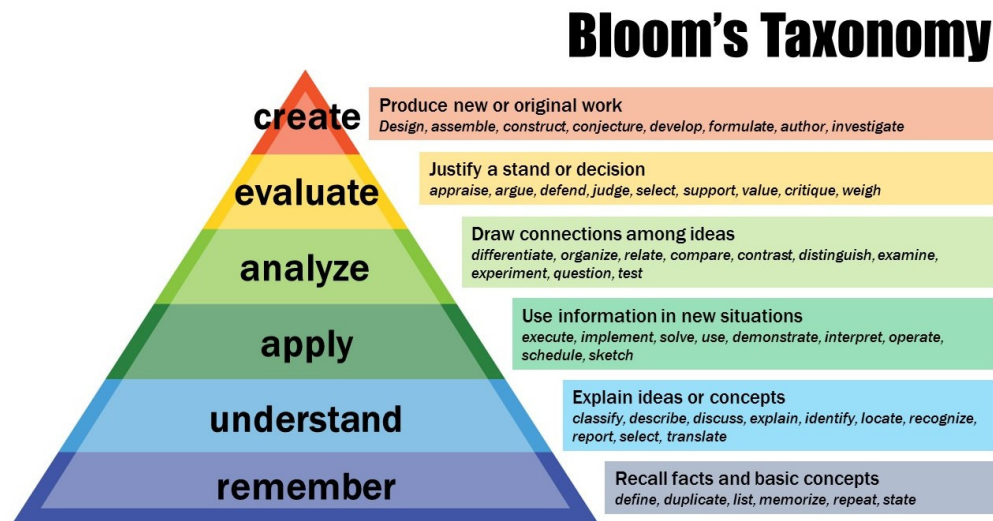
PSO5: demonstrate team work with the ability of leadership, analytical reasoning for solving real time critical problems and strong human values for responsible professional.

PSO6: build cross cultural, societal, professional, legal and ethical issues prevailing in industry.

PSO7: obtain the confidence for self and continuous life-long learning as a computing professional to have a successful career.

BLOOM'S TAXONOMY:

Bloom's Taxonomy was created in 1956 by an educational psychologist Dr. Benjamin Bloom in order to promote higher forms of thinking in education, such as analyzing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts. It is most often used when designing educational, training, and learning processes.



The K-levels mentioned in the diagram are usually denoted as [k1] to [k6] respectively from the bottom.

Course Outcomes (CO):

Course Outcomes are narrower statements that describe what students are expected to know and be able to do at the end of each course. These relate to the skills, knowledge, and behavior that students acquire in their study through the course. Each course comprises five COs and the keywords used to define COs are based on Bloom's Taxonomy [k1] to [k6].

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

CO1: [k1] / [k2]

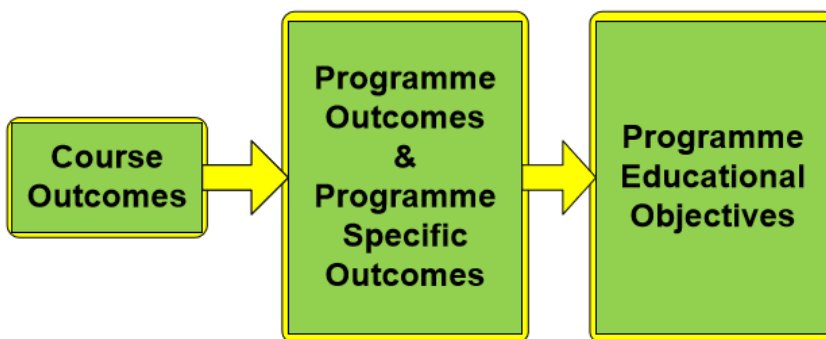
CO2: [k3]

CO3: [k4]

CO4: [k5]

CO5: [k6]

D. CO-PO & PO-PEO relationship:



E. CO – PO MAPPING OF COURSES:

After CO statements are developed by the course in-charge, COs will be mapped with any possible POs based on the relationship that exists between them. A CO must be mapped to at least one PO. The PO's which are not related to any of the COs in a particular course may be left blank. All the courses together must cover all the POs. The CO-PO matrix for a course is as shown below.

The correlation between COs and PO can be defined by three levels using the Letter Grades H, M, L which denotes respectively High (H), Medium (M), Low (L) and '-' for no correlation.

The concept of Six Sigma is used for calculating weighted percentage of contribution of each course in attainment of respective POs. As per Six Sigma Tool- Cause and Effect Matrix, the weightage of H, M and L are 9, 3 and 1 respectively.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1							
CO2							
CO3							
CO4							
CO5							
Weightage of the course							
Weighted percentage of Course contribution to POs							

The levels of contribution are denoted by Grades and weightages H-High (9), M-Medium(3), L-Low (1)

Weighted percentage of Contribution of the Course in attainment of PO1= Weightage of the course / Total weightage of all courses contributing PO1 computed based on correlation between COs and POs X 100

Programme Articulation Matrix (PAM):

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Total Weightage of all courses contributing to POs								

PO-PEO Mapping Matrix:

POs \ PEOs	PEO1	PEO2	PEO3
PO1	X	X	X
PO2	X	X	
PO3	X	X	
PO4	X	X	X

PO5		X	X
PO6	X	X	X
PO7		X	

(Mark X to map a PO to a PEO)

II. 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.

Assessment tools for CO

Assessment tool	Marks	Description	Conduct of Direct Assessment Tool
Theory Courses- Internal Assessment (40 Marks) (for all courses)			
Term Test	25 marks	Three written tests are conducted and average of best two is considered	Term Test I- after the completion of 30 working days Term Test II- after the completion of 55 working days Term test III- after the completion of 80 working days
Assignment	5 marks	Two Assignments for each course and the average of two is considered	Assignment I- before the commencement of Term Test I Assignment II- before the commencement of Term Test II
Seminar	10 marks	For PG, One Seminar for each course	For PG, Seminar should be completed before the commencement of Term Test III
Theory Courses- External Assessment(60 Marks)			
End Semester Examination	60 marks	Examination at the end of the course of 03- hour duration.	
Practical Courses - Internal Assessment(50 Marks)			

Observation / Record note book	10 marks	Submission of Observation / Record note book
Skill Based Test	10 marks	Day to day evaluation / Skill Test
Model Practical Examination	30 marks	A Minimum of TWO model Exams are conducted for each lab course and the average is considered.
Practical Courses - External Assessment (50 Marks)		
End Semester Practical Examination	50 marks	Examination at the end of the course of 03- hour duration

CO Assessment Rubrics

For the evaluation and assessment of CO's and PO's, rubrics are used.

Internal assessment contributes 60% and End Semester assessment contributes 40% to the total attainment of a CO for the theory courses. For the practical courses, internal assessment contributes 100% of total attainment to 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 mentioned above. The respective CO attainment level is evaluated based on set attainment rubrics.

Attainment Levels of COs

Assessment Methods	Attainment Levels	
Internal Assessment	Level 1	60% of students scoring more than average marks or set target marks in internal assessment tools
	Level 2	70% of students scoring more than average marks or set target marks in internal assessment tools
	Level 3	75% of students scoring more than average marks or set target marks in internal assessment tools
End Semester Examination	Level 1	60% of students scoring more than average marks or set target marks in End Semester Examination
	Level 2	70% of students scoring more than average marks or set target marks in End Semester Examination
	Level 3	75% of students scoring more than average marks or set target marks in End Semester Examination

Target setting for Assessment method:

For setting up the target of internal assessment tools, 50% of the maximum mark is allotted as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO:

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

$$\% \text{ of Attainment} = \frac{\text{Number of students who scored more than the target}}{\text{Total number of students}} * 100$$

- Internal Attainment is the average of attainments obtained using various internal assessment tools.
- For Theory Courses,
Direct CO Attainment = 60% of internal attainment + 40% of End Semester attainment.
- For Practical Courses,
Direct CO Attainment = 100% of internal attainment.
- For Project,
Direct CO Attainment = 100% of End semester attainment.

Indirect CO Attainment:

At the end of each course, an exit survey is collected from the students and it gives the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the attainment of course outcomes.

Overall CO Attainment = 80% of Direct CO Attainment+ 20% 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.

III. ASSESSMENT PROCESS FOR PO ATTAINMENT

Measurement of PO attainment shall be done by direct and indirect methods. Direct assessment method and indirect assessment method are considered for 80% and 20% weightages respectively. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct assessments (rubric based) - Conventional assessment tools such as Term Test, Seminar, Assignment and End Semester Examination are used.

Indirect assessments– Done through Course Exit Survey.

The description of Assessment tools used for the evaluation of COs and POs is given below.

Mode of Assessment	Assessment Tool	Description	Evaluation of Course Outcomes	Related POs
Direct (Weightage 80%)	Theory Courses- Internal Assessment (Weightage 60%)			
	Theory-Term Test (25 marks)	Three written tests are conducted and average of best two is considered	The questions in the three Term Tests, Seminar and Assignment are framed in such a way that they cover all the COs of respective course. The final attainment for each CO under direct assessment is calculated by taking average of the CO attainments from Term Tests, Assignment and Seminar.	PO1 to PO7
	Assignment (5 marks)	Two Assignments for each course and the average of two is considered		
	Seminar (10 marks)	One Seminar for each course		
	Theory Courses- External Assessment(Weightage 40%)			
	End Semester Examination (60 marks)	Examination at the end of the course of 03-hour duration	It covers the entire syllabus of the course. It would generally satisfy all course outcomes for a particular course. The COs are evaluated based on the set attainment levels.	PO1 to PO7
	Practical Courses - Internal Assessment (Weightage 100%)			
	Observation / Record note book (10 marks)	Submission of Observation / Record note book	Lab exercises are planned to cover all COs and CO attainment is calculated.	PO1 to PO7
	Skill Based Test (10 marks)	Day to day evaluation / Skill Test		
	Model Practical Examination (30 marks)	A Minimum of TWO model Exams are conducted for each lab course and the average is considered.		
Indirect (Weightage 20%)	Course Exit Survey	This survey gives the opinion of the students on attainment of Course	At the end of each course, an exit survey is collected from the students and considered for the CO attainment under Indirect assessment	PO1 to PO7

		Outcomes	
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IV. ASSESSMENT PROCESS FOR OVERALL PO ATTAINMENT

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 70% weightage to direct assessment and 30% weightage to indirect assessment. Direct assessment is based on CO attainment, where 40% weightage is given to attainment through End Semester examination and 60% weightage is given to attainment through internal assessments. Indirect assessment is done through Graduate exit survey and participation of students in Co-curricular / Extracurricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage 70%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage 30%)	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 / Extracurricular activities 20%	For participation in Co-curricular / extracurricular activities during the period of their study.

Direct Attainment of POs for all Courses

At the end of the each programme, the direct PO assessment is done from the CO attainment of all courses. The direct PO attainment for a particular course is determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values. For the evaluation and assessment of CO's and PO's, the same set of rubrics is used.

Programme Articulation Matrix (PAM):

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

Indirect Attainment of POs for all Courses

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

Indirect PO Attainment = 10% of PO Attainment from Graduate Exit survey + 20% of PO Attainment from the participation of students in Co-curricular / Extracurricular activities.

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Direct Attainment (Weightage 70%)							
Indirect Attainment (Weightage 30%)							
Overall PO Attainment							

Overall PO Attainment = 70% of Direct PO Attainment + 30% of Indirect PO Attainment

Expected Level of Attainment for each of the Programme Outcomes

PO	Level of Attainment
Value $\geq 70\%$	Excellent
Value ≥ 60 and value < 70	Very good
Value ≥ 50 and value < 60	Good
Value ≥ 40 and value < 50	Satisfactory
Value < 40	Not Satisfactory

Level of PO attainment

Graduation Batch	Overall PO Attainment	Whether Expected level of PO is achieved?

