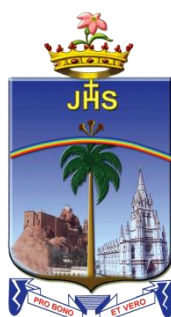# MCA

LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE

WITH CHOICE BASED CREDIT SYSTEM (CBCS)

DEPARTMENT OF COMPUTER SCIENCE
SCHOOL OF COMPUTING SCIENCES
ST. JOSEPH'S COLLEGE (AUTONOMOUS)
Special Heritage Status Awarded by UGC
Accredited at A^{++} Grade (IV Cycle) by NAAC
College with Potential for Excellence by UGC
DBT-STAR & DST-FIST Sponsored College
Tiruchirappalli - 620 002, Tamil Nadu, India

POSTGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to maintain and uphold the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014 – 15, to meet and excel the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system enhances the optimal utilization of both human and infrastructural resources. It also enhances academic mobility and enriches employability. The School system preserves the identity, autonomy and uniqueness of every department and reinforces Student centric curriculum designing and skill imparting. These five schools adhere to achieve and accomplish the following objectives.

Optimal utilization of resources both human and material for the academic flexibility leading to excellence.

Students experience or enjoy their choice of courses and credits for their horizontal mobility.

The existing curricular structure as specified by TANSCHE and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.

Human excellence in specialized areas

Thrust in internship and / or projects as a lead towards research and

The multi-discipline nature of the School System caters to the needs of stake-holders, especially the employers.

Credit system:

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The credits and hours of each course of a programme is given in the table of Programme Pattern. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses, a student must earn a minimum of 110 credits as mentioned in the programme pattern table. The total number of minimum courses offered by the Department is given in the Programme Structure.

OUTCOME-BASED EDUCATION (OBE)
LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

OBE is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no single specified style of teaching or assessment in OBE; instead, classes, opportunities and assessments should all help the students achieve the specific outcomes

Outcome Based Education, as the name suggests depends on Outcomes and not Inputs. The outcomes in OBE are expected to be measurable. In fact each Educational Institute can state its own outcomes. The ultimate goal is to ensure that there is a correlation between education and employability

Outcome –Based Education (OBE): is a student-centric teaching and learning methodology in which the course delivery, assessment are planned to achieve, stated objectives and outcomes. It focuses on measuring student performance i.e. outcomes at different levels.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs):
PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Programme Educational Objectives (PEOs): The PEOs of a programme are the statements that describe the expected achievement of graduates in their career, and also in particular, what the graduates are expected to perform and achieve during the first few years after Graduation.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC)

A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE)

Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

DSE: Four courses are offered, one course in each semester.

Note: To offer **one DSE**, a minimum of two courses of equal importance / weightage is a must.

One DSE Course in semester two is offered as interdisciplinary/common course among the departments in a School (Common Core Course) at the PG level.

Generic Elective Courses

An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Two GE Courses are offered, one each in semesters II and III. The GE course offered in semester II is within the school level and the GE in semester III is Between Schools level

The Ability Enhancement Courses (AEC)

One Main discipline related Ability Enhancement Course for 3 credits is offered for a PG programme by the Department.

Skill Enhancement Courses (SECs)

These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme.

One SEC is offered in semester II as a compulsory course on Soft Skills, offered by the Department of Human Excellence, common to all the students of PG programme.

Self–paced Learning: It is a course for two credits. It is offered to promote the habit of independent/self learning of Students. Since it is a two credit course, syllabus is framed to complete within 45 hours. It is not taught in the regular working hours.

Comprehensive Examinations: A detailed syllabus consisting of five units to be chosen from the courses offered over the five semesters which are of immense importance and those portions which could not be accommodated in the regular syllabus.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL and etc.

Course Coding:
The following code system (10 alphanumeric characters) is adopted for Post Graduate courses:

21	PXX	N	XX	NN/NNX
Year of Revision	PG Department Code	Semester number.	Part Category	running number/with choice

N:- Numerals   X :- Alphabet
Part   Category
CC - Core Theory
CP- Core Practical
IS- Internship
SP- Self Paced Learning
CE- Comprehensive Examination
PW- Project Work & viva-voce
Electives Courses
ES – Department Specific Electives
EG- Generic Electives
EC - Additional core Courses for Extra Credits (If any)*
Ability Enhancement Courses
AE – Ability Enhancement Course
SE – Skill Enhancement Course – Soft skills
CW - SHEPHERD & Gender Studies (Outreach)

CIA AND SEMESTER EXAMINATION
Continuous Internal Assessment (CIA):

Distribution of CIA Marks	
Passing Minimum: 50 Marks	
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
CIA	100

MID-SEM & END-SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective and Descriptive elements; with the existing question pattern PART-A; PART-B; PART-C and PART D.

2. One of the CIA Component II/III for UG & PG will be of 15 marks and compulsorily a online objective multiple choice question type.

3. The online CIA Component must be conducted by the Department / faculty concerned at a suitable computer centre.

4. The one marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS.

5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.

Duration of Examination must be rational; proportional to teaching hours 90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S. No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level) K- LEVELS	Lower Order Thinking			Higher Order Thinking			Total %
	K1	K2	K3	K4	K5	K6	
SEMESTER EXAMINATIONS	15	20	35	30			100
MID / END Semester TESTS	12	20	35	33			100

QUESTION PATTERN FOR SEMESTER EXAMINATION		MARKS
SECTION		
SECTION–A (No choice ,One Mark) **THREE** questions from each unit	(15x1 =15)	15
SECTION-B (No choice ,2-Marks) **TWO** questions from each unit	(10x2 =20)	20
SECTION-C (Either/or type) (7- Marks) **ONE** question from each unit	(5x7 =35)	35
SECTION-D (3 out of 5) (10 Marks) **ONE** question from each unit	(3x10 =30)	30
	Total	**100**

BLUE PRINT OF QUESTION PAPER FOR SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.							**Max Mark : 100**
K- LEVELS / **SECTIONS**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
SECTION–A (One Mark, No choice) (15x1 =15)	15						**15**
SECTION-B (2-Marks, No choice) (10x2=20)		10					**20**
SECTION-C (7- Marks) (Either/or type) (5x7=35)			5				**35**
SECTION-D (10 Marks) (3 out of 5) (3x10=30) Courses having only **K4** levels				3			
Courses having **K4** and **K5** levels **One K5 level question is compulsory**				2	1		**30**
(Courses having **all the 6** cognitive levels **One K5 and K6 level questions can be compulsory**				1	1	1	
Total	**15**	**20**	**35**	**30**			**100**

QUESTION PATTERN FOR MID/END TEST		
SECTION		**MARKS**
SECTION–A (No choice, One Mark)	(7x1 =7)	**7**
SECTION-B (No choice , 2-Marks)	(6x2 =12)	**12**
SECTION-C (Either/or type) (7- Marks)	(3x7 =21)	**21**
SECTION-D (2 out of 3) (10 Marks)	(2x10=20)	**20**
	Total	**60**

BLUE PRINT OF QUESTION PAPER FOR MID/END TEST							
DURATION: 2. 00 Hours.							**Max Mark: 60.**
K- LEVELS / **SECTIONS**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
SECTION –A (One Mark, No choice) (7 x 1 = 7)	7						**07**
SECTION-B (2-Marks, No choice) (6 x 2 = 12)		6					**12**
SECTION-C (Either/or type) (7-Marks) (3 x 7 =21)			3				**21**
SECTION-D (2 out of 3) (10 Marks) (2x10=20) Courses having only **K4** levels				2			
Courses having **K4** and **K5** levels **One K5 level question is compulsory**				1	1		**20**
Courses having **all the 6** cognitive levels **One K6 level question is compulsory**					1	1	
Total Marks	**07**	**12**	**21**	**20**			**60**
Weightage for 100 %	**12**	**20**	**35**	**33**			**100**

Assessment pattern for two credit courses.

S. No.	Course Title	CIA	Semester Examination	Total Marks
1	Self Paced Learning Course	25 + 25 = 50	50 Marks MCQ (COE)	100
2	Comprehensive Examinations	25 +25 = 50	50 Marks (MCQ) (COE)	100
3	Internship	100	--	100
4	Field Visit	100	--	100
5	Ability Enhancement Course (AEC) for PG (3 credits)	50 (Three Components)	50 (COE) Specific Question Pattern	100
Assessment Pattern for Courses in Part - IV				
6	Value Education Courses and Environmental Studies	50	50 Marks (For 2.00 hours) (COE)	100
7	Skill Enhancement Courses(SECs)	50 marks (by Course in-charge) 50 Marks (by an External member from the Department)		100
8	SEC: SOFT SKILLS (For UG and PG)	100	(Fully Internal)	100

EVALUATION
GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) respectively. These two are calculated by the following formulae:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad WAM\,(Weighted\,Average\,Marks) = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

Where,

C_i is the Credit earned for the Course i

G_i is the Grade Point obtained by the student for the Course i

M_i is the marks obtained for the course i and

n is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

i) The classification of final results shall be based on the CGPA, as indicated in Table-2.

ii) For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99 and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good', and 'Above Average' respectively.

iii) A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.

iv) Absence from an examination shall not be taken an attempt.

Table-1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	**10**	**O**
80 and above and below 90	**9**	A+
70 and above and below 80	**8**	A
60 and above and below 70	**7**	**B+**
50 and above and below 60	**6**	B
Below 50	**0**	RA

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	**O**	**Outstanding**
8.00 to 8.99	A+	Excellent
7.00 to 7.99	**A**	**Very Good**
6.00 to 6.99	**B+**	**Good**
5.0 0 to 5.99	**B**	**Above Average**
Below 5.00	**RA**	**Re-appearance**

Credit based weighted Mark System is adopted for the individual semesters and cumulative semesters in the column 'Marks secured' (for 100)

Declaration of Result

     Mr./ MS. _____ has successfully completed the Post Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) is _____ and the class secured is _____ by completing the minimum of 110 credits.

     The candidate has also acquired _____ (if any) extra by attending MOOC courses.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

The Programme Outcomes(POs)/Programme Specific Outcomes(PSOs) are the qualities that must be imbibed in the graduates by the time of completion of their programme. At the end of each programme the PO/PSO assessment in done from the CO attainment of all curriculum components. The POs/PSOs are framed based on the guidelines of LOCF. There are five POs UG programme and five POs for PG programme framed by the college. PSOs are framed by the departments and they are five in numbers.

For each Course, there are five Course Outcomes to be achieved at the end of the course. These Course outcomes are framed to achieve the POs/PSOs. All course outcomes shall have linkage to POs/PSOs in such a way that the strongest relation has the weight 3 and the weakest is 1. This relation is defined by using the following table.

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

Mean Scores of COs $= \dfrac{\text{Sum of values}}{\text{Total No.of POs \& PSOs}}$		**Mean Overall Score** $= \dfrac{\text{Sum of Mean Scores}}{\text{Total No.of COs}}$	
Result	**Mean Overall Score**	< 1.2	# Low
		≥ 1.2 and < 2.2	# Medium
		≥ 2.2	# High

If the mean overall score is low then the course in charge has to redesign the particular course content so as to achieve high level mean overall score.

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Result	**Mean Overall Score**	**< 1.2**	**# Low**
		$\geq$ 1.2 and < 2.2	**# Medium**
		$\geq$ 2.2	**# High**

 If the mean overall score is low then the course in charge has to redesign the particular course content so as to achieve high level mean overall score.

VISION

Forming globally competent, committed, compassionate and holistic persons, to be men and women for others, promoting a just society.

MISSION

- Fostering learning environment to students of diverse background, developing their inherent skills and competencies through reflection, creation of knowledge and service.

- Nurturing comprehensive learning and best practices through innovative and value-driven pedagogy.

- Contributing significantly to Higher Education through Teaching, Learning, Research and Extension.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Graduates will be able to accomplish professional standards in the global environment.
- Graduates will be able to uphold integrity and human values.
- Graduates will be able to appreciate and promote pluralism and multiculturalism in working environment.

PROGRAMME OUTCOMES (POs) PG

1. Graduates will be able to apply assimilated knowledge to evolve tangible solution to emerging problems.
2. Graduates will be able to analyze and interpret data to create and design new knowledge.
3. Graduates will be able to engage in innovative and socially relevant research and effectively communicate the findings.
4. Graduates will become ethically committed professional and entrepreneurs upholding human values.
5. Graduates imbibed with ethical values and social concern will be able to understand and appreciate cultural diversity, social harmony and ensure sustainable environment.

Programme Specific Outcomes (PSOs)	
After completing the MCA Programme, the graduates will be able to	
PSO1	implement the logic for solving the real life problems by using the knowledge gained
PSO2	understand, analyze, design, develop, test, implement and document software systems
PSO3	use their creative skill to evolve new ideas, defend their findings at the peer level and able to manage IT and ITES organizations.
PSO4	work in public and private sectors satisfying social and environmental obligations with multiple cultures
PSO5	act as socially responsible IT professionals or service minded entrepreneurs

**MCA (MASTER OF COMPUTER APPLICATIONS)**
**PROGRAMME STRUCTURE**
Sem.	**Specification**	**No. of Courses**	**No. of Hours**	**Credits**	**Total Credits**
I-III	Core Courses: Theory	9	42	33	33
I-III	Core Courses: Practical	6	17	17	17
II	Self-paced Learning	1	-	2	2
III	Comprehensive Examination	1	-	2	2
IV	Project Work & Viva-Voce	1	25	24	24
I- IV	Discipline Specific Elective	4	20	16	16
I	Ability Enhancement Course	1	4	3	3
II	Skill Enhancement Course (Soft Skills)	1	4	3	3
II	Generic Elective IDC (WS)	1	4	3	3
III	Generic Elective IDC (BS)	1	4	3	3
II – IV	Online Courses (MOOC)	3	-	(6)	(6)
I-IV	Outreach Programme	-	-	4	4
	Total		**120**		**110(6)**

		MCA (MASTER OF COMPUTER APPLICATIONS)						
		PROGRAMME PATTERN						
		Course Details				**Scheme of Exams**		
Sem	**Course Code**	**Course Title**	**Hrs**	**Cr**	**CIA**	**SE**	**Final**	
I	21PCA1CC01	Database Systems	5	4	100	100	100	
	21PCA1CC02	Operations Research	5	4	100	100	100	
	21PCA1CC03	Programming in Java	5	4	100	100	100	
	21PCA1CP01	Software Lab – 1: Java	3	3	100	100	100	
	21PCA1CP02	Software Lab – 2: RDBMS	3	3	100	100	100	
	21PCA1ES01A	**DSE-1:** Digital Computer Architecture	5	4	100	100	100	
	21PCA1ES01B	**DSE -1 :**Graph and Automata Theory						
	21PCA1AE01	**AEC :** Organisational Behaviour	4	3	50	50	50	
		Total	**30**	**25**				
II	21PCA2CC04	Programming Smart Devices	4	3	100	100	100	
	21PCA2CC05	Software Engineering	4	3	100	100	100	
	21PCA2CC06	Data Analysis using Python	4	3	100	100	100	
	21PCA2CP03	Software Lab – 3: Programming Smart Devices	3	3	100	100	100	
	21PCA2CP04	Software Lab – 4: Python	2	2	100	100	100	
	21PCA2SP01	**Self-Paced Learning:** XML	-	2	50	50	50	
	21SCS2ES02	**DSE -2:** Design and Analysis of Algorithms	5	4	100	100	100	
	21PSS2SE01	**SEC:** Soft skills	4	3	100	-	100	
	21PCA2EG01	**GE-1**(WS): Applied Statistics using R	4	3	100	100	100	
	21PMA2EG01	**GE-1**(WS): Mathematical Foundations						
	---	Extra Credit Courses (MOOC)-1	-	(2)				
		Total	**30**	**26(2)**				
III	21PCA3CC07	Distributed Technologies	5	4	100	100	100	
	21PCA3CC08	Computer Networks and Security	5	4	100	100	100	
	21PCA3CC09	Accounting and Financial Management	5	4	100	100	100	
	21PCA3CP05	Software Lab -5: Distributed Technologies	3	3	100	100	100	
	21PCA3CP06	Case Study based Application Development	3	3	100	100	100	
	21PCA3ES03A	**DSE -3:** MEAN Stack WebApp Development	5	4	100	100	100	
	21PCA3ES03B	**DSE -3:**PHP Programming						
	21PCA3EG02	**GE-2** (BS): Web Design	4	3	100	100	100	
	21PCA3CE01	Comprehensive Examination	-	2	50	50	50	
	---	Extra Credit Courses (MOOC)-2		(2)				
		Total	**30**	**27(2)**				
IV	21PCA4ES04A	**DSE -4:**Recent trends in Computer Science#	5	4	100	100	100	
	21PCA4ES04B	**DSE -4:**Big Data Analytics #						
	21PCA4PW01	Project Work & Viva-Voce	25	24	100	100	100	
	---	Extra Credit Courses (MOOC)-3	-	(2)				
		Total	**30**	**28(2)**				
I-IV	21PCW4OR01	Outreach Programme (SHEPHERD)		4				
		Total (Four Semesters)	**120**	**110(6)**				

*The courses with a scheme of Exam 50 in CIA and SE will be converted to 100 for grading.

Blended Learning – Online Evaluation

Mandatory Bridge Courses for Non-Computer Science Stream Students
(Courses are fully internal & for 100 marks)

Sem	Course Code	Course	Course Title	Hrs	Cr	CIA	SE	Final
I	21PCA1BC01	ADDL. Core I	C Programming	-	5	100	-	100
	21PCA1BC02	ADDL. Core II	C Programming Lab	-	5	100	-	100
			Total	-	10			
II	21PCA2BC03	ADDL. Core III	Web Design (HTML5, Java Script & CSS)	-	5	100	-	100
	21PCA2BC04	ADDL. Core IV	Web Design (HTML5, Java Script & CSS) Lab	-	5	100	-	100
			Total	-	10			
III	21PCA3BC05	ADDL. Core V	Web Graphics	-	5	100	-	100
	21PCA3BC06	ADDL. Core VI	Web Graphics Lab	-	5	100	-	100
			Total		10			

	GENERIC ELECTIVE -1: 2nd Semester Within school (WS)- Offered to students belong to other Departments in the School						
	Course Details				Scheme of Exams		
School	Course Code	Course Title	Hrs	Cr	CIA	SE	Final
SBS	21PBI2EG01	Herbal Technology	4	3	100	100	100
	21PBT2EG01	Medical Biotechnology	4	3	100	100	100
	21PBO2EG01	Medicinal Botany	4	3	100	100	100
SCS	21PCA2EG01	Applied Statistics using R	4	3	100	100	100
	21PMA2EG01	Mathematical Foundations	4	3	100	100	100
	21PCS2EG01	Mobile Adhoc Networks (MANET)	4	3	100	100	100
SLAC	21PEN2EG01A	Indian Literature in Translation	4	3	100	100	100
	21PEN2EG01B	English Literature For Competitive Examinations					
SMS	21PCO2EG01	Supply Chain Management	4	3	100	100	100
	21PEC2EG01	Labour Economics	4	3	100	100	100
	21PHR2EG01	Organizational Behaviour	4	3	100	100	100
	21PCC2EG01	Stress Management	4	3	100	100	100
SPS	21PCH2EG01	Industrial Products	4	3	100	100	100
	21PPH2EG01A	Solar Energy and Utilization	4	3	100	100	100
	21PPH2EG01B	Renewable Energy Resources	4	3	100	100	100

	GENERIC ELECTIVE -2: 3rd Semester Between schools (BS)- Offered to students in the Departments belong to other Schools (Except the school offering the course)						
	Course Details				Scheme of Exams		
School	Course Code	Course Title	Hrs	Cr	CIA	SE	Final
SBS	21PBI3EG02	First Aid Management	4	3	100	100	100
	21PBT3EG02	Food Technology	4	3	100	100	100
	21PBO3EG02	Horticulture and Landscaping	4	3	100	100	100
SCS	21PCA3EG02	Web Design	4	3	100	100	100
	21PMA3EG02	Operations Research	4	3	100	100	100
	21PCS3EG02	Advances in Computer Science	4	3	100	100	100
	21PDS3EG02	Deep Learning	4	3	100	100	100
SLAC	21PEN3EG02	English for Effective Communication	4	3	100	100	100
SMS	21PCO3EG02	Basics of Taxation	4	3	100	100	100
	21PEC3EG02	Managerial Economics	4	3	100	100	100
	21PHR3EG02	Counselling and Guidance	4	3	100	100	100
	21PCC3EG02	Dynamics of Human Behaviour in Business	4	3	100	100	100
SPS	21PCH3EG02	Health Science	4	3	100	100	100
	21PPH3EG02A	Physics for Competitive Exam	4	3	100	100	100
	21PPH3EG02B	Nano Science	4	3	100	100	100

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CC01	CORE-1: DATABASE SYSTEMS	5	4

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	define the basic commands of the SQL and the constructs of PL/SQL	K1
CO-2	discuss the intricacies of the schema & database design aspects and the issues connected with transaction processing.	K2
CO-3	apply the normalization procedure and solve the problems by constructing queries with SQL commands.	K3
CO-4	compare the SQL commands and demonstrate its use within PL/SQL blocks.	K4
CO-5	design database structures, frame and execute complex queries and implement backend routines.	K5 & K6

Unit-I (15 hours)

Introduction to DBS: Basic Concepts and Definitions - Data Dictionary - Database System - DBA - Database Languages - Database System Architecture: Schemas, Sub-schemas and Instances - Three-level Architecture - Data Independence - Mappings -Data Models - Types-Relational Algebra and Calculus: Structure - Relational Algebra - Relational Calculus - ER Model - Specialization and Generalization.

Unit-II (15 hours)

Relational Query Languages: Introduction - Codd's Rules-Information System Based Language - Structured Query Language (SQL)-Embedded SQL

Unit-III (15 hours)

Normalization: Introduction to Database Design - Functional Dependency and Decomposition - Normalization - Normal Forms - BCNF - Multi-valued and Join Dependencies

Unit-IV (15 hours)

PL/SQL: A Programming Language: History - Fundamentals -Data types - Operators. Control Structures: Control Structures - Nested Blocks - SQL in PL/SQL - Data Manipulation - Transaction Control statements. PL/SQL Cursors and Exceptions - Named Blocks: Procedures - Functions-Packages -Triggers

Unit-V (15 hours)

Transaction Processing and Concurrency Control - Database Recovery System - Database Security - Object Oriented Databases: Introduction - Object Oriented Data Model (OODM) – Concepts of Object Oriented Database (OODB) - Object Oriented DBMS (OODBMS) - Object Data Management Group (OMDG) and Object Oriented Languages - Parallel Database Systems: Introduction to Parallel databases - Architecture - Key Elements of

Parallel Database Processing -Distributed Databases - Architecture - Distributed Database design.

Books for Study
1. S K Singh, "Database Systems Concepts, Design and Applications", Pearson Education, India, 2006.

   Unit-I
   Chapter 1 (Sec:1.2, 1.2, 1.3, 1.5,1.7, 1.10),
   Chapter 2 (Sec:2.1, 2.2, 2.3, 2.4, 2.5, 2.7, 2.8)
   Chapter 4 (Sec:4.1, 4.3, 4.4, 4.5)
   Chapter 6 (Sec: 6.1, 6.2, 6.3, 6.4, 6.5)
   Chapter 7 (Sec:7.1, 7.3)
   Unit-II
   Chapter 5 (Sec:5.1, 5.2, 5.3, 5.5, 5.6)

   Unit-III
   Chapter 10 (Sec:10.1, 10.2, 10.3, 10.4, 10.5, 10.6),

   Unit – V
   Chapter 12 (Sec:12.1, 12.2, 12.3)
   Chapter 13 (Sec:13.1, 13.2, 13.3, 13.4, 13.5, 13.6)
   Chapter 14 (Sec:14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7)
   Chapter 15 (Sec:15.1, 15.2, 15.3, 15.4, 15.5)
   Chapter 17 (Sec:17.1, 17.2, 17.3, 17.4)
   Chapter 18 (Sec:18.1, 18.2, 18.3, 18.4)

2. Nilesh Shah, "Database Systems using ORACLE", Second Edition, Pearson India Education Services, 2016.
   Unit – IV
   Chapter *10 (Pages: 225 to 241),*
   Chapter *11 (Pages: 244 to 264),*
   Chapter *12 (Pages: 267 to 289),*
   Chapter *14 (Pages: 313 to 334)*

Books for Reference
1. Abraham Silberschatz, "Database Systems", McGraw Hill International, New York, 1997.
2. CJ Date, "An Introduction to Database Systems", 6th Edition, Addison Wesley Publishing Company, New York, 1995.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems: The Complete Book", Pearson, USA, 2009

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1CC01	CORE-1: DATABASE SYSTEMS									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	3	1	2	2	2	3	2	2	2.2	
CO-2	3	3	2	1	1	3	2	3	2	2	2.2	
CO-3	3	2	3	1	1	3	3	3	2	2	2.3	
CO-4	2	3	3	1	3	1	3	2	2	3	2.3	
CO-5	3	2	3	2	2	2	2	3	1	2	2.2	
									Mean Overall Score		2.24 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	**21PCA1CC02**	**CORE-2: OPERATIONS RESEARCH**	**5**	**4**

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	recall the basic concepts in LPP, TP, AP, CPM, PERT, Queue and Inventory	**K1**
CO-2	remember the characteristics and relationships in LPP, TP, AP, CPM, PERT, Queue and Inventory	**K2**
CO-3	identify the activities, model, methods and procedures in LPP, TP, AP, CPM, PERT, Queue and Inventory	**K3**
CO-4	analyze and apply the procedure for problem solving in LPP, TP, AP, CPM, PERT, Queue and Inventory	**K4**
CO-5	adopt the LPP, TP, AP, CPM, PERT, Queue and Inventory methods to real-life./ business problems	**K5 & K6**

Unit – I   (15 hours)
Linear Programming: Formulations and Graphical solution to L.P. Problem- Simplex method-Degeneracy, Unbounded and infeasible solution- Two Phase Method.

Unit – II   (15 hours)
Linear Programming (contd.): Duality-Primal and Dual Computations –Dual Simplex Method - Transportation problem and its solution – Assignment problem and its solution by Hungarian method.

Unit – III   (15 hours)
Project scheduling by PERT - CPM: Phases of project scheduling –Arrow Diagram - Critical Path Method - Probability Considerations in Project Scheduling.

Unit – IV   (15 hours)
Queueing Theory: Queueing System - Characteristics of Queueing system - classification of queues - Poisson Queues - M/M/1 and M/M/C Queueing Models.

Unit – V   (15 hours)
Inventory Management: Inventory Control - ABC analysis - Economic Lot size Problems - EOQ with uniform Demand and shortages - Limitations of inventories - Buffer stock - Determination of Buffer stocks.

(Note: Stress to be on solving Numerical Problems only.)