V. ASSESSMENT PROCESS FOR PEOs

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

Type of Assessment	Assessment Tool	Assessment criteria	Data collection frequency	Responsible entity	Indicators for Attainment of PEO
Indirect Weightage 100%	Placement Record Weightage 20%	Number of students Placed	Once in a year	Placement cell and Department	PEO-1 PEO-2 PEO-3
	Higher Education Weightage 20%	Number of students opted for higher education	Once in a year	Department	PEO-1 PEO-2 PEO-3
	Record of Entrepreneurship 10%	Number of Entrepreneurs	Once in a year	YWED cell and Incubation Centre	PEO-1 PEO-2 PEO-3
	Alumnae Survey Weightage 30%	Alumnae Survey is collected from the alumnae and it gives the opinion of the alumnae on attainment of Programme Outcomes and their achievements.	Once in a year	Alumnae Association	PEO-1 PEO-2 PEO-3
	Feedback from Parents 10%	Feedback from parents is collected and it gives the opinion of the parent on attainment of Programme Outcomes of their ward.	Once in a year	Parents Teachers Association	PEO-1 PEO-2 PEO-3
	Feedback from Employer 10%	Feedback from the employer is collected and it gives the opinion of the employers on attainment of Programme Outcomes of their employee.	Once in a year	Placement Cell and Department	PEO-1 PEO-2 PEO-3

Target for PEO attainment

Assessment criteria	Target
Record of Placement	30 % of the class strength
Progression to Higher Education	25 % of the class strength
Record of Entrepreneurship	5 % of the class strength

Attainment of PEOs

Assessment Tool	Attainment of PEO
Record of Placement	
Progression to Higher Education	
Record of Entrepreneurship	
Alumnae Survey Weightage	
Feedback from Parents	
Feedback from Employer	
Total Attainment	

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

$$\text{Percentage of PEO Attainment from higher studies} = \frac{\text{Number of students who pursue higher studies}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from entrepreneurship} = \frac{\text{Number of students who have become entrepreneur}}{\text{Target}} \times 100$$

PEO Attainment = 10% Attainment from placement + 20 % Attainment from higher studies + 10% Record of Entrepreneurs + 30% attainment of Alumnae survey + 10% Attainment from Parents Feedback + 20% Attainment from Employers Feedback

Expected Level of Attainment for each of the Programme Educational Objectives

PEO	Level of Attainment
Value $\geq 70\%$	Excellent
Value ≥ 60 and value < 70	Very good
Value ≥ 50 and value < 60	Good
Value ≥ 40 and value < 50	Satisfactory
Value < 40	Not Satisfactory

Level of PEO attainment

Graduation Batch	Overall PEO Attainment	Whether Expected level of PEO is achieved?

Process of Redefining the PEOs:

The college has always been involving the key stake holders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the programme are defined, refined and are inscribed in the form of PEO's. The level of attainment of PEO's defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like BOS, Academic Council and Governing Body involve appropriate actions.

VI. Eligibility Condition for Admission:

The candidate should be a graduate in any discipline of any recognized university or as equivalent with Mathematics as compulsory subject at +2 level and should have attended the TANCET exam conducted by Anna University.

VII. Duration of the Programme:

The duration of the programme is two academic years. Each academic year consists of two semesters. The duration of a semester is 90 working days.

VIII. Attendance:

The Rules regarding the attendance for regular classes for the candidates to appear for the End Semester Examinations are framed as given below:

- a) Each student must put in a minimum attendance of 68 days (75% of 90 days per semester) so as to become eligible to appear for the End Semester examinations.

Shortage of Attendance:

- b) Those students with an attendance of 67 days and less but 59 days (65%) and above can be permitted to appear for the End Semester Examinations provided, they get the condonation certificate from the Principal stating the proper reasons for the absence, within 5 days after the last working day of the concerned class. The certificate may be obtained from the office on payment of penalty as per Madurai Kamaraj University Norms.
- c) In case of attendance with 58 days and less but 45 days (50%) and above, the students cannot appear for the End Semester Examinations of that semester but can appear for the next End Semester Examinations by obtaining special permission from the Principal providing necessary documents supporting the

reasons for absence on payment of penalty as per Madurai Kamaraj University Norms.

- d) Students with an attendance of 44 days and less should repeat the whole semester.

IX. Evaluation Procedure:

Evaluation of each theory course will be 40 % for CIA and 60 % for End Semester Examinations. Evaluation of each Practical Course will be 50% for CIA and 50% for End Semester Examinations. Project will be evaluated for 100% in the End Semester Examinations. A mark statement will be issued to every student at the end of every semester.

X. Passing Minimum:

For a pass in each course a student should secure a minimum of 45% marks in the End Semester Examinations and a minimum of 50% marks in aggregate (ie marks of CIA and End Semester Examinations put together).The same rule is applicable for Project Report and Viva – Voce.

Minimum credits to be earned for M.C.A. Programme is 90 credits

For NPTEL and SWAYAM courses TWO credits will be given as extra credits.

XI. Eligibility Condition for getting the Degree:

A Candidate undergoing the Master of Computer Applications Degree Programme will be eligible for the award of degree of M.C.A., if she completes the entire Programme and pass all the examinations prescribed for the Programme.

As per UGC guidelines, a student who is not able to complete the Programme within three/two years, may be allowed for 2 years period beyond the three/two years duration to clear the backlog to be qualified for the degree.

XII. Classification of Successful Candidates:

The successful candidates will be classified as per the details given in the table below:

CGPA	Grade	Classification of Final Result
9.50000 – 10.00000	O+	First Class
9.00000 – 9.49999	O	
8.50000 – 8.99999	D++	
8.00000 – 8.49999	D+	
7.50000 – 7.99999	D	
7.00000 – 7.49999	A++	
6.50000 – 6.99999	A+	
6.00000 – 6.49999	A	
5.50000 – 5.99999	B+	Second Class

5.00000 – 5.49999	B	
0.00000 – 4.99999	U	Re-appear

XIII. Award of Ranks:

Candidates who qualify themselves for the respective degree programme passing all the examinations in the first attempt and secured first class are eligible for ranking I and II from the CGPA gained in the Core and Elective Courses.

$$\text{CUMULATIVE GRADE POINT AVERAGE [CGPA]} = \frac{\sum_i C_i G_i}{\sum_i C_i}$$

$$\text{CGPA} = \frac{\text{Sum of the multiplication of grade points by the respective credits of the course cleared in the entire programme}}{\text{Sum of the credits of all the courses cleared in the programme}}$$

C_i = Credits earned for course i in any semester

G_i = Grade point obtained for course i in any semester

\sum_i = Summation of all courses cleared in a semester in the case of GPA

and all courses cleared in all semesters in the case of CGPA.

XIV. Other Provisions:

1. In the Mark Sheet, the demarcation 'AA' will be marked against the courses for which the candidate was absent for the examination.
2. If a candidate is found indulging in malpractice, she must be expelled from the examination hall right away and debarred from appearing in all examinations of that particular semester. She can be allowed to take up examination only in the consecutive semester.
3. The courses she has already appeared during that semester will not be considered.
4. A student can appear for any number of arrear courses.
5. Repeat Examinations will be conducted for the final semester papers within a month after the publication of final semester results.
6. Revaluation is permitted.

XV. Transitory Provisions:

Students from other institutions have to appear and pass all the courses of all semesters under CBCS pattern in order to get the consolidated statement of marks.

Those students who have discontinued in the middle of the programme may be admitted in the respective semester if they want to rejoin and complete the programme; provided they had not got their transfer certificate.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI

M.C.A – Allotment of Hours and Credits

*(for those who have joined in **June 2020** and later)*

Subject		Semester				Total No. of Credits
		I	II	III	IV	
Core and Elective Courses						
Theory	Paper I	4(4)	4(4)	4(4)	-	70
	Paper II	4(4)	4(4)	4(4)	-	
	Paper III	4(4)	4(4)	4(3)	-	
	Paper IV	3(3)	3(3)	-	-	
Practical	Lab I	5(3)	5(3)	4(3)	-	
	Lab II	4(3)	4(3)	3(2)	-	
	Project Work	-	-	-	(12)	
Elective		6(5)	6(5)	6(5) 5(5)	-	20
Total Credits		26	26	26	12	90

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI
DEPARTMENT OF COMPUTER APPLICATIONS
M.C.A Programme
(For those who have joined in 2020 and later)
OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
PROGRAMME CODE – MDCA
PROGRAMME SCHEME

Semester	Course Code	Course Title	Teaching Hours Per Week	Credits	Duration of Exam (Hours)	Marks Allotted		
						Internal	External	Total
I	MDCA11	Core Courses Operating Systems	4	4	3	40	60	100
	MDCA12	Internet Programming	4	4	3	40	60	100
	MDCA13	Web Application Development	4	4	3	40	60	100
	MDCA14	Data Structures and Algorithms	3	3	3	40	60	100
	MDCA1L1	Internet Programming Lab	5	3	3	50	50	100
	MDCA1L2	Web Application Development Lab	4	3	3	50	50	100
	MDCA1E1/ MDCA1E2	Elective Course I 3D Animation Techniques / M-Commerce	6	5	3	40	60	100
Total			30	26				700
II	MDCA21	Core Courses Resource Management Techniques	4	4	3	40	60	100
	MDCA22	Dot NET Programming	4	4	3	40	60	100
	MDCA23	Computer Networks	4	4	3	40	60	100
	MDCA24	Relational Database Management System	3	3	3	40	60	100
	MDCA2L1	Dot NET Programming Lab	5	3	3	50	50	100
	MDCA2L2	Computer Networks Lab	4	3	3	50	50	100
	MD2E	Elective Course II (Offered by other Departments)	6	5	3	40	60	100
Total			30	26				700

III	MDCA31	Software Engineering	4	4	3	40	60	100
	MDCA32	Android Application Development	4	4	3	40	60	100
	MDCA33	Open Source Programming	4	3	3	40	60	100
	MDCA3L1	Android Application Development Lab	4	3	3	50	50	100
	MDCA3L2	Software Development Lab	3	2	3	50	50	100
	MDCA3E1 / MDCA3E2	Elective Course III Data Science and Analytics / Soft Computing	6	5	3	40	60	100
	MDCA3E3 / MDCA3E4	Elective Course IV Internet of Things / Digital Image Processing	5	5	3	40	60	100
Total			30	26				700
Field visit/Lab visit mandatory for the course MDCA31- Software Engineering								
IV	MDCA4P	Project Work and Viva voce	-	12	-	-	100	100
Total			-	12				100

ELECTIVE COURSE OFFERED FOR OTHER MAJOR STUDENTS

Semester	Course Code	Course Title	Teaching Hours Per Week	Credits	Duration of Exam (Hours)	Marks Allotted		
						Internal	External	Total
II	MDCA2E	Multimedia Systems	6	5	3	40	60	100

**MASTER OF COMPUTER APPLICATIONS
PROGRAMME ARTICULATION MATRIX (PAM) – Weights**

Sem	Course code	Course title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	MDCA11	Operating Systems	33	15	5	3	-	-	-
	MDCA12	Internet Programming	33	21	5	12	-	-	-
	MDCA13	Web Application Development	33	21	6	15	-	2	2
	MDCA14	Data Structures and Algorithms	21	15	2	11	-	-	3
	MDCA1EA	Elective I	33	15	-	3	-	-	3
	MDCA1L1	Internet Programming Lab	45	39	6	17	-	-	4
	MDCA1L2	Web Application Development Lab	45	33	2	15	-	-	6
II	MDCA21	Resource Management Techniques	39	21	6	8	-	-	2
	MDCA22	Dot NET Programming	39	21	1	15	-	-	1
	MDCA23	Computer Networks	33	15	2	10	-	-	-
	MDCA24	Relational Database Management System	39	27	2	21	-	-	-
	MDCA2E	Elective II	19	7	7	6	-	-	-
	MDCA2L1	Dot NET Programming Lab	45	39	6	10	-	-	-
	MDCA2L2	Computer Networks Lab	45	39	6	15	-	-	-
III	MDCA31	Software Engineering	33	15	2	11	1	-	-
	MDCA32	Android Application Development	33	21	5	11	-	-	6
	MDCA33	Open Source Programming	33	21	1	15	-	-	1
	MDCA3EB	Elective III	33	15	4	15	-	-	-
	MDCA3EC	Elective IV	33	15	4	15	-	-	-
	MDCA3L1	Android Application Development Lab	39	30	2	7	-	-	-
	MDCA3L2	Software Development Lab	45	33	5	15	-	-	1
IV	MDCA4P	Project Work and Viva voce	45	15	11	15	6	3	9
Total Weightage of all courses contributing to POs			796	493	90	265	7	5	38

**MASTER OF COMPUTER APPLICATIONS
PROGRAMME ARTICULATION MATRIX (PAM) – Weighted Percentage**

Sem	Course code	Course title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	MDCA11	Operating Systems	4.15	3.04	5.56	1.13	-	-	-
	MDCA12	Internet Programming	4.15	4.26	5.56	4.53	-	-	-
	MDCA13	Web Application Development	4.15	4.26	6.67	5.66	-	40	5.26
	MDCA14	Data Structures and Algorithms	2.64	3.04	2.22	4.15	-	-	7.89
	MDCA1EA	Elective I	4.15	3.04	-	1.13	-	-	7.89
	MDCA1L1	Internet Programming Lab	5.65	7.91	6.67	6.42	-	-	10.53
	MDCA1L2	Web Application Development Lab	5.65	6.69	2.22	5.66	-	-	15.79
II	MDCA21	Resource Management Techniques	4.90	4.26	6.67	3.02	-	-	5.26
	MDCA22	Dot NET Programming	4.90	4.26	1.11	5.66	-	-	2.63
	MDCA23	Computer Networks	4.15	3.04	2.22	3.77	-	-	-
	MDCA24	Relational Database Management System	4.90	5.48	2.22	7.92	-	-	-
	MDCA2E	Elective II	2.39	1.42	7.78	2.26	-	-	-
	MDCA2L1	Dot NET Programming Lab	5.65	7.91	6.67	3.77	-	-	-
	MDCA2L2	Computer Networks Lab	5.65	7.91	6.67	5.66	-	-	-
III	MDCA31	Software Engineering	4.15	3.04	2.22	4.15	14.29	-	-
	MDCA32	Android Application Development	4.15	4.26	5.56	4.15	-	-	15.79
	MDCA33	Open Source Programming	4.15	4.26	1.11	5.66	-	-	2.63
	MDCA3EB	Elective III	4.15	3.04	4.44	5.66	-	-	-
	MDCA3EC	Elective IV	4.15	3.04	4.44	5.66	-	-	-
	MDCA3L1	Android Application Development Lab	4.90	6.09	2.22	2.64	-	-	-
	MDCA3L2	Software Development Lab	5.65	6.69	5.56	5.66	-	-	2.63
IV	MDCA4P	Project Work and Viva voce	5.65	3.04	12.22	5.66	85.71	60	23.68
Total Weighted percentage of all courses contributing to POs			100	100	100	100	100	100	100

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DEPARTMENT OF COMPUTER APPLICATIONS
M. C. A.
SEMESTER I
CORE COURSE

MDCA11 – OPERATING SYSTEMS

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)
Total number of hours per semester(Lecture hour + Tutorial) : 60 (45+15)
Number of Credits : 04

Course Outcomes (CO):

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

CO1[K2]:discuss the system structures, process management, memory management and storage management in operating system.