Book for Study
1. KantiSwarup, P K Guptha and Man Mohan, "Operations Research", Sultan Chand &Sons, New Delhi, 2013.
   Unit-I *Chapter 1 (Sec: 1.1-1:6, 1:10), Chapter 2, Chapter 3(Sec: 3:1-3:5),Chapter 4(Sec: 4:1, 4:3, 4:4(only Two-Phase Method), 4:5),*

Unit-II *Chapter 5 (Sec: 5:1-5:5, 5:7, 5:9),Chapter 10 (Sec: 10:1, 10:5-10:6, 10:8-10:10, 10:12-10:13, 10:15)*
Unit-III Chapter *25 (Sec 25:1-25:7)*
Unit – IV Chapter 21(Sec: 21:1-21:9)
Unit – V *Chapter 19 (Sec: 19:1-19:2, 19:6-19:10(case1&2 only), 19:15)*

Books for Reference

1. Hamdy A. Taha, "Operations Research-An Introduction", Macmillan Publishing Co, 5th Edition, 1987
2. P.K.Gupta, Man Mohan, "Operations Research and Quantitative Analysis", Sultan Chand & Sons, New Delhi First Edition, 1987
3. S.Kalavathy, "Operations Research", Vikas Publishing House Pvt Ltd, Noida India-2013

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credit
I	**21PCA1CC02**	**CORE-2: OPERATIONS RESEARCH**								**5**	**4**
Course Outcomes ↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	2	3	2	3	2	3	3	2	2	2	2.4
CO-2	2	3	2	2	2	3	3	2	2	3	2.4
CO-3	3	3	2	2	3	2	2	3	3	2	2.5
CO-4	2	3	2	3	3	2	2	3	3	2	2.5
CO-5	3	3	2	3	3	3	3	2	2	3	2.7
									Mean Overall Score		**2.5 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
I	**21PCA1CC03**	**CORE-3: PROGRAMMING IN JAVA**	**5**	**4**

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	define the fundamentals of object oriented programming concepts	**K1**
CO-2	summarize various object oriented techniques	**K2**
CO-3	apply the object oriented programming concepts to write simple Java applications	**K3**
CO-4	classify various principles of object oriented programming methodologies	**K4**
CO-5	build a standard object oriented application in Java	**K5 & K6**

Unit – I (15 hours)
CLASSES AND OBJECTS: Class Fundamentals – Declaring Objects – Assigning Object Reference Variables – Introducing Methods – Constructors – 'this' Keyword – Garbage Collection. METHODS AND CLASSES: Overloading Methods – Objects as Parameters – Returning Objects – Access Control – Static and Final – Nested and Inner Classes – Exploring the String Class – Command Line Arguments.

Unit – II (15 hours)
INHERITANCE: Inheritance Basics – Using Super – Creating Multilevel Hierarchy – Method Overriding – Dynamic Method Dispatch – Abstract Classes – Final with Inheritance. PACKAGES AND INTERFACES: Packages – Packages and Member Access – Importing Packages – Interfaces. EXCEPTION HANDLING: Fundamentals – Exception Types – Using try and catch – Multiple catch Clauses – Nested try Statements – throw, throws, finally – Java's Built-in Exceptions.

Unit – III (15 hours)
MULTITHREADED PROGRAMMING: Java Thread Model – Main Thread – Creating a Thread and Multiple Threads – Using is Alive() and join() – Thread Priorities – Synchronization – Interthread Communication -Suspending, Resuming and Stopping Threads. EVENT HANDLING: Two Event Handling Mechanisms – Delegation Event Model – Event Classes – Key Event Class – Sources of Events – Event Listener Interfaces. SWING: Two Swing Features – Components and Containers – Swing Packages – Exploring Swing.

Unit – IV (15 hours)
STRING HANDLING CLASSES: String Constructors – Special String operations – Character extraction – String comparison – searching strings – modifying strings. String Buffer**.** EXPLORING JAVA LANG: Primitive type wrappers**.** JAVA.UTIL COLLECTIONS FRAMEWORK: Collections overview – Collection interfaces**:** Collection interface **-** Queue interface**.** The Collection classes**:** Array List – Linked List – Tree set- Enumset. Arrays -The Legacy classes and interfaces**:** Enumeration interface- Vector-Stack**.**

Unit – V   **(15 hours)**

UTILITY CLASSES: String Tokenizer– Date-Calendar-Gregorian Calendar Formatter**:** Formatting basics – strings and characters – numbers. EXPLORING JAVA.IO: IO Exceptions-Stream Classes-Byte Streams-Character Streams. JDBC: Establishing a Connection - Creation of Data Tables - Entering Data into The Tables - Table Updating – Prepared Statement.

Books for Study

1. Herbert Schildt, "Java The Complete Reference", Tata McGraw Hill, 11th Ed., 2019

     Unit-I   - *Chapter 6 & 7*
     Unit-II   - *Chapter 8, 9 & 10*
     Unit-III   - *Chapter 11, 24, 31 & 32*
     Unit-IV   - *Chapter 17, 18 & 19*
     Unit-V   - *Chapter 20 & 21*

2. C. Muthu, "Programming with JAVA**"**, Vijay Nicole Imprints Private Limited, 2nd Ed, Chennai, 2018

     Unit-V   - *Chapter 18*

Books for Reference

1. Sagayaraj, Denis, Karthik and Gajalakshmi, "Java Programming-for Core and Advanced Users", Universities Press, Hyderabad, 2017
2. P. Radhakrishna, "Object Oriented Programming through JAVA", Universities Press, 2016
3. K. Rajkumar, "Java Programming", Pearson India, 2013

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course							Hours	Credits
I	21PCA1CC03	CORE-3: PROGRAMMING IN JAVA							5	4

Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	1	1	3	3	3	2	1	2.1
CO-2	3	3	2	2	1	3	2	3	2	1	2.2
CO-3	3	3	3	2	2	3	3	2	2	1	2.4
CO-4	3	2	2	2	1	3	3	2	2	2	2.2
CO-5	3	3	3	2	2	3	3	3	2	3	2.7
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CP01	SOFTWARE LAB-1: JAVA	3	3

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	recall and apply the core OOP concepts to develop simple java programs	K1
CO-2	demonstrate the purpose of various predefined Java Libraries	K2
CO-3	solve real-world problems using Java	K3
CO-4	analyse the speed and memory utilization in Java environment	K4
CO-5	develop a simple project for real time environment	K5 & K6

List of Exercises
1. Classes & Objects
2. Inheritance & Polymorphism
3. Packages & Interfaces
4. Exception Handling
5. Multithreading
6. Swing
7. String Handling Classes
8. java.util and java.lang Classes
9. I/O Streams
10. JDBC

Web Links

Virtual Lab

http://vlabs.iitb.ac.in/vlabs-dev/labs/java-iitd/experiments/java-intro-iitd/

Online Java Compiler

https://www.onlinegdb.com/online_java_compiler

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1CP01	SOFTWARE LAB-1: JAVA									3	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	2	1	3	2	2	2	2	2.3	
CO-2	3	3	2	2	1	3	3	3	2	2	2.4	
CO-3	3	3	2	2	1	3	3	2	3	2	2.4	
CO-4	3	3	3	2	1	3	3	3	3	2	2.6	
CO-5	3	3	3	2	1	3	3	3	3	2	2.6	
Mean Overall Score											2.46 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1CP02	**SOFTWARE LAB- 2: RDBMS**	3	3

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On completion of this course, students will be able to	
CO-1	create database tables with all integrity constraints	K1
CO-2	understand and execute SQL queries to interact with the database.	K2
CO-3	apply the SQL commands to frame queries and SQL Plus commands to generate reports.	K3
CO-4	implement processing logic in the form of PL/SQL routines like functions, procedures, packages, triggers and PL/SQL blocks.	K4
CO-5	design forms with event handling feature to interact with database.	K5 & K6

SQL - Simple queries using DDL, DML, and DCL
1. SQL functions
   ▪ Creation of Tables (along with Primary and Foreign keys),
   ▪ Altering Tables and Dropping Tables
   ▪ Practicing DML commands- Insert, Select, Update, Delete
2. SET operations
3. View and Snapshots
4. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).
PL/SQL
5. PL/SQL Block
6. Cursors – Declaring, Opening & closing Cursor, Fetching the data
7. Database triggers - creation of trigger, Insertion, Deletion, Updating using trigger.
8. Subprograms and packages.
Forms and Reports
9. Designing forms with menus, buttons and List of values
10. Master-Detail form design.
11. Developing reports (Tabular, Master/detail, Matrix and Mailing label)

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course				Hours		Credits	
I	21PCA1CP02		Software Lab- 2: RDBMS				3		3	
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	

Course Outcomes↓	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Scores of COs
CO-1	3	3	3	1	3	3	2	2	1	3	2.4
CO-2	2	2	3	2	3	3	3	3	1	2	2.4
CO-3	3	3	3	2	2	3	3	2	2	3	2.6
CO-4	2	2	3	2	2	2	2	1	2	3	2.1
CO-5	3	3	2	3	3	3	2	1	1	2	2.3
								Mean Overall Score			**2.36 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1ES01A	DSE- 1: DIGITAL COMPUTER ARCHITECTURE	5	4

CO No.	CO- Statements On successful completion of this course, students will be able to	Cognitive Levels (K- Levels)
CO-1	recall the basic concepts of logic gates and logic circuits	K1
CO-2	compare the logical functions of digital circuits	K2
CO-3	construct the combinational and sequential circuits based on the digital logics	K3
CO-4	analyze the functioning the digital circuits and basic computer architecture	K4
CO-5	compare the digital logics and construct the digital circuits for various applications	K5 & K6

Unit-I (15 hours)

Digital Logic: The Basic Gates-NOT, OR, AND - Universal Logic Gates: NOR, NAND - AND-OR-Invert Gates. Combinational Logic Circuits: Boolean Laws and Theorems - Sum-of-Products Method - Truth Table to Karnaugh Map - Pairs, Quads, and Octets - Karnaugh Simplifications - Don't-care Conditions - Product-of-sums Method - Product-of-sums Simplification

Unit-II (15 hours)

Data-Processing Circuits: Multiplexers - Demultiplexers - 1-of-16 Decoder - BCD-to-decimal Decoders - Seven-segment Decoders - Encoders – Exclusive-OR Gates. Number Systems and Codes: Binary Number System - Binary-to-decimal Conversion - Decimal-to-binary Conversion- Octal Numbers - Hexadecimal Numbers - The ASCII Code-The Excess-3 Code - The Gray Code

Unit-III (15 hours)

Arithmetic Circuits: Binary Addition - Binary Subtraction - Unsigned Binary Numbers - Sign-magnitude Numbers - 2's Complement Representation - 2's Complement Arithmetic- Arithmetic Building Blocks - The Adder-subtracter - Arithmetic Logic Unit - Binary Multiplication and Division. Flip-Flops: RS FLIP-FLOPs - Gated FLIP-FLOPs - Edge-triggered RS FLIP-FLOPs – Edge-triggered D FLIP-FLOPs - Edge-triggered JK FLIP-FLOPs - JK Master-slave FLIP-FLOPs

Unit-IV (15 hours)

Basic Computer Organisation and Design: Instruction codes - Computer Registers - Computer Instructions - Timing and Control - Instruction Cycle - Memory Reference Instructions -Input/output & Interrupt – Complete Computer Description - Design of Basic Computer - Design of Accumulator Logic

Unit-V (15 hours)

CPU: General Register Organisation - Stack Organisation - Instruction Formats - Addressing Modes - Data Transfer and Manipulation - Program Control - RISC

Books for Study

Unit I, II and III

1. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Application", Seventh Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.

   Unit-I   *Chapter 1 (Sec: 2.1 to 2.3), Chapter 3 (Sec: 3.1 to 3.9)*
   Unit-II   *Chapter 4 (Sec: 4.1 to 4.7), Chapter 5 (Sec: 5.1 to 5.8)*
   Unit-III *Chapter 6 (Sec: 6.1 – 6.11), Chapter 8 (Sec:8.1 – 8.5, 8.8)*

Unit IV and V

2. M. Morris Mano, "Computer System Architecture", Third Edition, Prentice Hall of India, New Delhi, 2003.

   Unit-IV   *Chapter 5 (Sec: 5.1 – 5.10)*
   Unit-V   *Chapter 8 (Sec: 8.1 – 8.8)*

Books for Reference

1. Morris Mano and Michael D Ciletti, "Digital Design", 4th Edition, Pearson publications, 2008.
2. Rafiquzzaman "Microprocessors Theory and Applications" Revised Edition, PHI Learning Pvt. Ltd, New Delhi, 2012.
3. Smruti Ranjan Sarangi, "Computer Organisation and Architecture", TMH, New Delhi, 2014.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	**21PCA1ES01A**	**DSE- 1: DIGITAL COMPUTER ARCHITECTURE**									**5**	**4**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO-1	3	3	2	2	2	3	2	3	2	2	2.2	
CO-2	3	3	3	2	1	3	3	3	2	2	2.5	
CO-3	2	3	3	2	1	2	3	3	2	2	2.3	
CO-4	3	3	3	2	1	3	3	3	2	2	2.5	
CO-5	3	3	3	1	1	2	3	3	2	2	2.3	
									Mean Overall Score		2.4 **(High)**	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1ES01B	DSE- 1: GRAPH AND AUTOMATA THEORY	5	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On successful completion of this course, students will be able to	
CO-1	define various basic terms in graph and automata theory.	K1
CO-2	explain the fundamentals of theories in graph and automata theory.	K2
CO-3	apply the concepts of graph and automata theory to solve in real world problems.	K3
CO-4	analyze and compare the different procedures used in graph and automata theory.	K4
CO-5	build standard applications using graph and automata theory.	K5 & K6

Unit-I (15 hours)

Graph Introduction: Paths and Circuits - Isomorphism, Connected & Disconnected Graphs - Walk –Path -Euler graphs - Operations on Graphs-Hamiltonian Paths & Circuits- Travelling Sales Man Problem.

Unit-II (15 hours)

Trees and Matrix Representations: Definition and Properties of Trees, Rooted and Binary Trees, Spanning trees. Matrix representation of Graphs: Incidence Matrix, Adjacency Matrix - Algorithms: Shortest Path from a Specified Vertex to another Specified Vertex – Shortest Path between All Pairs of Vertices.

Unit-III (15 hours)

Theory of Automata: Definition of an Automaton – Description of a Finite Automaton (FA) – Transition Systems – Properties of Transition Functions – acceptability of a string by a FA – Non Deterministic Finite State Machines – Regular Expressions - Identities for Regular Expressions.

Unit-IV (15 hours)

Formal Languages: Basic Definition and Examples - Definition of a Grammar – Derivations and the Language generated by a Grammar - Chomsky classification of Languages – Context Free Languages (CFL's) and Derivation Trees – Ambiguity in CFG - Chomsky Normal Form - Pumping Lemma for CFL's.

Unit-V (15 hours)

Applications of Automata and Formal Languages: Lexical Analysis: The Role of the Lexical Analyzer - From Regular Expressions to Automata: Conversion of an NFAto DFA– Simulation of an NFA- Construction of an NFA from Regular Expression. Optimization of DFA: Minimizing the Number of states of DFA. Syntax Analysis: The role of parser – Representative Grammars- Syntax Error Handling –Bottom-Up Parsing: Reductions – Handling Pruning –Shift Reduce Parsing.

(Note: Stress can be given to problem solving instead of proof of theorems in Units III, IV and V)

Books for Study
1. Narsingh Deo, "Graph Theory with applications to Engineering and Computer Science", Dover Publications, First Edition, 2016). (Units I and II)
   Chapter-1: (Sec.: 1.1 to 1.5) Chapter-2: (Sec.: 2.1, 2.2, 2.4 to 2.10)
   Chapter 3: (Sec.: 3.1 to 3.7) Chapter-7: (Sec.: 7:7.1, 7.9)
   Chapter-11: (Sec.: 11.5)
2. Mishra K L P, Chandrasekaran N, "Theory of Computer Science Automata, Languages and Computation", Third Edition, PHI Learning private limited, 2019. (Units III, IV)
   Chapter-3: (Sec.: 3.1 – 3.6)   Chapter-4: (Sec.: 4.1, 4.2)
   Chapter-5: (Sec.: 5.1)Chapter-6: (Sec.: 6.1, 6.2, 6.4.1, 6.5)
3. Alfred V.Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers Principles, Techniques and Tools", Pearson Education, Inc. Publishing as Addison-Wesley Higher Education, Second Edition, 2011. (Unit V)
   Chapter- 3: (Sec.:3.1, 3.7.1, 3.7.2, 3.7.4, 3.9.6)
   Chapter-4: (Sec.:4.1.1, 4.1.2, 4.1.3, 4.5.1, 4.5.2, 4.5.3)

Books for References
1. Douglas B. West, "Introduction to Graph Theory", Pearson Education, India 2ndedition, 2015.
2. John E. Hopcroft & Jeffery D. Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, New Delhi, 2002.
3. Peter Linz, "An Introduction to Formal Languages and Automata", Bartlett Publication, 2011.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course							Hours	Credit
I	21PCA1ES01B		DSE- 1: GRAPH AND AUTOMATA THEORY							5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	2	1	3	3	3	2	1	2.2
CO-2	3	2	2	2	1	3	3	3	1	1	2.1
CO-3	3	3	2	2	1	3	3	3	1	2	2.3
CO-4	3	3	3	1	1	3	3	3	1	1	2.2
CO-5	3	3	3	2	2	3	3	3	2	2	2.6
									Mean Overall Score		2.28 (High)

Semester	Course Code	Title of the Course	Hours	Credits
I	21PCA1AE01	AEC: ORGANISATIONAL BEHAVIOUR	4	3

CO No.	CO-Statements	Cognitive Levels (K-Levels)
	On successful completion of this course, students will be able to	
CO-1	find differences of various basic concepts of organization.	K1
CO-2	relate the factors of formation of attitudes and formulate factors for attitude change	K2
CO-3	apply and build the perceptual interpretation and motivation	K3
CO-4	categorize leadership skills through various activities	K4
CO-5	create new organizational structure and projects	K5 & K6

Unit – I (12 hours)

NATURE OF ORGANIZATION – features – types – goals. NATURE OF ORGANIZATIONAL BEHAVIOR – Nature of OB – Role of OB – Foundations of OB.

Unit – II (12 hours)

NATURE OF HUMAN BEHAVIOR: Nature and causes of individual differences – models of man. PERCEPTION: concept – process – perceptual selectivity and distortion – Developing perceptual skills. ATTITUDES: Concept – Theories – Formation factors – measurements – Attitude change.

Unit – III (12 hours)

PERSONALITY: Concept – theories – determinants of personality- Personality and behaviour - MOTIVATION: Definition – Motivation & Behavior – Theories – approaches – incentives. INTERPERSONAL BEHAVIOR: Transactional analysis – Ego states – life scripts – life positions – transactions – stroking – Psychological games – Benefits of TA.

Unit – IV (12 hours)

GROUP DYNAMICS: Concepts & features of group – types of groups – group behavior – group decision making – committee – task group – inter group behavior. LEADERSHIP: Definitions – types – importance theories – styles. COMMUNICATION: Basics of communication – Communication network – Factors affecting communication – Business writing – Office management – Presentation strategies.

Unit – V (12 hours)

ORGANIZATION THEORY: Classical organizational theory – neoclassical organization theory – DESIGNING OF ORGANIZATIONAL STRUCTURE: need – planning and process – Departmentation Span of management – delegation of authorities – centralization & decentralization – FORMS OF ORGANIZATIONAL STRUCTURES: line and staff – functional – divisional – project – matrix – free form.

Book for Study

1. Prasad LM, "Organisational Behavior", Sultan Chand and Sons, New Delhi, 2014.

   Unit-I   : Chapters: 1 and 2
   Unit-II   : Chapters: 3, 4 and 7
   Unit-III   : Chapters: 8 and 11
   Unit-IV   : Chapters: 12, 14 and 15
   Unit-V   : Chapters: 18, 20 and 21

Books for Reference

1. S. S. Khanka, "Organisational Behavior", S. Chand Ltd., New Delhi, 2001
2. K. Aswathappa, "Organisational Behavior", Himalaya Publishing house, New Delhi, 2001

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21PCA1AE01	AEC: ORGANISATIONAL BEHAVIOUR									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	3	2	2	2	2	2	3	2.5	
CO-2	3	3	2	3	3	2	2	3	3	3	2.7	
CO-3	3	3	2	3	2	2	2	2	2	3	2.4	
CO-4	3	2	3	2	2	2	2	3	3	3	2.5	
CO-5	3	2	3	2	2	2	3	3	3	3	2.6	
									Mean Overall Score		2.54 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	**21PCA2CC04**	**CORE-4:** **PROGRAMMING SMART DEVICES**	**4**	**3**

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	state the fundamental building blocks of mobile apps.	**K1**
CO-2	select various modules for designing React Native components to build powerful and stylish mobile applications.	**K2**
CO-3	use stylesheets, APIs and cross-platform native modules in React Native apps.	**K3**
CO-4	organize React Native components and examine the parameter passing mechanism among them.	**K4**
CO-5	debug and use developer Tools to build native mobile applications in React Native.	**K5 & K6**

Unit-I (12 hours)

React Native - Advantages of React Native- Working with React Native- React Native Work- Rendering Lifecycle- Creating Components in React Native- Working with Views- Using JSX- Styling Native Components- Host Platform APIs. - Building Your First Application: Setting Up Your Environment - Creating a New Application- Exploring the Sample Code - Building a Weather App.

Unit-II (12 hours)

Components for Mobile - Analogies Between HTML Elements and Native Components - The Text Component- The Image Component- Working with Touch and Gestures- Using Touchable Highlight- The Gesture Responder System- Pan Responder- Working with Organizational Components - Using List View- Using Navigators- Other Organizational Components - Platform-Specific Components. **Styles**: - Declaring and Manipulating Styles- Organization and Inheritance- Positioning and Designing Layouts.

Unit-III (12 hours)

Platform APIs: Using Geolocation- Accessing the User's Images and Camera- Storing Persistent Data with AsyncStore- TheSmarter Weather Application. Modules: Installing JavaScript Libraries with npm- Native Modules for iOS- Native Modules for Android- Cross-Platform Native Modules.

Unit-IV (12 hours)

Debugging and Developer Tools: JavaScript Debugging Practices, Translated- React Native Debugging Tools - Debugging Beyond JavaScript- Testing Your Code- Putting It All Together: The Flashcard Application- Modeling and Storing Data - Using the Navigator- A Look at Third-Party Dependencies - Responsive Design and Font Sizes.

Unit-V (12 hours)

Deploying to the iOS App Store: Preparing Your Xcode Project- Uploading Your Application- Beta Testing with TestFlight- Submitting the Application for Review -

Deploying Android Applications: Setting Application Icon- Building the APK for Release - Distributing via Email or Other Links - Submitting Your Application to the Play Store.

Book for Study

1. Bonnie Eisenman, "Learning React Native" - Building Mobile Applications with JavaScript, O'Reilly Media, USA, 2016

   Unit-I *Chapter 1 (Pages 1 to 6), Chapter 2 (Pages 7 to 14), Chapter 3 (Pages 15 to 31)*
   Unit-II *Chapter 4 (Pages 47 to 81), Chapter 5 (Pages 83 to 100),*
   Unit-III *Chapter 6 (Pages 101 to 130), Chapter 7 (Pages 131 to 153),*
   Unit – IV *Chapter 8 (Pages 155 to 175), Chapter 9 (Pages 177 to 200),*
   Unit – V *Chapter10 (Pages 203 to 222), Chapter 11 (Pages 225 to 236)*

Books for Reference

1. JakobIversen, Michael Eierman, "Learning Mobile App Development -A Hands-on Guide to Building Apps with iOS and Android", Addison-Wesley, USA, 2014.
2. Nader Dabit, "React Native in Action"- Developing iOS and Android apps with JavaScript, Manning Publications Co. USA, 2019
3. Dotan Nahum, "Programming React Native",Leanpub, Canada, 2016.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credit
II	**21PCA2CC04**	**CORE-4: PROGRAMMING SMART DEVICES**								**4**	**3**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	3	1	3	3	2	2	2	2.4
CO-2	3	3	3	2	2	2	2	3	2	2	2.4
CO-3	2	2	3	3	3	3	3	3	3	3	2.8
CO-4	3	3	1	3	2	3	1	2	2	3	2.3
CO-5	3	3	1	2	2	2	3	2	3	2	2.3
										Mean Overall Score	**2.44 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2CC05	CORE-5: SOFTWARE ENGINEERING	4	3

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	remember and recall the basic concepts of software engineering and design process models.	K1
CO-2	understand the software requirements and compare the models.	K2
CO-3	construct software design process and develop software structures for real life problems.	K3
CO-4	examine testing concepts and identify them to develop error free software.	K4
CO-5	evaluate the risk and quality issues in project management, validate the solutions and construct alternate solutions if there is a need.	K5 & K6

Unit-I (12 hours)

The Nature of Software – The Changing Nature of Software – Software Engineering: Defining the Discipline – The Software Process – Software Engineering Process – Software Development Myths. Process Models: Prescriptive Process Models – Specialized Process Models – The Unified Process – Personal and Team Process Models – Process Technology – Product and Process. Agile Development: Meaning of Agility and Cost of Change – Agile Process – Extreme Programming – Other Agile Process Models – A Tool Set for the Agile Process. Humans Aspects of Software Engineering: Characteristics of a Software Engineer – The Psychology of Software Engineering – The Software Team – Team Structure – Agile teams – The Impact of Social Media – Software Engineering using the Cloud – Collaboration Tools – Global Teams.

Unit-II (12 hours)

Understanding Requirements: Requirements Engineering – Establishing Groundwork – Eliciting Requirements – Developing Use Cases – Building the analysis Model – Negotiating Requirements – Requirements Monitoring – Validating Requirements – Avoiding common mistakes. Scenario-Based Methods: Requirements Analysis – Scenario-Based Modeling – UML models that supplement the use cases. Class-Based Methods: Identifying Analysis Classes – Specifying Attributes – Defining Operations – Class-Responsibility – Collaborator Modeling – Associations and Dependencies – Analysis Packages.

Unit-III (12 hours)

Design Concepts: The Design Process – Design Concepts – The Design Model. Architectural Design: Software Architecture – Architectural Genres – Architectural Styles – Architectural Considerations – Architectural Decisions – Architectural Design – Assessing Alternative Architectural Design. User Interface Design: The Golden Rules – User Interface Analysis and Design – Interface Analysis – Interface Design Steps – WebApp and Mobile Interface Design – Design Evaluation.

Unit-IV (12 hours)

Software Testing Strategies: A Strategic Approach to Software Testing – Test Strategies for Conventional Software – Test Strategies for Object-Oriented Software – Test Strategies for WebApp – Test Strategies for Mobile App – Validation Testing – System Testing – The Art of Debugging. Testing Conventional Applications: Software Testing Fundamentals – Internal and External Views of Testing – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Model Based Testing – Testing Documentation and help facilities – Testing for Real Time Systems – Pattern for Software Testing. Testing Web Applications: Testing concepts for WebApps – The Testing Process – Content Testing – User Interface Testing – Component-Level Testing – Navigation Testing – Configuration Testing – Security Testing – Performance Testing

Unit-V (12 hours)

Project Management Concepts: The Management Spectrum – People – The Product – The Process – The Project – W5H Principle – Critical Process. Process and Project Metrics: Metric in the Process and Project Domains – Software Measurement – Metrics for Software Quality – Integrating Metrics within the Software Process – Metrics for small Organizations – Establishing a Software Metrics Program. Risk Management: Software Risks – Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring, and Management – RMMM Plan.

Book for Study
1. Roger S. Pressman and Bruce Maxim, "Software Engineering", McGraw Hill, International 8th Edition, 2019.
   Unit-1: Chapters 1 - 6
   Unit-2: Chapters 8 - 10
   Unit-3: Chapters 12, 13 & 15
   Unit-4: Chapters 22, 23 & 25
   Unit-5: Chapters 31, 32 & 35

Book for References
1. Roger S. Pressman, "Software Engineering", McGraw Hill, International 9th Edn., New York, 2019.
2. Ian Sommerville, "Software Engineering" Pearson India, 10th Edition 2018.
3. Richard Fairley, "Software Engineering Concepts", McGraw Hill, International Edition 2017.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course							Hours	Credit
II	21PCA2CC05	CORE-5: SOFTWARE ENGINEERING							4	3
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	3	3	2	2	2	2.4
CO-2	3	3	3	2	1	3	3	3	2	2	2.5
CO-3	2	3	3	2	2	2	3	3	2	2	2.4
CO-4	3	3	3	1	2	3	3	3	1	2	2.4
CO-5	2	3	3	2	2	2	3	3	2	2	2.5
									Mean Overall Score		2.37 (High)

Semester	Course Code	Title of the Course	Hours	Credits
II	**21PCA2CC06**	**CORE-6: DATA ANALYSIS USING PYTHON**	**4**	**3**

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	acquire knowledge about various programming constructs and libraries used for data analysis in Python	K1
CO-2	explain the basic concepts of object-oriented & procedural programming and concepts used in various data analysis libraries available in Python	K2
CO-3	apply core python concepts to write simple programs and various libraries used in python for performing data analysis	K3
CO-4	discover how to implement core python concepts in various domains and examine the possibilities of load, inspect, and explore real-world data	K4
CO-5	construct simple python applications and develop a real world dataset to perform data analysis and assess the outcome of the results using various libraries	K5 & K6

Unit - I (12 hours)
INTRODUCTION TO PYTHON: Features of Python - How to Run Python DATA TYPES AND OPERATIONS: Numbers-Strings-List-Tuple-Set-Dictionary. FUNCTIONS: Function Definition-Function Calling - Function Arguments - Anonymous Functions. MODULES AND PACKAGES: Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - dir() function - reload() function - Packages in Python - Date and Time Modules.