CO2[K2]: illustrate the concept of Parallelism and multicore processing.

CO3[K3]:apply the various paging and scheduling algorithms.

CO4[K4]: analyze the scheduling algorithms, page replacement algorithms and disk scheduling algorithms.

CO5[K5]:interpret the synchronization problems and deadlock prevention, avoidance, detection and recovery techniques.

CO-PO Mapping table (Course Articulation Matrix)

Pos \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	-	-	-
CO2	3	3	1	1	-	-	-
CO3	9	3	3	1	-	-	-
CO4	9	3	-	1	-	-	-
CO5	9	3	1		-	-	-
Weightage of the course	33	15	5	3	-	-	-
Weighted percentage of Course contribution to Pos	4.15	3.04	5.56	1.13	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(12L)

Introduction: Operating System's role – Computing Environments - Open-Source Operating Systems. **System Structures:** Operating System Services – System Calls – Operating-System Structure - System Boot. **Process Management -Process Concept:** Process Concept - Process Scheduling – Operations on Processes – Inter-process Communication

Unit II

(8L+4T)

Process Scheduling: Basic Concepts - Scheduling Criteria – Scheduling Algorithms - Multiple Processor Scheduling – Real-Time CPU Scheduling. **Synchronization:** Background - The Critical-Section Problem – Peterson’s Solution - Semaphores - Classical Problems of Synchronization.

Unit III

(8L+4T)

Deadlocks: Deadlock Characterization – Methods for handling Deadlocks - Deadlock Prevention – Deadlock Avoidance – Deadlock Detection - Recovery from Deadlock. **Memory Management -Memory-Management Strategies:** Background - Swapping – Contiguous Memory Allocation – Segmentation – Paging (Basic Concepts).

Unit IV

(8L+4T)

Virtual Memory Management: Background - Demand Paging – Page Replacement. **Storage Management -Implementing File-Systems:** Allocation Methods – File-Space Management - **Mass-Storage Structure:** Disk Scheduling – Disk Management – Swap-Space Management.

Unit V

(9L+3T)

Hardware, Processes and Threads: The Motivation for Multicore Processors – The Characteristics of Multiprocessor Systems. **Identifying Opportunities for Parallelism:** Using Multiple Processes – Multiple users utilizing a Single System - Using Parallelism to Improve the Performance of a Single Task – Parallelization Patterns - **Using Automatic Parallelization and OpenMP:** Using OpenMP to produce a Parallel Application – Ensuring that code is executed in order – Collapsing Loops – Enforcing Memory Consistency.

Text Books:

1. Abraham Silberschatz, Peter B Galvin and Greg Gagne (2018), *Operating System Concepts*, Wiley India (P).Ltd., 9th Edition.
Unit : I, II, III, IV.
2. Darryl Gove (2017), *Multicore Application Programming*, Pearson Education, Inc.
Unit : V

Reference Books:

1. Ektawalia (2017), *Operating systems Concepts and Design*, Khanna Book Publishing, Second Edition.
2. Achyut S Godbole and AtulKahate (2013), *Operating Systems*, Tata McGraw Hill, Third edition

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Scheduling Algorithms	II	Problem solving
Deadlocks, Memory Management	III	Mind map/Video
Page Replacement, Disk Scheduling	IV	Problem solving/Video
Parallelization and OpenMP	V	Presentation

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

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DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER I
CORE COURSE**

MDCA12 –INTERNET PROGRAMMING

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)

Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)

Number of Credits : 04

Course Outcomes (CO):

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

CO1[K2]: describe the features of Java, primitives, operators, statements, class and inheritance.

CO2[K2]: explain files, AWT controls, swing components, networking and RMI.

CO3[K3]: make use of variables, operators and statements in classes, packages and interfaces.

CO4[K4]: examine the concepts of string, package, interface, exception, thread and applets.

CO5[K6]: construct simple programs using applets, AWT and swing control.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	1	3	-	-	-
CO5	9	9	3	3	-	-	-
Weightage of the course	33	21	5	12	-	-	-
Weighted percentage of Course contribution to POs	4.15	4.26	5.56	4.53	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(8L+4T)

The History and Evolution of Java: The Java Buzzwords – **An Overview of Java:** Lexical Issues - **Data Types, Variables and Arrays:** The Primitive Types - A Closer Look at Literals – Variables - Type Conversion and Casting – Arrays – **Operators:** Arithmetic Operators - The Bitwise Operators - Relational Operators - Boolean Logical Operators - The Assignment Operator - The? Operator – **Control Statements:** if – switch – while - do-while – for - The For-Each Version of the for Loop.

Unit II

(8L+4T)

Introducing Classes: Class Fundamentals - Declaring Objects - Introducing Methods – Constructors - The this Keyword - **A Closer Look at Methods and Classes:** Overloading Methods – Recursion - Introducing Access Control - Introducing final - Using Command-

Line Arguments – **Inheritance:** Inheritance Basics - Using super - Creating a Multilevel Hierarchy - Method Overriding - Using Abstract Classes - Using final with Inheritance - **Packages and Interfaces:** Packages - Access Protection- Importing Packages – Interfaces.

Unit III

(8L+4T)

Exception Handling: Exception-Handling Fundamentals - Using try and catch - Multiple catch Clauses - Nested try Statements – throw – throws – finally - **Multithreaded Programming:** The Main Thread - Creating a Thread - Creating Multiple Threads - Using isAlive() and join() - Thread Priorities - **I/O, Applets, and Other Topics:** I/O Basics - Reading and Writing Files - Automatically Closing a File.

Unit IV

(9L+3T)

String Handling: The String Constructors - Special String Operations - String Comparison - Modifying a String – StringBuffer - **Event Handling:** The Delegation Event Model - Event Classes - Event Listener Interfaces - **Introducing the AWT: Working with Windows, Graphics, and Text:** Window Fundamentals - **Using AWT Controls, Layout Managers and Menus:** Labels - Using Buttons - Applying Check Boxes – CheckboxGroup - Choice Controls - Using Lists - Using a TextField - Using a TextArea - Understanding Layout Managers.

Unit V

(12L)

The Applet Class: Applet Basics - Applet Architecture - An Applet Skeleton - Simple Applet Display Methods - **Networking:** TCP/IP Client Sockets - TCP/IP Server Sockets – Datagrams - **Regular Expressions and Other Packages:** Remote Method Invocation (RMI) - **Exploring Swing:** JLabel and ImageIcon - JTextField - The Swing Buttons – Jlist – JComboBox.

Text Book:

Herbert Schildt (2018), *Java: The Complete Reference*, McGraw-Hill Education, Eighth Edition, Eleventh reprint.

Reference Books:

1. Herbert Schildt (2013), *Java2 The Complete Reference*, Tata McGraw-Hill Publishing Company Limited, Fifth Edition.
2. E.Balagurusamy (2019), *Programming with Java A Primer*, Tata McGraw Hill, New Delhi, 6th Edition.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Arrays, Operators, Control Statements	I	Program/Debugging
Classes, Inheritance	II	Mind map/Video
Exception Handling, Multithreaded Programming	III	Code Analysis
AWT Controls, Event Handling	IV	Presentation

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

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SEMESTER I
CORE COURSE

MDCA13 – WEB APPLICATION DEVELOPMENT

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)
Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)
Number of Credits : 04

Course Outcomes (CO):

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

- CO1[K2]:elucidate the features and fundamentals of HTML5, XML and other web technologies.
 CO2[K2]:describe working and web services of AJAX and the fundamentals of PHP and JQuery.
 CO3[K3]:apply DTD, Schema, XPath and XSLT in the XML document.
 CO4[K4]: examinethe concepts of XML, DTD, namespaces, schema, elements and functions of XSLT, XPath, XLink and XPointer.
 CO5[K6]: create simple web applications using HTML, PHP, AJAX and JQuery.

CO-PO Mapping table (Course Articulation Matrix)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	9	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	3	1	-	1	1
CO4	9	3	-	1	-	-	-
CO5	9	9	3	1	-	1	1
Weightage of the course	33	21	6	15	-	2	2
Weighted percentage of Course contribution to POs	4.15	4.26	6.67	5.66	-	40	5.26

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(12L)

Overview of HTML5 and other web technologies: Internet and Web Technologies – HTML5 and its essentials – Exploring new features of HTML5 – Structuring an HTML document –creating and saving an HTML document – Validating an HTML document – Viewing an HTML document -**Implementing the advanced features of HTML5:** Exploring custom data attributes – Exploring Microdata – Exploring client – side storage – Exploring the drag and drop feature – Exploring web communication.

Unit II

(8L+4T)

Working with basics of XML: Exploring XML – Comparing XML with HTML – Exploring advantages and disadvantages of XML – Describing the structure of an XML document – Exploring XML entity references – Exploring XML parsers – Describing DTD - **Implementing advanced features of XML:** Exploring XML namespaces – Describing an XML Schema – Understanding XML CDATA – Describing Entity references.

Unit III

(8L+4T)

Working with XSLT: Exploring XSLT elements and attributes – Exploring variables and parameters – Exploring conditional statements – Sorting elements- Exploring XSLT functions – Exploring NaN values and patterns -**Working with XPath, XLink and XPointer:** Exploring the XPath language – Exploring the XLink language – Exploring the XPointer language.

Unit IV

(9L+3T)

Overview of AJAX: Exploring AJAX- **Asynchronous data transfer with XMLHttpRequest:** Creating the XMLHttpRequest Object - the XMLHttpRequest Object in different browsers -**Working with ASP.NET AJAX application:** Introducing ASP.NET AJAX Extensions - configuring ASP.NET AJAX – **Consuming Web Services using AJAX:** Exploring Web Service Protocols – consuming web services using AJAX.

Unit V

(8L+4T)

Integrating PHP and AJAX: Exploring the fundamentals of PHP – Exploring the interaction between PHP and AJAX – Using PHP enabled server -**Working with JQuery:** Exploring the fundamentals of jquery – Exploring jquery selectors – Exploring jquery methods to access HTML attributes – Exploring jquery methods for traversing – Exploring jquery manipulators – Exploring jquery events – Exploring jquery effects – Exploring jquery with AJAX.

Text Book:

Kogent Learning Solutions Inc (2018), *HTML5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery* – Black Book, Dreamtech Press, India.

Reference Books:

1. Robin Nixon (2015), *Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5*, O'Reilly Media Inc., 4th Edition.
2. Ivan Bayross (2013), *Web enabled Commercial Application Development Using HTML, DHTML, JavaScript and PHP*, BPB Publications, 4th Revised Edition.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Basics of XML, DTD, Schema	II	Document design
XSLT	III	Program design
AJAX, Web Services	IV	Presentation
Working with JQuery	V	Video

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

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DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER I
CORE COURSE**

MDCA14 –DATA STRUCTURES AND ALGORITHMS

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 03 (02+01)
Total number of hours per semester(Lecture hour + Tutorial) : 45 (30+15)
Number of Credits : 03

Course Outcomes (CO):

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

CO1[K2]: explain the features of various data structures and algorithmic techniques.