Unit - II (12 hours)
OBJECT ORIENTED PROGRAMMING: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python-Encapsulation - Data Hiding-Inheritance - Method Overriding-Polymorphism. REGULAR EXPRESSIONS: match() function - search() function - Search and Replace - Regular Expression Modifiers: Option Flags - Regular Expression Patterns - find all() method - compile() method. DATABASE PROGRAMMING: Connecting to a Database – Creating Tables – Insert, Update, Delete and Read Operation – Disconnecting from a Database

Unit - III (12 hours)
INTRODUCTION TO NUMPY: Introduction to Numpy - Basics of NumPy Array – Computation on NumPy Array – Aggregations – Broadcasting – Comparisons, Masks and Boolean Logic – Sorting Arrays – NumPy Structured Array.

Unit - IV (12 hours)
DATA MANIPULATION WITH PANDAS: Introducing Panda Objects – Data Indexing and Selection - Operating Data on Pandas – Handling Missing Data – Hierarchical Indexing – Combining Data Sets – Vectorized String Operations – Working with Time Series.

Unit - V (12 hours)

VISUALIZATION WITH MATPLOTLIB: Simple Line Plots – Simple Scatter Plots – Density and Contour Plots – Histograms, Binnings and Density – Customizing Plot Legends – Customising Color bars – Multiple Subplots – Text and Annotation – Three Dimension Plotting in Matplotlib – Geographic Data with Base Map – Visualization with Seaborn

Books for Study
1. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Book Publishing Co. (P) Ltd., 2016.

   Unit-I - *Chapter 3 (3.1,3.2), Chapter 4(4.1-4.6), Chapter 6 (5.1-5.4), Chapter 7 (7.1-7.9)*

   Unit-II - *Chapter 9 (9.1 -9.10), Chapter 11 (11.1-11.5, 11.9,11.10), Chapter 12(12.1-12.6, 12.8)*

2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016

   Unit-III - *Chapter 2*
   Unit-IV - *Chapter 3*
   Unit-V - *Chapter 4*

Books for Reference
1. Wesley J. Chun, "Core Python Programming", Second Edition, Prentice Hall Publication, 2006.
2. Timothy A Budd, "Exploring Python", Tata McGraw Hill, New Delhi, 2011
3. Alberto Boschetti and Luca Massaron, "Python Data Science Essentials", Packt publishing, 3rd Edition, 2018

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course		Hours	Credit
II	**21PCA2CC06**	**CORE-6: DATA ANALYSIS USING PYTHON**		**4**	**3**
Course Outcomes ↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	2	1	3	3	2	2	2	2.3
CO-2	3	3	2	2	1	3	3	3	2	3	2.5
CO-3	3	3	2	2	1	3	3	2	2	3	2.4
CO-4	3	3	3	2	1	3	3	3	2	3	2.6
CO-5	3	3	3	2	1	3	3	3	2	3	2.6
									Mean Overall Score		**2.48 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
II	**21PCA2CP03**	**SOFTWARE LAB-3: PROGRAMMING SMART DEVICES**	**3**	**3**

CO No.	CO- Statements On successful completion of this course, students will be able to	Cognitive Levels (K- Levels)
CO-1	use the front-end tools to build mobile apps.	**K1**
CO-2	understand the concepts behind components, views, state and properties of mobile Apps.	**K2**
CO-3	handle styling and layout for the mobile app.	**K3**
CO-4	test mobile applications that interact with storage and external APIs.	**K4**
CO-5	design applications for publication in Play Store and iOS App Store.	**K5 & K6**

List of Exercises
1. Create an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and Event Listeners
3. Create a native calculator application.
4. Develop an application that draws basic Graphical Primitives on the screen.
5. Develop a native application that uses GPS location information.
6. Implement an application that writes data to the SD card
7. Implement an application that creates an alert upon receiving a message.
8. Mobile application with alarm clock.
9. Develop a photo gallery with search option.
10. Database Programming for mobile applications.
11. Develop the Tablet Programming.
12. Create Media Player.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	**21PCA2CP03**	**SOFTWARE LAB-3: PROGRAMMING SMART DEVICES**									**3**	**3**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	2	1	3	3	2	1	3	2.3
CO-2	2	2	3	2	3	3	3	3	2	3	2.6
CO-3	2	3	3	2	2	3	2	3	2	3	2.5
CO-4	3	3	1	3	2	3	1	2	2	3	2.3
CO-5	3	2	3	3	1	2	3	2	1	2	2.2
									Mean Overall Score		**2.38 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
II	**21PCA2CP04**	**SOFTWARE LAB-4: PYTHON**	**2**	**2**

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On completion of this course, students will be able to	
CO-1	recall, understand various data structures used in Python	**K1**
CO-2	develop simple python programs by interpreting the core concepts used in python	**K2**
CO-3	apply the methods used in python packages to perform effective data analysis	**K3**
CO-4	explore a dataset to perform effective data analysis and visualization	**K4**
CO-5	combine packages like Numpy, Pandas and Matplotlib and evaluate the outcome of the data analysis	**K5 & K6**

List of Exercises
Basic Python Programs
- Flow controls, Functions and String Manipulation
- Operations on Tuples and Lists
- Operations on Sets and Dictionary
- Simple OOP – Constructors, Method Overloading, Inheritance
- Regular Expressions
- Database Operations

Data Analysis - NumPy
- NumPy Arrays,
- Sorting and Searching on Arrays

Data Analysis - Pandas
- Data Series
- Data Frame
- Combining and Merging Data Sets
- Handling Missing Values, Filter, Grouping and Aggregation

Visualization – MatplotLib & Seaborn
- MatPlotLib – Line Chart, Scatter Plot, Histogram
- Seaborn – Boxplot, HeatMap

Web Links
Virtual Lab
http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/index.html
Online Python Compiler
https://www.programiz.com/python-programming/online-compiler/

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credit
II	21PCA2CP04	SOFTWARE LAB-4: PYTHON								2	2
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	3	1	3	2	2	2	2	2.4
CO-2	3	3	2	2	1	3	3	3	2	3	2.5
CO-3	2	3	2	2	2	3	3	2	2	3	2.4
CO-4	3	3	3	2	1	3	3	3	3	3	2.7
CO-5	3	3	3	2	1	3	3	3	3	3	2.7
Mean Overall Score											2.54 (High)

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2SP01	**SELF-PACED LEARNING: XML**	-	2

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	define the fundamental concepts of XML document	**K1**
CO-2	demonstrate the capacity to use encoding, tools and standards related to XML document	**K2**
CO-3	apply various styles related to DTD, Xml Schemas, CSS and XSL	**K3**
CO-4	distinguish the various supplemental technologies in XML	**K4**
CO-5	develop functional programming using XML	**K5 & K6**

Unit-I
Introducing XML: An Eagle's Eye View of XML – XML Applications – Your First XML Document – Structuring Data – Attributes, Empty – Element Tags, and XSL – Well – formedness.

Unit-II
Document Type Definitions: Validity – Element Declarations – Attribute Declarations – Entity Declarations – Namespaces.

Unit-III
Style Languages: CSS Style Sheets – CSS Layouts – CSS Text Styles – XSL Transformations- XSL Formatting Objects.

Unit-IV:
Supplemental Technologies: XLinks – Xpointers – Xinclude – Schemas.

Unit-V
XML Applications: Mathematical Markup Language – Chemical Markup Languages – Music XML – Voice XML.

Book for Study
   1. Elliotte Rusty Harold, "XML Bible", John Wiley & Sons, 3ʳᵈ Edition, 2004.
      Unit-I   *Chapter 1, 3 to 5 and 6*
      Unit-II   *Chapter 7 to 11*
      Unit-III *Chapter 12 to 16*
      Unit-IV   *Chapter 17 to 20*
      Unit-V   *Chapter 2*

Books for Reference

1. Thomas A Powell, "The Complete Reference XML", The McGraw – Hill Companies, 5th Edition, 2010.
2. Erik T. R Ray Learning XML, "O" Reilly Media, Third Edition, 2003.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course							Hours	Credit
II	21PCA2SP01		SELF-PACED LEARNING: XML							-	2
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	2	3	2	2	3	2	2.4
CO-2	2	3	2	1	3	2	3	2	3	2	2.3
CO-3	2	3	3	2	3	2	3	3	2	2	2.5
CO-4	3	2	2	3	2	3	2	3	2	2	2.4
CO-5	2	3	3	2	2	2	3	3	2	2	2.4
									Mean Overall Score		2.4 (High)

Semester	Course Code	Title of the Course	Hours	Credit
II	**21SCS2ES02**	**DSE-2: DESIGN AND ANALYSIS OF ALGORITHMS**	**5**	**4**

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On completion of this course, students will be able to	
CO-1	acquire the knowledge of data structures, design and analysis of algorithms	**K1**
CO-2	compare the data structures, design of computer algorithms with their complexity.	**K2**
CO-3	experiment with the complexity of algorithms and apply searching and sorting methods.	**K3**
CO-4	discover the basic results of time complexity and space complexity in different types of algorithms.	**K4**
CO-5	learn to develop algorithms for recursive, back-tracking and mathematical problems	**K5 & K6**

Unit-I   **(15 hours)**

Introduction-Algorithm-Algorithm specification: Pseudo code Conventions, Recursive algorithms-Performance analysis: Space Complexity, Time Complexity, Asymptotic Notation.

Unit II   **(15 hours)**

Ordered lists –Polynomial addition- Representation of Arrays – Stack – Queue – Circular queue – Evaluation of Expressions – Infix to Postfix – Evaluation of Postfix.

Unit III   **(15 hours)**

Singly linked list –Linked stacks and queues –The storage pool – More on linked list. Doubly linked list (insertion and deletion only)- Tree- Binary tree representation – Binary tree traversals – Application of tree – Eight coins Decision tree.

Unit-IV   **(15 hours)**

Divide and conquer – General method – Binary search- Finding the maximum and minimum in a set of items-Merge sort-Quick sort.

Unit-V   **(15 hours)**

The Greedy Method – The General Method –Knapsack Problem – Job Sequencing with Deadlines - Backtracking-The 8-Queens problem-Algebraic problems-The general method-Evaluation and interpolation-Horner'srule-Lagrange interpolation – Newtonian interpolation.

Books for Study

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications Pvt. Ltd., 2004.
   - **UNIT I** : *Chapter 1. (Sections: 1.1, 1.2, 1.3.1 to 1.3.3)*
   - **UNIT IV** : *Chapter 3. (Sections: 3.1 to 3.5)*
   - **UNIT V** : *Chapter 4. (Sections: 4.1,4.2, 4.4)*

Chapter 7 (Sec: 7.2) and Chapter 9 (Sec:9.2)

2. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Book Source,1981.

    UNIT II: *Chapter 2.(Sections:2.2,2.4) Chapter 3.(Sections:3.1,3.3)*
    UNIT III: *Chapter 4.(Sec: 4.1,4.2,4.3,4.5,4.8) Chapter 5.(Sec: 5.1,5.2,5.3,5.4,5.8.2)*

Books for Reference

1. A.V.Aho, J.E.Hopcroft, J.D.Ullman, "The Design and Analysis of Computer Algorithms", Addison-Wesley Publ. Comp., 1974.
2. Seymour E.Goodman and S. T. Hedetniemi, "Introduction to the Design and Analysis of Algorithms", McGraw Hill International Edition,2002.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	**21SCS2ES02**	**DSE-2:** **DESIGN AND ANALYSIS OF ALGORITHMS**									**5**	**4**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO-1	3	2	2	2	1	3	3	2	2	3	2.3	
CO-2	2	3	2	1	2	3	3	2	2	3	2.3	
CO-3	2	2	3	2	3	2	3	2	3	2	2.3	
CO-4	2	2	2	3	2	2	3	2	2	3	2.4	
CO-5	2	2	2	2	3	1	3	2	2	3	2.2	
									Mean Overall Score		2.3 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PSS2SE01	SEC: SOFT SKILLS	4	3

Course outcomes (COS)
Upon completion of this course, students will:

• be exposed and trained in various nuances of Soft Skills in a Professional manner responding to the requirements of national and international market
• be able to synthesize the knowledge and practical skills learnt to be personal effective in any managerial positions
• be equipped to construct plans and strategies to work for better human society
• be able to illustrate the problems at work and home and design solutions and Maintain a balance of work and home
• be able to connect on a continuum and maintain growth and sustainability and creativity in employment that increases in productivity, profit for individuals and the society.

Module 1: Effective Communication & Professional communication

Effective communication: Definition of communication, Process of Communication, Barriers of Communication, Non-verbal Communication. JOHARI Window as a tool of effective communication.

Professional Communication: The Art of Listening, The passage, Kinesthetic, Production of Speech, Speech writing ,Organization of Speech, Modes of delivery, Conversation Techniques, Good manners and Etiquettes, Different kinds of Etiquettes, Politeness markers.