CO2[K2]: discuss the ADTs and applications of different data structures.

CO3[K3]: solve problems on linear and nonlinear data structures and greedy methods.

CO4[K4]: analyze the general methods and problems of various algorithms.

CO5[K5]: assess different sorting, searching and traversal techniques.

CO-PO Mapping table (Course Articulation Matrix)

COs \ POs	POs						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	1	3	-	-	3
CO4	3	3	-	1	-	-	-
CO5	3	3	1	1	-	-	-
Weightage of the course	21	15	2	11	-	-	3
Weighted percentage of Course contribution to POs	2.64	3.04	2.22	4.15	-	-	7.89

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(6L+3T)

Stacks and Queues: Stacks – Stacks Using Dynamic Arrays – Queues – Circular Queues Using Dynamic Arrays — Evaluation of Expressions – Multiple Stacks and Queues.

Unit II

(6L+3T)

Linked Lists: Singly Linked Lists And Chains – Representing Chains In C - Linked Stacks And Queues – Doubly Linked Lists- **Trees:** Introduction – Binary Trees – Binary Tree Traversals– Binary Search Trees.

Unit III

(6L+3T)

Graphs: The Graph Abstract Data Type – Elementary Graph Operations - **Sorting:** Insertion Sort – Quick Sort - Merge Sort(iterative merge sort).

Unit IV

(6L+3T)

Introduction: Algorithm – Algorithm Specification – Performance Analysis (Space Complexity –Time Complexity) - **Divide And Conquer:** The General Method – Binary Search - **Greedy Method:** The General Method – Minimum Cost Spanning Trees - Knapsack Problem.

Unit V

(6L+3T)

Dynamic Programming: The General Method – Multistage Graphs – All Pairs Shortest Paths – Single-Source Shortest Paths (General Weights) - **Backtracking:** The General Method – The 8-Queens Problem – Sum of Subsets.

Text Books:

1. Ellis Horowitz, SartajSahni and Susan Anderson-Freed (2012), *Fundamentals of Data Structures in C*, Universities Press Private Limited, Second edition.
Units :I, II, III
2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran (2015), *Fundamentals of Computer Algorithms*, Universities Press Private Limited, Second edition.
Units : IV, V

(Excluding Theorems and Analysis)

Reference Books:

1. Harsh Bhasin (2015), *Algorithms Design and Analysis*, Oxford University Press.
2. DebasisSamanta (2018), *Classical Data Structures*, PHI Learning Private Limited, Second Edition.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Stacks , Queues	I	Problem solving
Lists, Trees	II	Video/ Role play
Sorting	III	Problem solving/ Mind map
Greedy Method	IV	Problem solving
Dynamic Programming, Backtracking	V	Presentation

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

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DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER I
CORE COURSE**

MDCA1L1- INTERNET PROGRAMMING LAB

(For those who have joined in June 2020 and later)

Contact hours per week : 05

Total number of hours per semester : 75

Number of Credits : 03

Course Outcomes (CO):

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

CO1[K3]: build simple programs using arrays, statements and classes.

CO2[K6]: create programs using inheritance, packages, interfaces, multithreading and exceptions.

CO3[K6]: develop programs using files, strings and command line arguments.

CO4[K6]: construct programs using networking, AWT and Swing controls.

CO5[K6]: design Applets and RMI programs.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	3	-	9	-	-	-
CO2	9	9	-	3	-	-	1
CO3	9	9	-	3	-	-	1
CO4	9	9	3	1	-	-	1
CO5	9	9	3	1	-	-	1
Weightage of the course	45	39	6	17	-	-	4
Weighted percentage of Course contribution to POs	5.65	7.91	6.67	6.42	-	-	10.53

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Areas of Programs:

1. Programs using arrays.
2. Programs using different statements.
3. Programs using class.
4. Programs using package and interfaces.
5. Programs using command line arguments.
6. Programs using string methods.
7. Programs using inheritance, thread and exceptions.
8. Programs using AWT and Swing controls.
9. Programs using Client/Server mechanism.
10. Simple RMI programs.
11. Simple Applets and Files.

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M. C. A.
SEMESTER I
CORE COURSE

MDCA1L2 –WEB APPLICATION DEVELOPMENT LAB

(For those who have joined in June 2020 and later)

Contact hours per week : 04

Total number of hours per semester : 60

Number of Credits : 03

Course Outcomes (CO):

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

CO1[K3]:build simple and interactive bootstrap web pages.

CO2[K3]:make use of JQuery libraries.

CO3[K6]:create simple PHP and AJAX applications.

CO4[K6]:design a well-formed XML documents using CSS, DTD, DSO, XSLT and Schema.

CO5[K6]:develop simple web services.

CO-PO Mapping table (Course Articulation Matrix)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	3	1	3	-	-	-
CO2	9	3	-	3	-	-	-
CO3	9	9	-	3	-	-	-
CO4	9	9	-	3	-	-	3
CO5	9	9	1	3	-	-	3
Weightage of the course	45	33	2	15	-	-	6
Weighted percentage of Course contribution to POs	5.65	6.69	2.22	5.66	-	-	15.79

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Areas of Programs:

1. Simple HTML programs using bootstrap.
2. Simple PHP programs.
3. Simple programs using JQuery.
4. Simple AJAX applications.
5. Programs to create XML document.
6. Programs to create XML document using cascading style sheets (CSS).
7. Programs using internal DTD file.
8. Programs using external DTD file.
9. Programs using internal DSO.
10. Programs using external DSO.
11. Programs using XML schema.
12. Programs using XSLT.
13. Creation of Web services.

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DEPARTMENT OF COMPUTER APPLICATIONS**

M. C. A.

SEMESTER I

CORE ELECTIVE COURSE

MDCA1E1- 3D ANIMATION TECHNIQUES

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 06 (05+01)
Total number of hours per semester(Lecture hour + Tutorial) : 90 (75+15)
Number of Credits : 05

Course Outcomes (CO):

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

CO1[K2]:describe the fundamentals of objects, effects, Modifier, splines, lights, Shadows and Cameras in 3ds Max.

CO2[K2]:demonstrate the workings of character studio, particle systems and space wraps in 3ds Max.

CO3[K3]: implement lighting effects and animation effects in Maya.

CO4[K4]: examine the creation, modification and rendering of Polygon and NURBS modeling in Maya.

CO5[K6]: design various transformations, lighting and texturing effects on objects in Maya.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	1	-	-	-
CO2	3	3	-	-	-	-	3
CO3	9	3	-	-	-	-	-
CO4	9	3	-	1	-	-	-
CO5	9	3	-	1	-	-	-
Weightage of the course	33	15	-	3	-	-	3
Weighted percentage of Course contribution to POs	4.15	3.04	-	1.13	-	-	7.89

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(15L+3T)

Introduction to 3ds Max 2010: Opening Autodesk 3ds Max 2010. **Fundamentals of 3ds Max 2010:**Understanding the project workflow – Understanding Geometry primitives – Architectural objects – Shapes – Compound objects – Dynamic objects – Systems – Working with objects in 3ds Max 2010. **Modifiers, Splines and reactor:** Working with modifiers - Working with splines.

Unit – II

(13L+5T)

Lights, Shadows and cameras: Understanding lights – Creating lights – Creating Sunlight and Daylight Systems – Working with Shadows – Working with Cameras.

Character studio: Understanding character studio – Working with Biped. **Particle Systems and Space Wraps:** Working with Particle Systems – Working with Space Wraps (Creating and Binding a Space Wrap to an object).

Unit – III

(18L)

Getting Started with CGI and Maya 2014: Getting to know Maya 2014 User Interface – Working with Project and Scene in Maya 2014 – **Working with Maya Objects:** Creating Primitive Objects – Exploring Viewport Modes – Understanding Pivot point – Navigating in Viewports – Understanding Object Selection – Duplicating Objects – Transforming Objects in Maya - Understanding Construction History.

Unit – IV

(14L+4T)

Modeling with NURBS: Deconstructing a NURBS curve - Drawing a NURBS Curve – Importing a Curve – Modifying NURBS Curves. **Modeling with Polygons:** Creating a Polygon Mesh – Working with Modeling Toolkit – Modifying a Polygon Mesh.

Unit – V

(15L+3T)

Animating in Maya 2013: Exploring Types of Animation in Maya – Exploring Animation Controls – Working with Keyframe Animation. **Working with Maya Lights:** Creating Lightning Effects in Maya - Exploring the Mental Ray Attributes – **Rendering in Maya:** Exploring the different types of Renderers – Rendering a scene in Maya.

Text Books :

1. Kogent Learning Solutions Inc, (2011), *3ds Max 2010 in Simple Steps*, Dreamtech Press, New Delhi.
UNIT I, II
2. Kogent Solutions Inc.,(2014), *Maya 2014 in Simple Steps*, Dreamtech Press, New Delhi.
UNIT III, IV, V

Reference Books:

1. Kelly L. Murdock (2009), *3ds Max 2010 Bible*, Wiley Publisher.
2. Paul Naas (2013), *Autodesk Maya 2014 Essentials*, Autodesk Official Press.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Primitives, Modifiers, Splines in 3ds Max	I	Video/Presentation
Character studio, Particle Systems in 3ds Max	II	Create Animation
NURBS, Polygons in Maya	IV	Create 3D models
Animation and rendering in Maya	V	Video

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

M. C. A.

SEMESTER I

CORE ELECTIVE COURSE

MDCA1E2 – M-COMMERCE

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 06 (05+01)
Total number of hours per semester(Lecture hour + Tutorial) : 90 (75+15)
Number of Credits : 05

Course Outcomes (CO):

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

CO1[K2]: explain the concept of Mobile commerce and its applications.

CO2[K2]: describe the types of M-commerce services.

CO3[K3]: make use of Mobile Business intelligence.

CO4[K4]: examine the different security features.

CO5[K5]: assess various mobile communication systems.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	1	-	-	-
CO2	3	3	-	-	-	-	-
CO3	9	3	-	-	-	-	3
CO4	9	3	-	1	-	-	-
CO5	9	3	-	1	-	-	-
Weightage of the course	33	15	-	3	-	-	3
Weighted percentage of Course contribution to POs	4.15	3.04	-	1.13	-	-	7.89

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(15L+3T)

Introduction to Mobile Commerce: (Mobile Commerce-Wireless Communication Technology-Scope of Mobile Commerce-Applications of M-Commerce-Principles of Mobile Commerce-Benefits of Mobile Commerce-Limitations of Mobile Commerce) – **Mobile Commerce Framework:** (Content Management-Technology Infrastructure – Application Development – Business Service Infrastructure)– **Mobile Commerce Business Models:** (Payment Models- Advertiser Model- Shopping Model-Content Provider Model) –**M-Commerce Applications:** (Mobile Banking – Mobile Payments – E-Commerce vs M-Commerce – Impact of M-Commerce.)

Unit II

(15L+3T)

Mobile Commerce Services: M-Commerce Services -Types of M-Commerce Services –

Location Based Services –Information Services – NTT Do Co Mo I-Mode – Mobile Portal (Google Mobile –Yahoo Mobile- AOL Mobile – MSN Mobile – Relevance of M-Commerce in Modern Society). **Mobile Commerce Applications:** (Applications of Mobile Commerce in Industry: (Financial Sector –Retail Sector –Telecommunication Sector –Entertainment Sector).

Unit III

(15L+3T)

Wireless and Mobile Communication: Communication Systems – Analog Communication System – Digital Communication System – **Wireless Communication:** (Wireless Services – Spectrum Allocation – wireless system) - **Satellite Communication:** (Categories of Satellites – Global Satellite Communication) - **Mobile Communication Systems:** (Broadband Technology – Wireless Broadband Internet –Wireless Application Protocol (WAP)) – **Digital Cellular Technology:** Mobile phone Cellular Network :(System Architecture – Signal Inference and Distortion – Multiple Antennas).

Unit IV

(15L+3T)

M-Commerce Security and Privacy Issues:Mobile Security Concepts – Mobile Security Mechanism: (Encryption- Digital Signatures – Digital Certificates – Public Key Infrastructure – Firewalls – Proxy Servers) – Mobile Network Security – Mobile Information Security: (Bluetooth Security - WLAN Security – Mobile Device Security – Mobile Device Security Arrangements) – Mobile Application Security: (Precautionary measures) – Mobile Security Management.

Unit V

(15L+3T)

Future of Mobile Commerce: Future of Mobile Commerce (Mobile Payment Applications – Mobile Shopping-Mobile Social Networking) - **Mobile Commerce Case Studies: (Case Study 1:** Mobile Shopping – **Case Study 2:** Mobile Business intelligence - **Case Study 3 :** Mobile CRM case study - **Case Study 4** Mobile Education).

Text Book:

KarabiBandyopadhyay (2013), *Mobile Commerce*, PHI Learning Private Limited.

Reference Books:

1. Brian Ernest Mennecke, Troy J. Strader (2003), *Mobile Commerce: Technology, Theory, and Applications*, Idea Group Inc (IGI).
2. June Wei (2014), *Mobile Electronic Commerce: Foundations, Development, and Applications*, CRC Press.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
M-Commerce Applications	I	Group Discussion
Mobile Commerce Services	II	Mind maps
Wireless, Digital Cellular Technology	III	Case Study
M-Commerce Security and Privacy Issues	IV	Presentation
Future of Mobile Commerce	V	Case Study

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER II
CORE COURSE**

MDCA21 – RESOURCE MANAGEMENT TECHNIQUES

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)
Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)
Number of Credits : 04

Course Outcomes (CO):

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

- CO1[K2]: summarize various algorithms, rules and terms to solve decision making problems.
- CO2[K3]: use various methods to solve Transportation, Assignment Problems and Forecasting.
- CO3[K3]: solve problems using Probability, Markov Analysis and Queuing Theory.
- CO4[K4]: examine the various characteristics of Queuing Theory and Forecasting.
- CO5[K6]: create networks to plan, schedule and control Project activities.

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

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	9	3	-	3	-	-	-
CO3	9	3	3	-	-	-	1
CO4	9	3	-	1	-	-	-
CO5	9	9	3	1	-	-	1
Weightage of the course	39	21	6	8	-	-	2
Weighted percentage of Course contribution to POs	4.90	4.26	6.67	3.02	-	-	5.26

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(9L+3T)

Transportation Problem: Introduction - LP formulation of the Transportation Problem – The Transportation Table – Loops in a Transportation Tables - Solution of a Transportation Problem – Finding an Initial Basic Feasible Solution – Test for Optimality – Degeneracy in Transportation Problem – Transportation Algorithm – Some Exceptional cases. **Assignment Problem:** Introduction – Mathematical formulation of the Problem – Solution Method of Assignment Problems (Hungarian Assignment method only) - Special cases in Assignment Problems.

Unit II

(8L+4T)

Probability: Introduction – Uncertainty and Probability – Sample space and Probability – Algebra of events – Conditional Probability – Random variables – Expectation of a random variable – Central Tendency and Dispersion – Some Probability Distributions. **Markov Analysis:** Introduction – Markov Processes – State and Transition Probabilities – Characteristics of a Markov Process – State Transition Matrix – Transition Diagram – Construction of a State Transition Matrix – n step transition Probabilities – Steady State (Equilibrium) conditions – Markov Analysis Algorithm.

Unit III

(8L+4T)

Network scheduling by PERT/CPM: Introduction – Network: Basic Components – Logical Sequencing - Rules for Network Construction – Concurrent Activities - Critical Path Analysis – Probability Consideration in PERT – Distinction Between PERT and CPM.

Unit IV

(8L+4T)

Queueing Theory: Introduction - Queueing System – Elements of a Queueing system – Operating Characteristics of a Queueing System – Deterministic Queueing System - Probability Distributions in Queueing systems – Classification of Queueing models – Definitions of Transient and Steady states – Poisson Queueing Systems (M/M/1) : (∞ /FIFO) model.

Unit V

(12L)

Forecasting: Introduction – Forecasting Methods – Components of a Time Series – Smoothing Methods of Forecasting – Trend Projection in Forecasting – Seasonal Components in Forecasting – Casual Forecasting Method – Qualitative Methods of Forecasting.

Textbook:

KantiSwarup, P.K. Gupta, and Man Mohan (2014), *Operations Research*, Sultan Chand & Sons, New Delhi.

Reference Books:

1. HamdyA.Taha (2014), *Operations Research – An Introduction*, Prentice Hall of India Private Ltd, New Delhi, 9th Edition.
2. S.D.Sharma (2006), *Operations Research*, Kedarnath and Ramnath Company, Meerut, Fifteenth Edition.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Transportation, Assignment Problem	I	Problem Solving
Probability	II	Exercises
Network scheduling by PERT/CPM	III	Mind maps
Queueing Theory	IV	Presentation

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

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DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER II
CORE COURSE**

MDCA22 –DOT NET PROGRAMMING

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)
Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)
Number of Credits : 04

Course Outcomes (CO):

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

CO1[K2]: describe the components of .NET framework, features of ASP.NET and ADO.NET, Namespaces, Pointers, Delegates, Collections in C#.

CO2[K3]: make use of WPF controls and ASP.Net controls.

CO3[K4]:examine the Windows Communication Foundation and Windows Presentation Foundation.

CO4[K6]: design simple programs in C# and ASP.NET.

CO5[K6]: create database connectivity using ADO.NET.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	9	3	-	3	-	-	-
CO3	9	3	-	3	-	-	-
CO4	9	3	1	3	-	-	-
CO5	9	9	-	3	-	-	1
Weightage of the course	39	21	1	15	-	-	1
Weighted percentage of Course contribution to POs	4.90	4.26	1.11	5.66	-	-	2.63

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(12L)

The Philosophy of .NET: An initial look at the .NET platform – Introducing the building blocks of the .NET platform(CLR,CTS and CLS)-Additional .NET aware programming languages – An overview of .NET assemblies – Understanding the Common Type System - Understanding the Common Language Specification - Understanding the Common Language Runtime – The Assembly/Namespace/Type Distinction – The Platform Independent Nature of .NET – **Building C# Applications:** Building .NET Applications Beyond the Windows OS - **Collections and Generics :** The Motivation for Collection Classes – The Role of Generic Type Parameters – The System.Collections.Generic Namespace.

Unit – II

(9L+3T)

Delegates, Events, and Lambda Expressions: Understanding the .NET Delegate Type – **Advanced C# Language Features:** Working with Pointer Types – **Introducing Windows Communication Foundation:** A Potpourri of Distributed Computing APIs – The Role of WCF – Investigating the Core WCF Assemblies – The Visual Studio WCF Project Templates – The Basic Composition of WCF Application – The ABCs of WCF – Building a WCF Service – Hosting the WCF Service – Building the WCF Client Application – Hosting the WCF Service within a Windows Service.

Unit – III

(8L+4T)

Introducing Windows Presentation Foundation and XAML: The Motivation Behind WPF – The Various Flavors of WPF – Investigating the WPF Assemblies – Building WPF Applications Using Visual Studio – **Programming with WPF Controls:** A Survey of the Core WPF Controls – Controlling Content Layout Using Panels – Understanding WPF Commands – **WPF Resources, Animations, Styles and Templates:** Understanding the Role of WPF Styles

Unit – IV

(8L+4T)

ADO.NET Part I: The Connected Layer: A High Level Definition of ADO.NET – Understanding ADO.NET Data Providers – Additional ADO.NET Namespaces – Creating the AutoLot Database – Understanding the Connected Layer of ADO.NET – Working with Data Readers – Building a Reusable Data Access Library (Adding the Connection Logic, Insertion Logic, Deletion Logic, Update Logic, Selection Logic) - **ADO.NET Part II: The Disconnected Layer:** Understanding the Disconnected Layer of ADO.NET – Understanding the Role of the Dataset – Working with Data Tables – Working with Data Adapters – The Windows Forms Database Designer Tools (Visually Designing the DataGridView).

Unit – V

(8L+4T)

Introducing ASP.NET Web Forms: An Overview of the Web Forms API – Building a Single-File Web Forms Web App – ASP.NET Web Sites vs ASP.NET Web Applications – The Life Cycle of an ASP.NET Web Page – **ASP.NET Web Controls, Master Pages and Themes:** Major Categories of Web Forms Controls – The Role of the Validation Controls – Working with Themes.

Text Book:

Andrew Troelsen and Philip Japikse *C# 6.0 and the .NET 4.6 Framework*, Apress, 7th edition.

Reference Books:

1. Matthew MacDonald (2011), *The Complete Reference ASP.Net*, McGraw Hill Publications.
2. P. Radhaganesan (2012), *VB.Net*, Scitech Publications (India) Pvt Ltd.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Delegates, WCF	II	Program Code
WPF Controls	III	Mind maps
ADO.NET	IV	Presentation
ASP.NET Web Forms, Controls	V	Create simple web form

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER II
CORE COURSE**

MDCA23 –COMPUTER NETWORKS

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)
Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)
Number of Credits : 04

Course Outcomes (CO):

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

CO1[K2]: describe the networks terminologies, the reference models, connecting devices, Wireless WANs and different applications.

CO2[K2]: discuss the transmission media, switching and design issues of data link and transport layer.

CO3[K3]: solve problems in multiplexing, error detection & correction and routing algorithms.

CO4[K4]: analyze routing algorithms, framing, flow controls and domain name system.

CO5[K5]: assess the protocols of data link, network, transport and application layers.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	1	1	-	-	-
CO5	9	3	-	-	-	-	-
Weightage of the course	33	15	2	10	-	-	-
Weighted percentage of Course contribution to POs	4.15	3.04	2.22	3.77	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(9L+3T)

Introduction: Data Communications – Networks – Network Types – Internet History – Standards and Administration – **Network Models:** Protocol Layering – TCP/IP Protocol Suite – The OSI Model.

Unit – II

(9L+3T)

Physical Layer - Introduction to Physical Layer: Digital Signals – Transmission Impairment – Data rate Limits – Performance – **Bandwidth Utilization: Multiplexing and**

Spectrum: Multiplexing–**Transmission Media:** Introduction – Guided Media – Unguided Media – **Switching:** Introduction – Circuit-Switched Networks – Packet Switching.

Unit – III

(8L+4T)

Data Link Layer - Error Detection and Correction: Introduction – Block Coding – Cyclic Codes – Checksum – Forward Error Correction – **Data Link Control:** DLC Services – Data-Link Layer Protocols – **Wired LANs: Ethernet:** Ethernet Protocols – Standard Ethernet – Fast Ethernet.

Unit – IV

(7L+5T)

Other Wireless Networks: WiMAX – Cellular Telephony – Satellite Networks – **Connecting Devices and Virtual LANs** – Connecting Devices –**Network Layer: Network-Layer Protocols:** Internet Protocol – ICMPv4–**Unicast Routing:** Routing Algorithm–**Unicast Routing Protocols** – Internet Structure – Routing Information Protocol(RIP).

Unit - V

(12L)

Transport Layer: Transport layer Protocols: Introduction – User Datagram Protocol – Transmission Control Protocol– **Application layer: Standard Client-Server Protocols:** World Wide Web and HTTP – FTP – Electronic Mail – Telnet – Domain Name System.

Text Book:

Behrouz A. Forouzan (2015), *Data Communications and Networking*, Tata McGraw Hill, Fifth Edition, Fifth reprint.

Reference Books:

1. Larry L. Peterson & Bruce S. Davie (2018), *Computer Networks - A Systems Approach*, Morgan Kaufmann Publishers, 5th Edition.
2. Andrew S. Tanenbaum(2019), *Computer Networks*, Prentice Hall of India, Fifth Edition.

Online Cisco Network tutorial:

<https://www.udemy.com/topic/cisco-ccna/free/>

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Network Types, Network Models	I	Mind maps/Cisco Network tutorial
Transmission Impairment, Switching	II	Comparative Study
Error Detection and Correction	III	Problem Solving
Network-Layer Protocols, Routing Algorithms	IV	Video/Presentation

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER II
CORE COURSE**

MDCA24 – RELATIONAL DATABASE MANAGEMENT SYSTEM

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 03 (02+01)
Total number of hours per semester (Lecture hour + Tutorial) : 45 (30+15)
Number of Credits : 03

Course Outcomes (CO):

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

CO1[K2]: explain the DBMS concepts, formal relational query language, SQL and concurrency control.

CO2[K3]: apply aggregate functions and DML commands to solve queries.

CO3[K4]: examine the concepts of transaction management and recovery system.

CO4[K5]: justify the different data models and database design.

CO5[K6]: create table and design queries using DML commands.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	9	-	-	-
CO2	9	3	-	3	-	-	-
CO3	9	3	-	3	-	-	-
CO4	9	9	1	3	-	-	-
CO5	9	9	1	3	-	-	-
Weightage of the course	39	27	2	21	-	-	-
Weighted percentage of Course contribution to POs	4.90	5.48	2.22	7.92	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(9L)

Introduction: Database System Applications– Purpose of Database Systems– View of Data– Data Abstraction– Instances and Schemas–Data Models– Database Languages– DDL– DML. Introduction to Data base design – ER diagrams–Beyond ER Design–Entities– Attributes and Entity sets– Relationships and Relationship sets–**Relational Model:** Introduction to the Relational Model -Integrity Constraints over Relations–Enforcing Integrity constraints– Querying relational data– Logical data base Design– Introduction to Views Destroying/ altering Tables and Views.