Module II. Resume Writing & Interview Skills

Resume Writing: Meaning and Purpose. Resume Formats. Types of Resume. Functional and Mixed Resume**,** Steps in preparation of Resume, Model resumes for an IT professional Chronological, Types of interviews, Creative resumes using online platforms

Interview Skills: Common interview questions, Dos and Don'ts for an interview, Attitude, Emotions, Measurement, Body Language, Facial expressions, Different types of interviews, Telephonic interviews, Behavioral interviews and Mock interviews(Centralized).

Module III: Group Discussion & Team Building

Group Discussion: Group Discussion Basics, GD as the first criterion for selecting software testers, Essentials of GD, Factors that matter in GD, GD parameters for evaluation, Points for GD Topics, GD Topics for Practice, Tips for GD participation. Video shooting of GD presentation & Evaluation (Centralized)

Team Building: Characteristics of a team, Guidelines for effective team membership, Pedagogy of team building, Team building skills. Team Vs Group – synergy, Types of synergy, Synergy relates to leadership ,Stages of Team Formation, Broken Square-Exercise, Leadership, Leadership styles, Conflict styles, Conflict management strategies & Exercises

Module IV: Personal Effectiveness

Personal Effectiveness: Self Discovery: Personality, Characteristics of personality, kinds of self, Personality inventory table, measuring personality, intelligence and Exercises

Self Esteem: Types-High & Low self-esteem, Ways of proving self-esteem, Hypersensitive to criticism, activities. Goal setting: Goal setting process, Decision making process& Exercises.

Stress Management: Identifying stress, Symptoms of stress, Responding to Stress, Sources of stress, Coping with stress and Managing stress.

Module V:Numerical Ability

Average, Percentage, Profit and Loss**,** Problems of ages, Simple Interest, Compound Interest,, Area, Volume and Surface Area, Illustration, Time and Work, Pipes and Cisterns, Time and Distance**,** Problems on Trains**,** Illustrations, Boats and Streams, Calendars and Clocks.

Module VI: Test of Reasoning

Verbal Reasoning: Number series, letter series, coding and decoding, logical sequence of words, Assertion and Reasoning, Data Sufficiency, Analogy, Kinds of relationships.

Non-Verbal Reasoning: Completion of Series**,** Classification, analogical, Pattern comparison, Deduction of figures out of series, Mirror Reflection Pattern, Hidden figures, Rotation pattern, Pattern completion and comparison, Sense of direction, Blood relations.

Text cum Exercise book

Melchias G, Balaiah, John Love Joy (Eds),2018. Winners in the Making: A Primer on soft Skills. SJC, Trichy.

References
* Aggarwal, R.S. *Quantitative Aptitude, S. Chand& Sons*
*.Aggarwal, R.S. (2010). *A Modern Approach to Verbal and Non Verbal Reasoning*.
   S.Chand & Co, Revised Edition.
* Covey, Stephen. (2004). *7 Habits of Highly effective people,* Free Press.
*Egan,Gerard.(1994).*The Skilled Helper*(5th Ed).Pacific Grove,Brooks/Cole.
* Khera Shiv(2003).*You Can Win.* Macmillan Books, Revised Edition.

Other Text Books
* Murphy, Raymond. (1998). *Essential English Grammar.* 2[nd]ed.,   Cambridge University Press.
* Prasad, L. M. (*2000). Organizational Behaviour, S.Chand & Sons.*
*Sankaran, K., & Kumar, M. *Group Discussion and Public Speaking*. M.I. Pub, Agra*,* 5[th]ed., Adams Media.
* Schuller, Robert. (2010) .*Positive Attitudes*. Jaico Books.
* Trishna's (2006).*How to do wellin GDs & Interviews*, Trishna Knowledge Systems.
** Yate, Martin. (2005).H*iring the Best: A Manager's Guide to EffectiveInterviewing and Recruiting**

Semester	Course Code	Title of the Course	Hours	Credits
II	**21PCA2EG01**	**GENERIC ELECTIVE – I (WS): APPLIED STATISTICS USING R**	**4**	**3**

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On completion of this course, students will be able to	
CO-1	recall the basic concepts used in R Programming structure	**K1**
CO-2	define different concepts in R Programming such as data structures in R like Vectors, Matrices and Lists	**K2**
CO-3	apply fundamental statistical techniques in R tool and evaluate R commands using an Integrated Development Environment	**K3**
CO-4	compare various statistical methods using R tool	**K4**
CO-5	produce effective data analysis on real time datasets	**K5 & K6**

Unit – I (12 hours)

INTRODUCTION TO R PROGRAMMING: Overview of R – Installation of R - Loading R Packages – R Basic Syntax – Data Types and Objects – Variables – Constants – Comments – Debuting in R. DATA DEFINITION AND CATEGORISATION: Overview of Data – Sources of Data – Big Data – Data Categorisation – Data Cube. CONTROL STATEMNETS AND FUNCTIONS: if Statement – for statement – while loop – repeat and break Statements – next Statement – switch Statement – Functions.

Unit – II (12 hours)

VECTORS: Overview of Vector – Creating a Vector – Accessing Elements of a Vector – Vector Manipulation and Vector Arithmetic – Deleting a Vector – Vector Element Sorting MATRICES: Creating a Matrix –Matrix Subsetting – Matrix Operations – Combining Matrices – Special Matrices – Eigen Vectors and Eigen Values - Arrays LISTS: Introduction to Lists – Creating a List – General List Operations – Accessing and Manipulating Elements of a List – Merging Lists – Applying Functions to a List – Sorting and Searching.

Unit - III (12 hours)

DATA FRAMES: Introduction to Data Frames – Creating a Data Frame – General Operations on Data Frames – Extending a Data Frame – Applying Functions to Data Frame. FACTORS AND TABLES: Introduction to Factors – Creating a Factor – Factor Levels – Summarising a Factor – Ordered Factors – Converting Factors – Common Functions used with Factors – Introduction to Tables and Creating Tables – Table Related Functions – Cross Tabulation. GRAPHICS IN R: Creating Graphs – Histograms – Bar Plot – Line Chart – Pie Chart – Box Plot _ Scatter Plot – Saving Graphs to a File

Unit - IV (12 hours)

DESCRIPTIVE STATISTICS USING R: Introduction to Statistical Analysis in R – Measures of Central Tendency or Location – Measures of Dispersion – Measures of Shape. PROBABILITY: Introduction to Probability – Probability and Statistics – Random Variables – Probability Distribution.

Unit - V (12 hours)

CORRELATION AND REGRESSION ANALYSIS: Correlation Analysis – Regression Analysis. STATISTICAL INFERENCE: Introduction to Statistical Inference – Hypothesis Testing. ANALYSIS OF VARIANCE: Introduction to Analysis of Variance – Implementing Analysis of Variance - ANNOVA in R.

Book for Study
1. Sandhya Arora and Latesh Malik, "R Programming for Beginners", Universities Press India (P) Ltd., 2020.
   Unit-I   -   *Chapter 1 , 2 & 4*
   Unit- II   -   *Chapter 6, 7 & 8*
   Unit-III   -   *Chapter 9, 10 & 14*
   Unit-IV   -   *Chapter 17 & 18*
   Unit-V   -   *Chapter 20, 21 & 22*

Books for Reference
1. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.
2. Mark Gardener, "Beginning R – The Statistical Programming Language", Wiley, 2013
3. AKVerma, "RProgramming", CengageLearning, 2017

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
II	**21PCA2EG01**		**GENERIC ELECTIVE – I (WS): APPLIED STATISTICS USING R**								**4**	**3**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	1	3	3	2	2	2	2.3	
CO-2	3	3	2	2	1	3	3	3	2	3	2.5	
CO-3	3	3	2	2	1	3	3	2	2	3	2.4	
CO-4	2	3	3	2	2	3	3	3	2	3	2.6	
CO-5	3	3	3	2	1	3	3	3	2	3	2.6	
									Mean Overall Score		**2.48 (High)**	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PMA2EG01	**GENERIC ELECTIVE - I (WS): MATHEMATICAL FOUNDATIONS**	4	3

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	have knowledge of relations, functions, mathematical logic, lattices and numerical methods.	K1
CO-2	understand the types of functions, conditional statements and tautology in mathematical logic, properties of lattices, Boolean algebra, numerical techniques to find the roots and interpolation methods.	K2
CO-3	apply mathematical induction, composition of functions, logical notation to write an argument, suitable method to solve linear equations and numerical integration, interpolation.	K3
CO-4	analyze various types of function, statements using truth tables, use Boolean algebra to design and simplify logic circuits, numerical methods to find solutions of linear equations and system of equations using different methods.	K4
CO-5	justify relations and functions, to construct mathematical arguments using logical connectives and quantifiers, lattices. Evaluate solutions of system of linear equations and numerical integration.	K5 &K6

Unit-I (12 Hours)

Relations – Equivalence Relation – Functions and Operators – One-to-one, Onto Functions – Special Types of Functions – Invertible Functions – Composition of Function – Mathematical Induction.

Unit –II (12 Hours)

Logic: Introduction – TF – Statements – Connectives – Conjunction – Disjunction – Negation – Conditional Statements – Biconditional Statements – The Truth Table of a Formula – Tautology.

Unit- III (12 Hours)

Lattices – Some Properties of Lattices - New Lattices – Lattice Homomorphisms – Product Lattices of Two Lattices– Modular and Distributive Lattices – Boolean Algebra.

Unit-IV (12 Hours)

Iterative Methods: Birge – Vieta –Graeffe's Root squaring methods. System of linear algebraic equations: Gauss Elimination, Jacobi iteration method - Gauss-Seidel iteration method.

Unit- V **(12 Hours)**

Interpolation: Lagrange interpolation – Newton's Forward Difference Interpolation– Newton's Backward Difference Interpolation – Trapezoidal Rule - Simpson Rule - Romberg integration.

(Note: Stress on solving Numerical problems in Units IV and V. No Derivations).

Books for Study

1. Dr. M.K. Venkataraman, Dr. N. Sridharan, N. Chandrasekaran., **"Discrete Mathematics"**, The National Publishing Company, Chennai. 2006.

> **Unit-I** *Chapter II (Sec: 2, 5), Chapter III (Sec: 1, 2, 3, 4, 5),*
> *Chapter IV (Sec: 2 Theorems are excluded).*
> **Unit-II** *Chapter IX (Sec: 1, 2, 3, 6, 7).*
> **Unit-III** *Chapter X (Sec: 1, 2, 3,4, 5) (Definition and example only for Sec 5)*

2. M.K. Jain, S.R.K. Iyengar, R.K. Jain., "**Numerical Methods for Scientific and Engineering Computation"**, 4th Edition, New Age International (P) Limited, Publishers, 2003.

> **Unit-IV** *Chapter 2 (Sec: 2.9,), Chapter 3 (Sec 3.2, 3.4).*
> **Unit-V** *Chapter 4 (Sec: 4.2, 4.4), Chapter 5 (Sec 5.9, 5.10).*

Books for Reference

1. J.P. Trumblay, R. Manohar. **"Discrete Mathematical Structures with Applications to Computer Sciences"**, McGraw-Hill International Edition, 1987.
2. S.S. Sastry, **"Introductory Methods of Numerical Analysis",** PHI Learning Private Limited, 4th Edition, New Delhi 2009
3. P. Kandasamy, K.Thilagavathy, K.Gunavathi, **"Numerical methods",** S. Chand & company Ltd-2008.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credits
II	**21PMA2EG01**	**GENERIC ELECTIVE- I (WS): MATHEMATICAL FOUNDATIONS**								**4**	**3**
Course Outcomes ↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	2	1	3	3	2	2	3	2.4
CO-2	3	3	2	1	2	3	3	2	2	2	2.3
CO-3	3	2	3	2	1	2	3	2	3	2	2.3
CO-4	3	2	3	1	2	3	2	3	2	2	2.3
CO-5	3	3	3	2	1	2	3	3	2	2	2.4
									Mean Overall Score		**2.34 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CC07	**CORE-7:** **DISTRIBUTED TECHNOLOGIES**	5	4

CO No.	CO- Statement	Cognitive Levels (K- Level)
	On completion of this course, students will be able to	
CO-1	understand the architectures of distributed systems.	K1
CO-2	provide the better understanding of the features of presentation layer.	K2
CO-3	create applications for the implementation of server side distributed technologies.	K3
CO-4	evaluate and compare the technologies associated with presentation and interaction services.	K4
CO-5	design applications that involve presentation, interaction, persistence and component technologies.	K5 & K6

Unit-I   **(15 hours)**

Client server computing- classification of client server system- client server advantages and disadvantages. J2EE architecture - MVC architecture - .NET Framework.

Unit-II   **(15 hours)**

Presentation services: Servlet - JSP - Javamail - Interaction services: RMI - CORBA – XML- XSL –AJAX.

Unit-III   **(15 hours)**

Component model: EJB: Session Beans: Stateless and Stateful - Entity Beans- CMP and BMP - Message Driven Beans.

Unit-IV   **(15 hours)**

Getting Started with ASP.NET: Introducing the .NET Framework - Creating an ASP.NET Application- Deploying an ASP.NET Web Application. Building Forms with Web Controls: Introducing ASP.NET Web Forms- Creating Web Forms Application Projects- Using Web Controls- Working with Events.

Unit-V   **(15 hours)**

Using Rich Web Controls: Using the AdRotator Control- Using the Calendar Control- Using the Tree View Control- ASP.NET Database Programming: Introducing ADO.NET- ADO.NET Basics- ADO.NET Object Model- Managed Providers- Dataset class.