Unit II

(5L+4T)

Relational Algebra and Calculus: Relational Algebra –Selection and Projection– Set operations– Renaming– Joins– Division, Examples of Algebra Queries–Relational calculus – Tuple relational Calculus – Domain relational calculus –Expressive Power of Algebra and calculus. **Form of Basic SQL Query**–Examples of Basic SQL Queries–Introduction to Nested Queries– Correlated Nested Queries– Set -Comparison Operators– Aggregate Operators– NULL values –Comparison using Null values – Logical connectives – AND, OR and NOT – Impact on SQL Constructs–Outer Joins– Disallowing NULL values– Complex Integrity Constraints in SQL Triggers and Active Data bases

Unit III

(5L+4T)

Introduction to Schema Refinement: Problems Caused by redundancy–Decompositions – Problem related to decomposition– Functional Dependencies – Reasoning about FDS– NormalForms -FIRST, SECOND, THIRD Normal forms –BCNF –Properties of Decompositions – Lossless join Decomposition– Dependency preserving Decomposition– Schema Refinement in Database Design – Multi valued Dependencies – FOURTH Normal Form– Join Dependencies, FIFTH Normal form.

Unit IV

(5L+4T)

Indexing and Hashing: Basic Concepts – Ordered Indices – B⁺ - Tree Index Files – B⁺ - Tree Extensions – **Transactions:** Transaction concept - A Simple Transaction model – Storage structure – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Transaction Isolation and Atomicity.

Unit V

(6L+3T)

Concurrency Control: Lock based Protocols – Deadlock Handling – Multiple Granularity – Timestamp-Based Protocol – Validation Based Protocols **Recovery System:** Recovery and Atomicity – Recovery Algorithm.

Text Book:

1. Raghu Ramakrishnan and Johannes Gehrke (2003), *Database Management Systems*, McGraw Hill, Third Edition.
Unit- I, II, III
2. Abraham Silberschatz, Henry F Korth, Sudarshan L (2019), *Database System Concepts*, McGraw Hill Education, Sixth Indian Edition.
Unit- IV, V

Reference Books :

1. ElmasriRamez and NavatheShamkant(2017),*Fundamentals ofDatabase Systems*, Pearson India, 7th edition.
2. ArepalliGopi and MonelliAyyavaraiah(2017), *Database Management System*, Horizon Books.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
SQL	II	Design Queries
Normal form	III	Mind maps
Indexing, Transaction	IV	Presentation
Concurrency Control	V	Presentation

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER II
CORE COURSE**

MDCA2L1- DOT NET PROGRAMMING LAB

(For those who have joined in June 2020 and later)

Contact hours per week : 05

Total number of hours per semester : 75

Number of Credits : 03

Course Outcomes (CO):

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

CO1[K3]: build simple applications using VB.Net.

CO2[K6]: create Simple Windowing Applications in C#.Net.

CO3[K6]: combine Windows Applications with Database using ADO.Net.

CO4[K6]: construct Web based Programs.

CO5[K6]: develop Master Pages.

CO-PO Mapping table (Course Articulation Matrix)

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COs							
CO1	9	3	-	3	-	-	-
CO2	9	9	-	3	-	-	-
CO3	9	9	3	-	-	-	-
CO4	9	9	3	3	-	-	-
CO5	9	9	-	1	-	-	-
Weightage of the course	45	39	6	10	-	-	-
Weighted percentage of Course contribution to POs	5.65	7.91	6.67	3.77	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Areas of Programs:

VB.NET

1. Simple programs using various controls
2. Database application using Bound controls

C#.NET

1. Simple programs using statements and functions
2. Simple programs using exception handling concept
3. Simple Pointer programs
4. Simple Windowing Applications
5. Database Applications using ADO.Net

ASP.NET

1. Developing Web Programs using standard controls
2. Developing Web Programs using navigation controls
3. Developing Web Programs to display records using Data Grid view
4. Developing Web Programs to add, edit and modify records using Data Grid view

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER II
CORE COURSE**

MDCA2L2 – COMPUTER NETWORKS LAB

(For those who have joined in June 2020 and later)

Contact hours per week : 04

Total number of hours per semester : 60

Number of Credits : 03

Course Outcomes (CO):

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

CO1[K3]: build to measure the network performance.

CO2[K3]: implement routing algorithms.

CO3[K3]: make use of data link layer protocols.

CO4[K6]: develop simple programs for Error detection and correction.

CO5[K6]: design applications using TCP and UDP protocol.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	3	-	3	-	-	-
CO2	9	9	3	3	-	-	-
CO3	9	9	-	3	-	-	-
CO4	9	9	-	3	-	-	-
CO5	9	9	3	3	-	-	-
Weightage of the course	45	39	6	15	-	-	-
Weighted percentage of Course contribution to POs	5.65	7.91	6.67	5.66	-	-	-

Based on the level of contribution (9-High, 3-Medium, 1-Low)

Areas of Programs

1. Displaying IP address.
2. Finding Maximum Data Rate, Bit Rate, Baud rate (channel capacity) for Noiseless and Noisy channels.
3. Implementation of Data Link Layer Protocols.
4. Implementation of Checksum.
5. Implementation of CRC.
6. Implementation of Routing Algorithms.
7. Echo client server using TDP and UDP.
8. Chatting program using TCP and UDP.
9. File Transfer Program.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER III
CORE COURSE**

**MDCA31 – SOFTWARE ENGINEERING
(For those who have joined in June 2020 and later)**

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)
Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)
Number of Credits : 04

Course Outcomes (CO):

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

CO1[K2]: discuss the software engineering, processes, requirements engineering and ethical values.

CO2[K2]: explain the process of managing software projects.

CO3[K3]: use the UML diagrams and the MVC pattern.

CO4[K4]: analyze the system models, design and testing methods.

CO5[K5]: interpret the system architecture, project scheduling and estimation techniques.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	1	1	1	-	-
CO5	9	3	-	1	-	-	-
Weightage of the course	33	15	2	11	1	-	-
Weighted percentage of Course contribution to POs	4.15	3.04	2.22	4.15	14.29	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(9L+3T)

Introduction to Software Engineering: Professional software development – Software engineering ethics. **Software processes:** Software process models – Process activities – **Requirements engineering:** Functional and non-functional requirements – Requirements engineering processes – Requirements elicitation – Requirements specification – Requirements validation.

Unit – II

(8L+4T)

System modeling: Introduction – Context models – Interaction models – Structural models – Behavioral models – Model driven architecture - **Architectural design:** Architectural design decisions – Architectural views – Architectural patterns – Application architectures. **Design**

and implementations: Object-Oriented design using the UML – Design patterns – Implementation issues – Open-source development.

Unit – III

(8L+4T)

Software testing: Introduction – Development testing – Release testing – User testing.

Software evolution: Evolution processes – Software maintenance. **Project Management:** Risk management– Managing people –Team work.

Unit – IV

(12L)

Project planning: Project scheduling– Estimation techniques – COCOMO cost modeling.

Quality management: Software quality – Software standards – Reviews and Inspections – Software measurement. **Configuration management:** System building – Change management.

Unit – V

(8L+4T)

Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Discrimination- Character - Collegiality and Loyalty – Confidentiality - Professional Rights – Computer Ethics.

Text Book:

1. Ian Sommerville (2017),*Software Engineering*, Pearson Education, 10th Edition.

Units I - IV

2. Mike W. Martin and Roland Schinzinger (2005), *Ethics in Engineering*, Tata McGraw Hill, New Delhi, 4th Edition.

Unit V

Reference Books:

1. Roger S. Pressman, Bruce R. Maxim (2015),*Software Engineering: A Practitioner's Approach*, Published by McGraw-Hill Education, Eighth Edition.

2. Govindarajan M, Natarajan S, Senthil Kumar V. S(2004), *Engineering Ethics*§, Prentice Hall of India.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Software processes, Requirements engineering	I	Field visit/Lab visit
Architectural design	II	Mind maps/Group discussion
Software testing, Project Management	III	Presentation/Video
Morals, Values and Ethics	V	Role Play

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER III
CORE COURSE**

MDCA32 –ANDROID APPLICATION DEVELOPMENT

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)

Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)

Number of Credits : 04

Course Outcomes (CO):

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

CO1[K2]: describe the usage of Activities, Fragments, Intents and user interfaces of Android.

CO2[K2]: discuss the creation of various views, dialog boxes, Interactive Menus and ActionBars.

CO3[K3]: implement views, databases, content providers and services.

CO4[K4]: examine the utilization of resources, media, Google maps and SMS.

CO5[K6]: create Android applications using different widgets and simple services.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	3	-	-	-
CO2	3	3	1	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	1	1	-	-	3
CO5	9	9	1	1	-	-	3
Weightage of the course	33	21	5	11	-	-	6
Weighted percentage of Course contribution to POs	4.15	4.26	5.56	4.15	-	-	15.79

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(10L+2T)

Getting started with Android Programming: Introduction – Obtaining the Required Tools – Creating your First Android Application – Anatomy of an Android Application. **Activities, Fragments, and Intents:** Understanding Activities – Linking Activities Using Intents – Fragments – Calling Built-in Applications Using Intents – Displaying Notifications. **Getting to know the Android User Interface:** Understanding the Components of a Screen – Adapting to Display Orientation –Utilizing the Action Bar – Creating the User Interface Programmatically – Listening for UI Notifications.

Unit II

(9L+3T)

Designing your User Interface with Views: Using Basic Views – Using Picker Views – Using List Views to Display Long Lists – Understanding Specialized Fragments. **Displaying**

Pictures and Menus with Views: Using Image Views to Display Pictures – Using Menus with Views – Some Additional Views.

Utilizing Resources and Media: Resources – Creating Values Resources – Using Drawable Resources.

Unit – III

(12L)

Utilizing Resources and Media: Switching States with Toggle Buttons – Creating an Image Switcher Application - Scrolling through ScrollView – Playing Audio – Playing Video.**Displaying and Fetching Information Using Dialogs and Fragments:** Dialogs.

Unit – IV

(7L+5T)

Using Databases: Using the SQLiteOpenHelper Class – Accessing Databases with the ADB – Creating a Data Entry Form - **Displaying Web Pages and Maps:** Displaying Web Pages – Using the WebViewClient Class – Using Google Maps (Obtaining a Google Maps API Key – Installing the Google API – AVDs for Map-Based Applications – Creating a Google Maps-Based Application – Using Location-Based Services – Supplying values through DDMS – Displaying Map Locations – Printing the GPS Location Address).

Unit – V

(7L+5T)

Communicating with SMS and Emails: Understanding Broadcast Receivers – Using the Notification System – Sending SMS Messages with Java Code – Receiving SMS Messages – Sending Email - Working with the Telephony Manager – **Creating and Using Content Providers:** What is a Content Provider – Understanding the Android Content URI – Using Content Providers -**Creating and Consuming Services:** Creating a Service – Creating a Bound Service – Setting Up Alarms – Using Sensors.

Text Books:

1. Wei-Meng Lee (2018), “*Beginning Android 4 Application Development*”, Wiley India Pvt. Ltd.
Units – I and II
2. B.M.Harwani (2013), “*Android Programming Unleashed*”, Pearson Education Inc.
Units – III, IV and V

Reference Books:

1. Charlie Collins, Michael D.Galpin, Matthias Kappler(2016), *Android in Practice*, DreamTech Press.
2. Reto Meier(2015), *Professional Android 4 Application Development*, Wiley Publishing.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Activities, User Interface	I	Mind maps
Views, Pictures, Menus	II	Simple App design
Displaying Web Pages and Maps	IV	Presentation
Communicating with SMS and Emails, Services	V	Group Discussion

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

**M. C. A.
SEMESTER III
CORE COURSE**

MDCA33 – OPEN SOURCE PROGRAMMING

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 04 (03+01)

Total number of hours per semester (Lecture hour + Tutorial) : 60 (45+15)

Number of Credits : 03

Course Outcomes (CO):

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

CO1[K2]: describe the features of Python, primitives, operators, statements, functions and module.

CO2[K2]: explicate the working of class, inheritance, operator overloading and exception handling mechanism.

CO3[K3]: implement the operators, statements, functions and modules in python code.

CO4[K4]: examine the concepts of strings, files and data structures.

CO5[K6]: develop simple programs using data structures, strings, class and exceptions.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	-	3	-	-	-
CO4	9	3	-	3	-	-	-
CO5	9	9	1	3	-	-	1
Weightage of the course	33	21	1	15	-	-	1
Weighted percentage of Course contribution to POs	4.15	4.26	1.11	5.66	-	-	2.63

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I

(9L+3T)

Basics of Python Programming: Features of Python – Writing and Executing First Python Program – Literal Constants – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved Words – Indentation – Operators and Expressions – Operations on Strings –Type Conversion – **Decision Control Statements:** Selection/Conditional branching statements –Basic Loop Structures/Iterative statements – Nested Loops – break statement – continue statement – pass statement – else statement used with loops.