Books for Study
1. Chandra Yadav Subhash **,** "An Introduction to Client Server Computing**",** New Age International (P) Limited, New Delhi, India, 2009.
   Unit-I   *Chapter1 (Sec: 1.1, 1.2, 1.3)*
2. Justin Couch, Daniel H.Steinberg, "J2EE Bible", Wiley India(P) Ltd, New Delhi, India, 2002.
   Unit-I   *Chapter1 (Pages3 to 10),*

Unit-II   *Chapter 3 (Pages 36 to 46), Chapter 4 (Pages 47 to 68),*
            Chapter 5 (Pages 69 to 93), Chapter 15 (Pages 309 to 327),
            Chapter 18 (Pages 431 to 461), Chapter 10 (Pages 191 to 208),
            Chapter 14 (Pages 269 to 276),
Unit-III *Chapter 16 (Sec: 328 to 378)*
3. Mridula Parihar, "ASP.NET Bible", Hungry Minds, Third Avenue, New York, 2002
   Unit-I   *Chapter1*
   Unit-IV   *Chapter 2 and 3*
   Unit-V   *Chapter 4 and 8*

Books for Reference
1. Stephanie Bodoff, Dale Green, Eric Jendrock, "The J2EE tutorial", Addison-Wesley, New York, 2002.
2. Paul Tremblett, "Instant Enterprise Java - Beans", Tata McGraw Hill Publishing Company, New Delhi, India, 2001.
3. Hitesh Seth, "Microsoft .NET: kick start", Sams Publishing, USA, 2004.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21PCA3CC07	CORE-7: DISTRIBUTED TECHNOLOGIES									5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	2	3	1	2	2	3	3	1	3	2.2	
CO-2	3	3	3	2	3	2	3	1	2	3	2.5	
CO-3	2	1	3	3	2	2	3	3	1	2	2.2	
CO-4	3	2	1	1	3	2	3	3	1	2	2.1	
CO-5	2	3	1	2	3	3	2	3	1	2	2.2	
								Mean Overall Score			2.24 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CC08	CORE-8: COMPUTER NETWORKS AND SECURITY	5	4

CO No.	CO-Statements On completion of this course, students will be able to	Cognitive Levels (K-Levels)
CO-1	recall the fundamental knowledge in computer network communication and security	K1
CO-2	summarize the technical aspects of every layer of OSI reference model	K2
CO-3	identify the issues in the layers of OSI reference model	K3
CO-4	analyse the technical factors involved network communication	K4
CO-5	evaluate the network security issues and propose appropriate security solution	K5 & K6

Unit-I   **(15 hours)**
Introduction: Definition of Computer Networks - Uses of Networks - Network Architecture-Protocol hierarchies - Service Primitives - OSI Reference Model - ARPANET - Internet - Physical Layer Transmission Media - Telephone Systems.

Unit-II   **(15 hours)**
Data link layer: Data link layer - Design Issues - Error Detection and Correction   Data Link Protocols - Sliding Window Protocols - Finite state Machine Model - Petri Networks-PPP-Polling - FDM.
-
Unit-III   **(15 hours)**
Network Layer: Design Issues - Routing Algorithms - Congestion Control Algorithms - Inter Network Routing - Fragmentation.

Unit-IV   **(15 hours)**
Transport Layer - Design Issues - Elements of Transport Protocols - The Internet - Transport Protocol (TCP &UDP) - Application Layer: Design Issues.

Unit-V   **(15 hours)**
Network Security: Security Requirements and Attacks - Confidentiality with Symmetric Encryption - Message Authentication and Hash Functions – Public -key Encryption and Digital Signatures - Secure Socket Layer and Transport Layer Security - IPv4 and IPv6 Security.

Books for Study
 1. Andrew S Tanenbaum, "Computer Networks", Prentice Hall of India, New Delhi, 1999.
        Unit I   – Chapters I and II
        Unit II   – Chapters III and IV
        Unit III   – Chapter V
        Unit IV   – Chapter VI

2. William Stallings, "Data and Computer Communications", Pearson,Eighth Edition, 2007.

Unit V – Chapter 21

Books for Reference

1. Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGraw Hill, New York, 1985.
2. Behrouz A Fourouzan, "Data Communications and Networking", McGraw Hill, Fourth Edition, 2006.
3. Andrew S Tanenbaum, David J. Wetherall, "Computer Networks", Prentice Hall, 2011.
4. Gregory B. White, ,Eric A. Fisch Udo W. Pooch, "Computer System and Network + .Security", CRC Press, 2017

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	**21PCA3CC08**	**CORE-8: COMPUTER NETWORKS AND SECURITY**									**5**	**4**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO-1	2	3	2	2	1	2	2	2	2	1	1.9	
CO-2	3	2	3	2	1	3	2	2	2	1	2.1	
CO-3	3	2	3	2	1	3	3	2	2	1	2.2	
CO-4	3	3	3	3	2	3	3	3	2	2	2.7	
CO-5	3	3	3	2	1	3	3	3	3	1	2.5	
									Mean Overall Score		**2.28 (High)**	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CC09	**CORE-9:** **ACCOUNTING AND FINANCIAL MANAGEMENT**	5	4

CO No.	CO- Statements On completion of this course, students will be able to	Cognitive Levels (K- Levels)
CO-1	remember the basic concepts of accounting and recalling the financial statements.	K1
CO-2	understand the errors in accounting & organizing interpreting them.	K2
CO-3	apply acquired knowledge to solve depreciation.	K3
CO-4	analyze and examine the business operations based on cost analysis	K4
CO-5	evaluate and criticize the various budgets and compile and build in decision-making related to capital expenditure	K5 & K6

Unit – I (15 hours)
Basic Accounting Terms – Accounting Equation – Accounting Procedures – Rules of Debit and Credit – Transactions – Journals –Ledgers – Trial Balance.

Unit – II (15 hours)
Trading account- Rectifications of Errors – Financial Statements – Adjustments – Profit and Loss Account – Balance Sheet.

Unit – III (15 hours)
Depreciation; Meaning - need - methods of charging depreciation. Accounting Packages: General Framework - Accounting Applications. (Tally.ERP 9, QuickBooks India, Zoho Books, Busy Accounting)

Unit – IV (15 hours)
Marginal Costing - Break Even Analysis - Standard Costing: Analysis of Variance.

Unit – V (15 hours)
Budgeting: Characteristics - Advantages - Classification - Preparation of Budgets. Capital Budgeting: Meaning - Methods of Capital Investment Decision making.

Books for Study
1. TS Grewal's "Double Entry Book Keeping-Solutions for Accountancy-Financial Accounting", Sultan Chand Sons, 2021
    Unit-I : Chapters 1 to 6 and 10
    Unit-II : Chapters 14 to 16
    Unit- III : Chapter 11
2. R Ramachandran & R Srinivasan, "Management Accounting" (Theories, Problems & Solutions), Sriram Publications, 6th Revised Edison, 2017.
    Unit-IV : Chapters 6 and 9
    Unit-V : Chapters 7and 8

Books for Reference

1. SN Maheswari "Cost& Management Accounting", Sultan Chand Sons, New Delhi, 2015.
2. Tally ERP9 Training Guide – 4th Revised & Updated Edition, 2018
3. MC Shukla, TS Grewal and SC Gupta "Advanced Accounting", S Chand and Company (Pvt.) Ltd., Ram Nagar, New Delhi, 2016.
4. RSN Pillai & Bagavathi "Management Accounting", Sultan Chand Sons, New Delhi, 2017.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credit
III	**21PCA3CC09**	**CORE-9: ACCOUNTING AND FINANCIAL MANAGEMENT**								**5**	**4**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	1	2	3	3	2	1	2	2.2
CO-2	3	3	3	2	1	3	3	3	2	2	2.5
CO-3	2	3	3	2	2	2	3	3	2	2	2.4
CO-4	3	3	3	1	2	3	3	3	1	2	2.4
CO-5	2	3	3	1	2	2	3	3	2	1	2.3
									Mean Overall Score		**2.35 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CP05	SOFTWARE LAB – 5: DISTRIBUTED TECHNOLOGIES	3	3

CO No.	CO- Statements	Cognitive Levels
	On completion of this course, students will be able to	(K- Levels)
CO-1	acquire the knowledge of distributed applications.	K1
CO-2	understand the presentational aspects of distributed applications.	K2
CO-3	present web contents by creating web pages.	K3
CO-4	test web applications that interact with storage devices.	K4
CO-5	design, implement and test distributed applications in J2EE and DOT NET environments.	K5 & K6

List of Exercises
1. RMI - Invocation of server side methods.
2. Servlets - Returning Information received from the client.
3. Servlets and JDBC - Constructing a response by accessing a database.
4. JSP - use of script let.
5. JSP - use of java beans.
6. EJB - Session Bean.
7. EJB - Entity Bean.
8. ASP.NET - Server &Client side controls.
9. Database Access - ADO.NET
10. Components Creation and Usage
11. ASP.NET: Data bind Controls.
12. File Accessing
13. Creating Web Services and Access.
14. DOM usage on the server side.
15. AJAX: Dynamic client - server interaction.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course	Hours	Credit
III	21PCA3CP05	SOFTWARE LAB – 5: DISTRIBUTED TECHNOLOGIES	3	3

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	3	3	2	3	1	2	2.4
CO-2	2	3	3	2	2	3	2	3	1	3	2.4
CO-3	3	2	3	1	1	2	3	3	2	3	2.3
CO-4	3	3	3	1	2	1	2	3	2	3	2.3
CO-5	3	2	2	2	3	3	3	1	1	1	2.1
								Mean Overall Score			2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3CP06	**CASE STUDY BASED APPLICATION DEVELOPMENT**	3	3

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	recall and examine specific functional domains like Marketing, Finance, HR, SCM etc	K1
CO-2	gain practical insights in the selected domain	K2
CO-3	connect their chosen domain into actual work environment in an organization	K3
CO-4	assess the outcome of the project with industry standards	K4
CO-5	build career opportunities in a specific domain	K5 & K6

Procedure

• Each student will be assigned to a faculty, and the faculty will act as guide and monitor the progress of the work of the assigned student.

• The staff member will assess the work via submission of a report and viva-voce.

• Every student is expected to choose one of the following IT Sector domains

List of Industry Sectors / Specific Domains

Agriculture Industry	Engineering and Construction	Manufacturing Domain
Automotive Industry	Energy Industry	Retail Industry
Banking Domain	Education Domain	Textiles & Clothing
BFSI Industry	Finance Domain	Travel and Tourism Domain
Consumer / FMCG Industry	Hospitality Domain	Telecom Industry
Chemicals Industry	Healthcare Industry	Transport
Construction	Insurance Domain	Utilities (Water, Gas, Electricity)
Commerce / E-Commerce	Media & Entertainment	

• Students are expected to visit a local industry or institute for getting the problem statement / ideas of their case study and data collection.

• They will submit the Case Study Idea to their guide for approval.

• The ideas should be submitted to the respective guide in the beginning of the second week after the college reopens.

• Students can develop their application as Desktop based application/Web Application/ Mobile based application.

• They are also encouraged to develop Data Analytics Applications, or applications based on IoT or any other latest technologies based on the viability of software's and simulation tools available in the Computer Centre/Labs.

• Students can choose any one of the Language, Database, Tools and Techniques they have studied in the previous semesters for their application development.

Schedule

S. No.	Task	Tentative Timescale
1	Guide Allotment	Third Week of June
2	Submission of and Case Study and Title approval	Last Week of June
3	Interim Review	First Week after Mid Semester
4	Demonstration	Last Week of September
5	Draft Report Submission	First Week of October
6	Final Report Submission	Second Week of October
7	Viva-voce	Second Week of October

Evaluation Pattern

Component	Marks
Regularity in Reporting to guide	20
Interim Review	10
Documentation	20
Demonstration	25
Viva	25
Total	**100**

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course					Hours	Credit
III	**21PCA3CP06**		**CASE STUDY BASED APPLICATION DEVELOPMENT**					**3**	**3**

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	1	3	3	3	3	2	2.6
CO-2	3	3	3	2	1	3	3	3	3	2	2.6
CO-3	3	3	3	2	1	3	3	3	3	2	2.6
CO-4	3	3	3	2	1	3	3	3	3	2	2.6
CO-5	3	3	3	2	1	3	3	3	3	2	2.6
Mean Overall Score											2.6 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3ES03A	**DSE-3: MEAN STACK WEBAPP DEVELOPMENT**	5	4

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On completion of this course, students will be able to	
CO-1	define the basic components of Full Stack Development and MEAN Stack Architecture	K1
CO-2	discuss the process of setting up a MEAN Project and understanding the nuances.	K2
CO-3	implement a Data Model with MongoDB by applying the concepts of REST APIs.	K3
CO-4	compare the various tools used in the development of MEAN stack web applications.	K4
CO-5	develop end–to–end web applications with Angular, Node, Express and MongoDB.	K5 & K6

Unit - I (15 hours)

INTRODUCING FULL STACK DEVELOPMENT: Brief History of Web Development – Towards Full Stack Development – Benefits of Full Stack Development –MEAN Stack – Node.js: The Web Server/Platform – Express: The Framework – MongoDB: The Database – AngularJS: The Front End Framework. DESIGNING A MEAN STACK ARCHITECTURE: Common MEAN Stack Architecture – Designing a Flexible MEAN Architecture

Unit - II (15 hours)

CREATING AND SETTING UP MEAN PROJECT: Creating an Express Project – Modifying Express for MVC – Import Bootstrap for Responsive Layouts. STATIC SITE WITH NODE AND EXPRESS: Defining Routes in Express – Building Basic Controllers – Creating Some Views – Adding Rest of Views – Take Data out of Views and Make Smarter

Unit - III (15 hours)

DATA MODEL with MONGODB: Connecting Express Application to MongoDB using Mongoose – Model the Data – Simple Mongoose Schema – MongoDB Shell to create MongoDB Database REST API: EXPOSE MONGODB DATABASE TO APPLICATION: Setting up API in Express – GET Methods: Reading Data from Mongo DB – POST Methods: Adding Data to MongoDB. PUT Methods: Updating Data in MongoDB. DELETE Method: Deleting Data from MongoDB

Unit - IV (15 hours)

CONSUMING A REST API: Call API from Express – List of Data from an API – Getting Single Document from API – Adding Data to Database via API. ADDING ANGULAR COMPONENT TO AN EXPRESS APPLICATION: Getting and Running Angular – Displaying and Filtering the Homepage List – Getting Data from API – Ensuring Forms work as Expected

Unit - V   **(15 hours)**

SINGLE PAGE APPLICATION WITH ANGULAR: Groundwork for an Angular SPA – Switch from Express Routing to Angular Routing – Adding First Views, Controllers and Services. BUILDING SPA WITH ANGULAR: Full SPA – Adding Additional Pages and dynamically injecting HTML – Complex Views and Routing Parameters – Angular UI Components to create Modal Popup