Unit II

(8L+4T)

Functions and Modules: Introduction – Function Definition- Function call – return statement – More on Defining Functions - Lambda functions – Recursive functions – Modules – Packages in Python - Function Redefinition – **Python Strings Revisited:** Introduction –String Formatting Operator – Built-in String Methods and Functions – Slice operation – Comparing strings – Iterating string – Regular Expressions.

Unit III

(8L+4T)

File Handling: Introduction – Types of files – Opening and Closing files – Reading and Writing files – Renaming and Deleting files - **Data Structures:** Sequence – Lists – Functional Programming – Tuple – Sets – Dictionaries.

Unit IV

(8L+4T)

Classes and Objects: Introduction – Classes and Objects – Class Method and self Argument – The `__init__()` Method – Class Variables and Object Variables – The `__del__()` Method – Other Special Methods – Public and Private Data Members – Private Methods – Calling a Class Method from Another Class Method – Built-in Functions to Check, Get, Set and Delete Class Attributes – Built in Class Attributes – Class Methods - **Inheritance:** Introduction – Inheriting Classes in Python – Types of Inheritance – Abstract classes and interfaces.

Unit V

(12L)

Operator Overloading:Introduction – Implementing Operator Overloading – Reverse Adding – Overriding `__getitem__()` and `__setitem__()` methods – Overriding the in operator – **Error and Exception Handling:** Introduction to Errors and Exceptions – Handling Exceptions – Multiple Except Blocks – Multiple Exceptions in a Single Block – Except Block without Exception – The else clause – Raising Exceptions – Instantiating Exceptions – The finally block.

Text Book:

ReemaThareja (2018), *Python Programming using Problem Solving Approach*, Oxford University Press, New Delhi, India.

Reference Books:

1. Allen Downey, Jeffrey Elkner, Chris Meyers (2016), *Learning with Python*, DreamTech Press, New Delhi, India.
2. John Paul Mueller (2018), *Beginning Programming with Python*, John Wiley & Sons, Inc., Second Edition.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Python Basics	I	Simple code design
Functions, Modules, Strings	II	Presentation
Data Structures	III	Video
Classes and Objects, Inheritance	IV	Mind maps

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

M. C. A.

SEMESTER III

CORE COURSE

MDCA3L1- ANDROID APPLICATION DEVELOPMENT LAB

(For those who have joined in June 2020 and later)

Contact hours per week :04

Total number of hours per semester : 60

Number of Credits : 03

Course Outcomes (CO):

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

CO1[K3]: build advanced Android applications for publishing.

CO2[K6]: develop simple Android Applications using Basic Widgets.

CO3[K6]: create applications using scrollview and selection Widgets.

CO4[K6]: design applications using Menus, dialog boxes and some special views.

CO5[K6]: formulate the applications to connect with the SQLite Database.

CO-PO Mapping table (Course Articulation Matrix)

COs \ POs	POs						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	3	-	3	-	-	-
CO2	9	9	1	1	-	-	-
CO3	9	9	-	1	-	-	-
CO4	9	9	-	1	-	-	-
CO5	3	-	1	1	-	-	-
Weightage of the course	39	30	2	7	-	-	-
Weighted percentage of Course contribution to POs	4.90	6.09	2.22	2.64	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Areas of Programs:

1. Program using Basic Widgets (TextView, EditText, CheckBox&RadioButtons).
2. Programs using ScrollView and ProgressBar.
3. Programs using Selection Widgets (ListView, Spinner Control &GridView Control).
4. Program to Check the Login Page Using Intent.
5. Program to Pass Value from one form to another.
6. Program to Create the Options Menu.
7. Program to Insert, Delete, Update and Select the Database.
8. Program to Display the Web Page Using Web View Control.
9. Creating simple applications using dialog boxes.
10. Creating applications for course enrollment, room booking, quiz Programme, etc.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS
M. C. A.
SEMESTER III
CORE COURSE

MDCA3L2 – SOFTWARE DEVELOPMENT LAB

(For those who have joined in June 2020 and later)

Contact hours per week : 03

Total number of hours per semester : 45

Number of Credits : 02

Course Outcomes (CO):

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

CO1[K3]: build simple python programs.

CO2[K3]: apply Data Mining, security and Image Processing techniques.

CO3[K6]: develop programs using Server side scripts.

CO4[K6]: construct UML diagrams.

CO5[K6]: design programs using R.

CO-PO Mapping table (Course Articulation Matrix)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	3	1	3	-	-	-
CO2	9	3	1	3	-	-	1
CO3	9	9	1	3	-	-	-
CO4	9	9	1	3	-	-	-
CO5	9	9	1	3	-	-	-
Weightage of the course	45	33	5	15	-	-	1
Weighted percentage of Course contribution to POs	5.65	6.69	5.56	5.66	-	-	2.63

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Areas of Programs:

1. Programs using Python.
2. Programs using R
3. Programs using server side scripts.
4. Programs using Data Mining Techniques.
5. Programs using Digital Image Processing Techniques.
6. Programs in Cryptography.
7. Develop use case diagram, sequence diagram and class diagram for various software projects.

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DEPARTMENT OF COMPUTER APPLICATIONS
M. C. A.
SEMESTER III
CORE ELECTIVE COURSE
MDCA3E1– DATA SCIENCE AND ANALYTICS
(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 06 (05+01)
Total number of hours per semester (Lecture hour + Tutorial) : 90 (75+15)
Number of Credits : 05

Course Outcomes (CO):

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

CO1[K2]: describe the basic concepts of Data Science, its terminologies, Data Management and analysis.

CO2[K2]: explain Machine Learning Algorithms, Regression, SVM, Naïve Bayes and Data Visualization.

CO3[K4]: examine recent trends in Data Science, Big Data Visualization and applications of Data Science Technologies.

CO4[K5]: calculate various Statistical measures using R.

CO5[K6]: create simple code using python and Bokeh.

CO-PO Mapping table (Course Articulation Matrix)

COs \ POs	POs						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	-	3	-	-	-
CO5	9	3	3	3	-	-	-
Weightage of the course	33	15	4	15	-	-	-
Weighted percentage of Course contribution to POs	4.15	3.04	4.44	5.66	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit I (18L)

Introduction to Data Science: Data Science – Terminology Related with Data Science – Methods of Data Repository – Personnel involved with Data Science – Types of Data – The Data Science Process (DSP) – Popular Data Science Toolkits.

Unit II (13L+5T)

Data Management using IBM SPSS: Data Management Planning – Data Management Plan – Data Collection and Management – **Data Analysis using R programming language:** Introduction to Applied Statistical Techniques – Types of Statistical Data – Types of Big

Data Analytics – Calculating Various Statistical Measures using R – Examining the distribution of a set of Data.

Unit III (13L+5T)

Machine Learning Algorithms – Linear Regression – Support Vector Machine – Naïve Bayes – **Data Visualization:** Data Visualization – Data Attributes – Importance of Data Visualization – Conventional Data Visualization Methods.

Unit IV (13L+5T)

Applications of Data Science Technologies for Visualization and Bokeh (Python): Introduction to Python – Basic Numeric Operations – Data Types in Python – Modules – Library – Introduction to Bokeh.

Unit V (18L)

Recent Trends – Data Analysis: Recent trends in various Data Collection and Analysis Techniques – Various Big Data Visualization Tools – Visualizing Big Data – Challenges of Big Data Visualization.

Text Books:

V.K. Jain (2019), *Data Science and Analytics (with Python, R and SPSS Programming)*, Khanna Publishing.

Reference Books

1. Mendelevitch, Casey Stella, Douglas Eadline (2017), *Practical Data Science with Hadoop and Spark: Designing and Building Effective Analytics at Scale (Addison-Wesley Data & Analytics)*, Kindle Edition, 1st Edition.
2. M. SudheepElayidom (2015) , *Data Mining and Warehousing*, Cingage learning.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Data Analysis	II	Problem Solving
Data Visualization	III	Presentation
Python Concepts	IV	Simple code design

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

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DEPARTMENT OF COMPUTER APPLICATIONS**

M. C. A.

SEMESTER III

CORE ELECTIVE COURSE

MDCA3E2 – SOFT COMPUTING

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 06 (05+01)
Total number of hours per semester (Lecture hour + Tutorial) : 90 (75+15)
Number of Credits : 05

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

CO1[K2]: explain the concepts of Fuzzy Logic, neural networks and its applications.

CO2[K3]: use Fuzzy Sets and Genetic Algorithms in Game Playing and Color Recipe Prediction.

CO3[K4]: differentiate supervised and unsupervised learning.

CO4[K4]:analyze Neuro-Fuzzy Control systems.

CO5[K5]: assess Neuro-Fuzzy logic models and control systems

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	-	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	-	3	-	-	-
CO5	9	3	3	3	-	-	-
Weightage of the course	33	15	4	15	-	-	-
Weighted percentage of Course contribution to POs	4.15	3.04	4.44	5.66	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(13L+5T)

Fuzzy Set Theory: Fuzzy sets: Introduction – Basic Definitions and Terminology– Set Theoretic Operations – MF Formulation and Parameterization – More on Fuzzy Union, Intersection and Complement – **Fuzzy rules and Fuzzy Reasoning:** Introduction – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – **Fuzzy Inference Systems:** Introduction – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy models.

Unit – II

(13L+5T)

Neural Networks: Adaptive Networks: Introduction – Architecture – Back propagation for Feed Forward Networks–**Supervised Learning Neural Networks:**Introduction – Perceptrons – Adaline – **Learning from Reinforcement:** Art of Dynamic Programming – Adaptive Heuristic Critic – Q-learning – **Unsupervised Learning and Other Neural Networks:**Introduction – Competitive Learning Networks – Kohonen Self-organizing Networks.

Unit – III**(13L+5T)**

Neuro Fuzzy Modeling : Adaptive Neuro-Fuzzy Inference Systems (ANFIS) : Introduction – ANFIS Architecture – Hybrid Learning Algorithm – Learning Methods that Cross Fertilize ANFIS and RBFN – **Coactive Neuro-Fuzzy Modelling :** Introduction – Framework – **Advanced Neuro Fuzzy Modeling : Classification and Regression Trees:** Introduction – Decision Trees – CART Algorithm for Tree Induction – **Data Clustering Algorithm:** Introduction – K-Means Clustering – Fuzzy C-Means Clustering – Mountain Clustering – Subtractive Clustering – **Rule base Structure Identification:** Introduction – Input Selection – Input Space Partitioning – Rule-base Organization – Focus Set-Based Rule Combination.

Unit – IV**(18L)**

Neuro-Fuzzy Control : Neuro-Fuzzy Control I : Introduction – Feedback Control System and Neuro-Fuzzy Control: An overview – Expert Control – Inverse Learning – Fundamentals – Specialized Learning – Back Propagation Through Time and Real-Time Recurrent Learning – Fundamentals – **Neuro Fuzzy Control II:** Introduction – Reinforcement Learning Control – Gradient Free Optimization – Gain Scheduling – Fundamentals – Feedback Linearization and Sliding Control - **Advanced Applications :** ANFIS Applications

Unit – V**(18L)**

Advanced Applications:Fuzzy Filtered Neural Networks – Introduction –Fuzzy Filtered Neural Networks– Application 1: Plasma Spectrum Analysis – Application 2: Hand Written Numeral Recognition – **Soft Computing for Color Recipe Prediction:** Introduction – Color Recipe Prediction – Single MLP approaches – CANFIS Modeling for Color Recipe Prediction – Color Paint Manufacturing Intelligence.

Text Book:

Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani (2017), *Neuro-Fuzzy and Soft Computing – A Computational Approach to Learning and Machine Intelligence*, Pearson Education.

Reference Books:

1. Rajasekaran S. and Pai G.A.V. (2010), *Neural Networks, Fuzzy Logic and Genetic Algorithms*, PHI.
2. Timothy J. Ross (2009), *Fuzzy Logic with Engineering Application*, Tata McGraw Hill, Second Edition.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Fuzzy Set Theory, Fuzzy rules	I	Presentation
Supervised Learning, Unsupervised Learning	II	Comparative Study/Group Discussion
Classification, Clustering	III	Mind maps

Marks are recorded for each student in each learning activity and which can be taken as

assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

M. C. A.

SEMESTER III

CORE ELECTIVE COURSE

MDCA3E3 – INTERNET OF THINGS

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 05 (04+01)

Total number of hours per semester (Lecture hour + Tutorial) : 75 (60+15)

Number of Credits : 05

Course Outcomes (CO):

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

CO1[K2]: describe the fundamental concepts, domain specific and design methodologies of IoT.

CO2[K2]: discuss IoT platform design, logical design and physical servers.

CO3[K4]: compare the different IoT Physical Devices and endpoints.

CO4[K4]: analyze the IoT web applications and various tools for IoT.

CO5[K5]: assess transducers, sensors,actuators and various IoT protocols.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	1	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	1	3	-	-	-
CO5	9	3	1	3	-	-	-
Weightage of the course	33	15	4	15	-	-	-
Weighted percentage of Course contribution to POs	4.15	3.04	4.44	5.66	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(11L+4T)

Introduction to Internet of Things: Introduction– Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – **Domain Specific IoT:** Introduction – Home Automation – Cities – Environment – Retail

Unit – II

(11L+4T)

IoT and M2M: Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT – **IoT Platforms Design Methodology:** Introduction – IoT Design Methodology – **IoT Systems – Logical Design using Python:** Introduction– Installing Python – Python Data Types & Data Structures – Control Flow – Functions – **IoT Physical Servers & Cloud Offerings:** Introduction toCloud Storage Models& Communication APIs – WAMP – AutoBahn for IoT – Xively Cloud for IoT – Amazon Web Services for IoT

Unit – III

(11L+4T)

Transducers, Sensors and Actuators: Defining Transducers, Sensors and Actuators – Introduction to Transducers – Introduction to Sensors – Introduction to Actuators – Interfacing Concepts to Embedded System – **IoT Protocols:** Protocol Classification – MQTT – XMPP – DDS – AMQP

Unit – IV

(12L+3T)

IoT Physical Devices and Endpoints Arduino UNO: Define Arduino– Exploring Arduino Uno learning Board – Installing Software – Fundamentals of Arduino Programming – **IoT Physical Devices and Endpoints Raspberry Pi:** Define Raspberry Pi – Exploring Raspberry Pi learning Board – Raspberry Pi Operating Systems – Operating System setup on Raspberry Pi – Raspberry Pi Comments – Programming Raspberry Pi with Python – **IoT Physical Devices and Endpoints**

Unit – V

(15L)

IoT Web Application Development: Introduction – HTML – CSS – JavaScript – MongoDB
Tools for IoT: Introduction – Chef – Puppet.

Text Books:

1. ArshdeepBahga. Vijay Madiseti (2018), *Internet of Things – A Hands-on Approach*, Universities Press Private Ltd.
Units – I, II
2. Srinivasa K.G, Siddesh G.M, Hanumantha Raju R (2019), *Internet of Things*, Cengage Learning India Pvt.Ltd.
Units – III, IV, V

Reference Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossette, Rob Barton, Jerome Hentry (2019), *IoT Fundamentals*, Pearson India Education Services Pvt.Ltd.
2. AnandTamboli (2019), *Built your Own IoT Platform*, Apress.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Domain Specific IoT	I	Mind maps
IoT and M2M	II	Comparative Study
Transducers, Sensors and Actuators	III	Video
Arduino UNO, Raspberry Pi	IV	Presentation

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS**

M. C. A.

SEMESTER III

CORE ELECTIVE COURSE

MDCA3E4 – DIGITAL IMAGE PROCESSING

(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 05 (04+01)
Total number of hours per semester (Lecture hour + Tutorial) : 75 (60+15)
Number of Credits : 05

Course Outcomes (CO):

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

CO1[K2]: describe the fundamentals of digital image and transformation process.

CO2[K2]: explicate filtering in frequency domain, image restoration and reconstruction methods.

CO3[K4]: examine histogram processing, point, line and edge detection techniques.

CO4[K4]: analyze the segmentation, filtering and compression techniques.

CO5[K5]: appraise and justify the image segmentation, process of digital image, compression and filtering methodologies.

CO-PO Mapping table (Course Articulation Matrix)

POs \ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	3	-	-	-
CO2	3	3	1	3	-	-	-
CO3	9	3	1	3	-	-	-
CO4	9	3	1	3	-	-	-
CO5	9	3	1	3	-	-	-
Weightage of the course	33	15	4	15	-	-	-
Weighted percentage of Course contribution to POs	4.15	3.04	4.44	5.66	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(11L+4T)

Introduction: Digital Image Processing – The Origins of Digital Image Processing– Fundamental Steps in Digital Image Processing – Components of an Image Processing System – **Digital Image Fundamentals:** Image Sampling and Quantization – Some Basic Relationships Between Pixels - An Introduction to the Mathematical Tools used in Digital Image Processing.

Unit – II

(12L+3T)

Intensity Transformations and Spatial filtering: Background – Some Basic Intensity Transformations Functions – Histogram Processing (Histogram Equalization, Histogram

Matching, Local Histogram Processing) – Fundamentals of spatial Filtering – smoothing spatial Filters- sharpening spatial Filters.

Unit – III (15L)

Filtering in the Frequency Domain: Sampling and the Fourier Transform of Sampled Functions- The Discrete Fourier Transform (DFT) of One Variable - Thebasics of filtering in the frequency domain - Image Smoothing using Frequency Domain Filters- Image Sharpening using Frequency Domain Filters.

Unit – IV (11L+4T)

Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process –Restoration in the presence of Noise only Spatial Filtering. **Image Segmentation:** Point, Line and Edge Detection (Background- Detection of Isolated Points-Line Detection-Edge Models-Basic Edge Detection- More Advanced Techniques for Edge Detection).

Unit – V (11L+4T)

Image Compression: Some basic Image Compression Methods (Huffman Coding– Golomb Coding - Arithmetic Coding - LZW Coding - Run-Length Coding- Symbol-Based Coding- Bit-Plane Coding- Block Transform Coding - Wavelet Coding).

Text Book:

Rafael C. Gonzalez, Richard E. Woods (2018), *Digital Image Processing*, Pearson Education, Fourth Edition.

Reference Books:

1. Anil K Jain (2015), *Fundamentals of Digital Image Processing*, Pearson Education.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar (2009), *Digital image processing*, Tata McGraw Hill EducationPvt Limited.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Digital Image Fundamentals	I	Presentation
Intensity Transformations and Spatial filtering	II	Comparative Study
Image Segmentation	IV	Mind maps
Image Compression	V	Problem Solving/Video

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS
M. C. A.
SEMESTER IV
CORE COURSE
MDCA4P- PROJECT WORK AND VIVA VOCE
(For those who have joined in June 2020 and later)

Number of Credits : 12

Course Outcomes (CO):

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

CO1[K3]: make use of hardware and/or software techniques for business to meet the global competency.

CO2[K4]: test and analyze the modules of planned project.

CO3[K5]: assess the literature and develop solutions for real-time problem statement.

CO4[K6]: develop technical report and deliver presentation.

CO5[K6]: apply professional and managerial skills to achieve project goal.

CO-PO Mapping table (Course Articulation Matrix)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	3	1	3	-	-	1
CO2	9	3	3	3	3	-	1
CO3	9	3	1	3	3	-	1
CO4	9	3	3	3	-	-	3
CO5	9	3	3	3	-	3	3
Weightage of the course	45	15	11	15	6	3	9
Weighted percentage of Course contribution to POs	5.65	3.04	12.22	5.66	85.71	60	23.68

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Rules governing Project Report

1. During the sixth semester, the students have to undertake project individually by selecting a problem of their choice pertaining to this discipline.
2. The project report should be free from plagiarism and the students should check problem specification and abstract part of their report against plagiarism in the library before one week of submission. The plagiarism report should be enclosed along with the project report.
3. Two copies of the project report with 60-80 pages excluding bibliography and appendices should be submitted on or before the last working day of the students.

4. The project report shall be evaluated by the guide and the external examiner for 50 marks. The *Viva-voce* examination shall be conducted jointly by the guide and external examiner for 50 marks.
5. For a pass in the project, each student should secure a minimum of 50% of marks.
6. If a student fails to get a minimum pass mark, she may be permitted to resubmit her project report once again within the period of six months after the publication of results.
7. If a student fails to submit the project report within the stipulated time the candidate can submit the same after getting permission from the Chief Controller of Examinations along with the fine.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI.
DEPARTMENT OF COMPUTER APPLICATIONS
SEMESTER II
ELECTIVE COURSE
MDCA2E – MULTIMEDIA SYSTEMS
(For those who have joined in June 2020 and later)

Contact hours per week (Lecture hour + Tutorial) : 06 (05+01)
Total number of hours per semester (Lecture hour + Tutorial) : 90 (75+15)
Number of Credits : 05

Course Outcomes (CO):

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

- CO1[K2]: describe the basic concepts of Multimedia, Text and Product Design.
- CO2[K2]: demonstrate the working of Text, Video and Animation in Photoshop
- CO3[K3]: apply text, Painting and Retouching tools in Photoshop.
- CO4[K4]: analyze the concepts of Digital Video, Animation and Product Design.
- CO5[K5]: assess the concept of Graphics and Digital Audio.

CO-PO Mapping table (Course Articulation Matrix)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	1	-	-	-
CO2	3	1	1	1	-	-	-
CO3	9	1	1	1	-	-	-
CO4	3	1	1	3	-	-	-
CO5	1	3	3	-	-	-	-
Weightage of the course	19	7	7	6	-	-	-

Based on the level of contribution(9-High, 3-Medium, 1-Low)

Unit – I

(18L)

Introduction: Multimedia - The Multimedia market – Content and copyright - Resources for Multimedia Developers – Multimedia Computer Architecture. **Text:** Elements of text (Text Technology, Types of fonts, Fonts and Operating Systems) – Text Data Files (ASCII, Encoded or Formatted Text, Proprietary Text formats) – Using text in multimedia applications – Hypertext.

Unit – II

(14L+4T)

Graphics: Element of graphics (Pictures and Images, Raster or Bitmap Images, Vector Images) – Images and Color (Computer Display Resolution, Computer-generated Color, Color Palettes and Color Look-up Tables, Color Dithering, Color Flashing) – Graphics File and Application Formats – Obtaining images for multimedia use (Painting and Drawing Applications, Scanners, Video and Image digitizers, Digital Cameras)– Using Graphics in Multimedia Applications(Selecting graphics for multimedia, Backgrounds and Transitions,

Information Delivery, Navigation). **Digital Audio:** Characteristics of sound and digital audio (Voice and Music, Digitizing Sound, Calculating Audio Data size) – Using Audio in multimedia applications (Audio Quality, Audio for Managing Software Function, Using Audio to Enhance other Content, Audio for Content Delivery).

Unit III

(13L+5T)

Digital Video & Animation: Background on video (Sources of Digital Video, Types of Analog Video, Component Video, Digital Video, Computer based Digital Video) – Video capture & Playback systems (Digital Video Software) – Computer Animation (Creating Animation, Object-based animation) – Using Digital Video in Multimedia Applications. **Product Design:** Classes of products (Non-Interactive Multimedia, Interactive Multimedia, Interactive strategies for organizing information, Interactivity and Presentation Strategies) – Content organizational strategies (Reference, Temporal, Geographical, Systemic, Organizational) – Storyboarding.

Unit IV:

(12L+6T)

Getting Started with Photoshop CS6: Exploring the New Photoshop Interface – Creating a New Document – Saving a Document – Opening an Existing Document – Working with Tools Panel – Using Screen Modes (Standard Screen Mode, Full Screen Mode with Menu bar, Full Screen Mode) – **Making Photoshop Selections:** Making a Selection with Selection Tools. **Working with Text:** Exploring Character and Paragraph Panels – Creating a Text – Formatting Text using the Options Bar, Formatting Text using the Character Panel – Working with Text, Working with Type Mask, Working with Character Styles – Creating 3D Text.

Unit V:

(18L)

Painting and Retouching in Photoshop: Working with Painting Tools - Working with Retouching Tools. **Working with Video and Animation:** Working with Digital videos (Importing Existing Video Files, Creating a Video Layer, Creating a New Video Project) – Modifying a Video Layer (Trimming a Video File, Splitting a Video layer, Adding a Transition to a Video layer, Adding text and Vector Elements, Adding Audio to Video Project, Rendering and Exporting Video) – Working with Animation.

Text Books:

1. David Hillman (2015), *Multimedia Technology & Applications*, Galgotia Publications Pvt Ltd.

UNIT I, II, III

2. Kogent Solutions Inc., 2013, *Photoshop CS6 in Simple Steps*, Dreamtech Press, New Delhi.

UNIT IV, V

Reference Books:

1. Lisa Danae Dayley, Brad Dayley (2014), *Adobe Photoshop CS6*, Wiley India Pvt. Ltd.
2. Judith Jeffcoate (2015), *Multimedia in Practice – Technology and applications*, Prentice Hall of India.

Tutorials:

Topic	Unit	Constructive Alignment - Learning Activity
Graphics	II	Presentation
Digital Video & Animation	III	Presentation/Mind maps
Photoshop CS6 tools	IV	Create simple designs

Marks are recorded for each student in each learning activity and which can be taken as assignment marks.