Book for Study

1. Simon Holmes, "Getting MEAN with Mongo, Express, Angular, and Node", Manning Publications, 2016

     Unit-I   -   *Chapter 1 (Sec 1,2)*
     Unit-II   -   *Chapter 2 (Sec 3, 4)*
     Unit-III   -   *Chapter 2 (Sec 5, 6)*
     Unit-IV   -   *Chapter 2 (Sec 7), Chapter 3 (Sec 8)*
     Unit-V   -   *Chapter 3 (Sec 9, 10)*

Books for Reference
1. Jeff Dickey, "Write Modern Web Apps with the MEAN Stack: Mongo, Express, AngularJS, and Node.js", Peachpit Press, 2015.
2. Brad Dayley, Brendan Dayley, "Node.js, MongoDB and Angular Web Development", Addison Wesley, 2017.
3. Amos Q. Haviv, Adrian Mejia,"Web Application Development with MEAN ", Kindle, June 15, 2017

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credit
III	**21PCA3ES03A**	**DSE-3: MEAN STACK WEBAPP DEVELOPMENT**								**5**	**4**
Course Outcomes ↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	2	1	3	3	2	2	2	2.3
CO-2	3	3	2	2	1	3	3	3	2	3	2.5
CO-3	3	3	2	2	1	3	3	2	2	3	2.4
CO-4	3	3	3	2	1	3	3	3	2	3	2.6
CO-5	3	3	3	2	1	3	3	3	2	3	2.6
									Mean Overall Score		**2.48 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
III	**21PCA3ES03B**	**DSE-3:PHP PROGRAMMING**	**5**	**4**

CO No.	CO-Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to;	
CO-1	define and relate the basic syntax of PHP and Laravel.	**K1**
CO-2	demonstrate the syntax and semantics of PHP programs in Laravel.	**K2**
CO-3	built simple PHP programs using Laravel	**K3**
CO-4	examine the concepts of Laravel Frameworks and develop web applications using PHP.	**K4**
CO-5	develop websites using built in-functions with PHP/MYSQL in Laravel frameworks.	**K5 & K6**

Unit-I   **(15 hours)**

HTML: Structuring Documents – Core Elements – Basic Formatting – Lists – Tables – Basic Table Elements – Nested Tables – Forms – Form Controls – Sending Form Data – CSS: Cascading Style Sheets – CSS Properties – Controlling Text – Text Formatting – Selectors – Links – Backgrounds – Lists – Java Script: – Variables – Operators – Functions – Conditional Statement – Looping - Form Validation.

Unit-II   **(15 hours)**

Linux: Introduction - Download and Install - Decisions, Decisions – Linux Partition Sizes - Accounts – Unix Commands - Apache Web server: Starting and Stopping and Restarting Apache - Configuration - Securing Apache - Create the Web Site - Apache Log Files - PHP: Embedding PHP into HTML - Configuration - Language Syntax: Variables - Data Types - Web variables - Operators - Flow Control Constructs- Writing PHP Functions.

Unit-III   **(15 hours)**

Built in PHP functions - Important Functions - Array Functions – String Functions - Other Functions - PHP and MySQL: MySQL Functions - My SQL: Commands - Database Independent Interface - Tables – Loading and Dumping Database.

Unit-IV   **(15 hours)**

Introduction: Laravel- Framework – History – System Requirements - Composer - Local Development Environments - Creating a New Laravel Project - Laravels Directory Structure - Configuration - Routing and Controllers – MVC - Views - Controllers - Route Model binding - Redirects - Custom Responses.

Unit-V   **(15 hours)**

Frontend components – Presets – Pagination – Message Bags – Collecting and Handling User Data - Request Object - Form Requests - Artisian commands - Writing artisian commands -

Calling Artisian commands - Request Object - Response Object - Container – Binding Classes - Writing APIs: REST - Controller - Reading and Sending Headers - Sorting and Filtering - Transforming Results.

Books for Study

1. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", Wiley Publishing, Indiana, 2010.
   [Unit I: Ch.1, Ch. 4, Ch. 5, Ch. 7, Ch. 8, Ch. 11, Ch. 12: 535 – 554]
2. James Lee and Brent Lee "Open Source Development with LAMP Using Linux, Apache, MySQL, Perl and PHP", Pearson Education, 2009.
   [Unit 2: Ch.2, Ch. 3, Ch. 12 : 12.1 – 12.5, Unit 3: Ch.12: 12.6 – 12.7, Ch.5]
3. Matt Stauffer, "LARAVEL Up and Running, A Framework for building modern PHP Apps", 2nd Edition, O'REILLY, 2019.
   [Unit 4 - Ch.1:1.1, 1.2, Ch.2: 2.1 – 2.5, Ch.3: 3.1, 3.5, 3.6, 3.7, 3.11, 3.13,
   Unit 5 – Ch.6: 6.2- 6.4, Ch.7: 7.1, 7.4, Ch.8: 8.2, 8.3, 8.4, Ch10: 10.2, 10.3,
   Ch.11: 11.5, Ch.13:13.1, 13.2, 13.3, 13.5]

Books for Reference

1. John Dean, "Web Programming with HTML5, CSS and JavaScript" Jones & Bartlett Learning, 2019.
2. Json Gerner, Elizabeth Naramore, Morgan Owens and Matt Warden, "Professional LAMP - Using Linux, Apache, My SQL and PHP5 Web development", Wiley Publisher, 2006.
3. Jack Vo, Learning Laravel: The Easiest Way, Learninglaravel.net, 2014.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course							Hours	Credit
III	**21PCA3ES03B**		**DSE-3: PHP PROGRAMMING**							**5**	**4**
Course Outcomes ↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	2	2	3	3	2	1	2	2.3
CO-2	3	3	3	2	1	3	3	3	2	1	2.4
CO-3	2	3	3	2	2	2	3	3	2	2	2.4
CO-4	3	3	3	2	2	3	3	3	1	2	2.5
CO-5	2	3	3	2	2	2	3	3	2	2	2.4
									Mean Overall Score		**2.4 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3GE02	GENERIC ELECTIVE-2 (BS): WEB DESIGN	4	3

CO No.	CO-Statements	Cognitive Levels (K-Levels)
	On successful completion of this course, students will be able to	
CO-1	recall the basic concepts of Internet, E-mail and web design.	K1
CO-2	understand the various features of HTML tags and Java script.	K2
CO-3	apply the HTML tags to design web pages.	K3
CO-4	discover the technical concepts of HTML and JavaScript programming	K4
CO-5	evaluate the programming skills using Markup and Scripting Languages and design simple web pages using HTML and JavaScript	K5 & K6

Unit-I   **(12 hours)**

Accessing the World Wide Web- Internet – Protocols and other Jargon – Host machines and Host names - Internet Architecture and Packet Switching - The Client/Server Software Model - Bandwidth and Asynchronous Communication. Working with E-mail – Anatomy of an E-mail message – Viewing your Inbox – Viewing individual mail messages – Sending a new mail message – Replying to and Forwarding E-mail messages.

Unit-II   **(12 hours)**

HTML Tags, Paired Tags, Singular Tags – Structure of a HTML program – Titles and Footers –Text Formatting – Emphasizing material in a web page – Text styles – Other Text Effects – Types of Lists – Adding Graphics to HTML documents.

Unit-III   **(12 hours)**

Tables – Linking Documents – Links – Images as Hyperlinks – Frames – Forms – Text element – Password element – Button element – Checkbox element – Radio element – Text Area element – Select and Option elements.

Unit-IV   **(12 hours)**

JavaScript: Introduction to JavaScript - JavaScript in web pages - writing JavaScript with HTML - Basic programming techniques - operators and expressions - conditional checking - loops - functions - user defined functions - dialog boxes.

Unit-V   **(12 hours)**

JavaScript: JavaScript DOM: JSS DOM - understanding objects in HTML - browser objects - web page object hierarchy - Handling events.

Books for Study

1. Wendy G.Lehnert, "Internet 101 - A Beginners Guide to the Internet and the World Wide Web", Addison Wesley, 1999.
   Unit I   – Chapters 1, 2 and 3
2. Ivan N. Bayross, "Web enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP", 4th Revised Edition, BPB Publications, New Delhi, 2010.
   Unit II   – Chapters 2, 3 and 4
   Unit III   – Chapters 5, 6, 7 and 10
   Unit IV   – Chapter 8
   Unit V   – Chapter 9

Books for Reference
1. Chuck Musciano & Bill Kennedy, "HTML - The Definitive Guide", Shroff Publishers & Distributors Pvt. Ltd., Calcutta - 1999.
2. Raj Kamal, "Internet and Web Technologies", TMH, New Delhi, 2002.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course							Hours	Credit
III	**21PCA3GE02**		**GENERIC ELECTIVE-2 (BS): WEB DESIGN**							**4**	**3**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	2	1	2	1	3	3	3	2	2	2.2
CO-2	3	3	1	2	1	3	3	3	2	2	2.3
CO-3	3	2	2	3	1	3	3	3	2	3	2.5
CO-4	3	2	2	3	1	3	3	3	2	3	2.5
CO-5	3	3	2	3	1	3	3	3	2	3	2.6
									Mean Overall Score		**2.42 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
III	**21PCA3CE01**	**COMPREHENSIVE EXAMINATION**	--	2

CO No.	CO – Statements	Cognitive Levels (K- Levels)
	On completion of this course, students will be able to	
CO-1	recall and summarize on the core concepts they have studied in their course of study	**K1**
CO-2	relate the ideas during competitive exams	**K2**
CO-3	build the concepts with industry applications	**K3**
CO-4	appraise themselves by answering core discipline questions during interviews	**K4**
CO-5	synthesize and apply the information in their higher studies/research	**K5 & K6**

Unit I: Data Management Systems
- Database System Concepts & Architecture
- Data Modelling
- SQL
- Normalization
- Transaction Processing and Concurrency Control
- Database Recovery Techniques
- Data warehousing and Data Mining
- Big Data and NoSQL

Unit II: Operations Research
- Linear Programming
- Simplex Method
- Two Phase Method
- Dual Simplex Method
- Transportation
- Assignment Problem
- Project Scheduling by PERT-CPM
- Queuing Theory

Unit III: Data Structures and Algorithms
- Array and its Applications
- Stack, Queue, Linked List
- Trees, Binary Tree
- Sets and Graphs
- Sorting and Searching Algorithms
- Algorithm Complexity
- Algorithm Design Techniques - Divide and Conquer; Dynamic Programming,
- Greedy Algorithms, Backtracking, Branch and Bound

.**Unit IV: Software Engineering**
- Software Process Models
- Software Requirements

- Software Design
- Software Quality
- Software Testing

Unit V: Computer Networks and Security
- Data Communication
- Network Models, OSI and TCP/IP Layers
- Mobile Communication
- Cloud Computing and IoT

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credit
III	21PCA3CE01	COMPREHENSIVE EXAMINATION								--	2
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	1	3	3	2	2	2	2.4
CO-2	3	3	3	2	1	3	3	3	2	2	2.5
CO-3	3	3	3	2	1	3	3	3	3	2	2.6
CO-4	3	3	3	2	1	3	3	3	3	2	2.6
CO-5	3	3	3	2	1	3	3	3	2	2	2.5
									Mean Overall Score		2.52 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCA4ES04A	DSE- 4: RECENT TRENDS IN COMPUTER SCIENCE	5	4

CO No.	CO-Statements	Cognitive Levels (K-Levels)
	On completion of this course, students will be able to	
CO-1	define the basic concepts and technical aspects of recent trends in computer science	K1
CO-2	relate the technical aspects of cloud computing, IoT and Artificial Intelligence	K2
CO-3	analyse the various concepts of recent trends to apply them in appropriate applications	K3
CO-4	compare various techniques in the recent trends used in the real time applications	K4
CO-5	choose the appropriate mechanism in recent trends to build new smart applications	K5 & K6

Unit – I: Cloud Computing (15 hours)

Evolution of Cloud Computing -Essential Characteristics of cloud computing - Operational models such as private, dedicated, virtual private, community, hybrid and public cloud - Service models such as IaaS, PaaS and SaaS - Governance and Change Management - Business drivers, metrics and typical use cases. Example cloud vendors - Google cloud platform, Amazon AWS, Microsoft Azure, Pivotal cloud foundry and Open Stack.

Unit – II: Internet of Things (15 hours)

Fundamentals of Internet of Things **:** Introduction – Characteristics of IoT – The Physical design of IoT – IoT Architecture and components – Logical design of IoT – Communication models – IoT Communication APIs – Emerging Applications in IoT -IoT Architectures and Protocols :Introduction – Three Layer and five layer architecture of IoT – Cloud and fog based architecture-of IoT - Representative architecture – Near Field Communication (NFC) – Wireless Sensor Network (WSN) – IoT network protocol stack – IoT technology stack – Bluetooth, Zigbee and 6Lowpan

Unit – III: Artificial Intelligence (15 hours)

Introduction: Definitions of Artificial Intelligence – Artificial Intelligence Problems – Topics of Artificial Intelligence – Timelines of Artificial Intelligence – Production Systems – State Space Representation – Branches of Artificial Intelligence – Applications of Artificial Intelligence.

Unit – IV: Machine Learning (15 hours)

Learning: Types of Learning – Machine Learning: Types in Machine Learning – History of Machine Learning – Aspects of Inputs to Training – Learning Systems – Machine Learning Applications- Quantification of Classification – Intelligent Agents

Unit – V: Blockchain   (15 hours)

Fundamentals of Blockchain: Origin of Blockchain - Blockchain Solution - Components of Blockchain - Block in a Blockchain - The Technology and the Future. Blockchain Types and Consensus Mechanism: Introduction - Decentralization and Distribution - Types of Blockchain - Consensus Protocol.

Books for Study

1. Buyya, Vecciola and Selvi, "Mastering Cloud Computing: Foundations and Applications Programming", Tata McGraw Hill, 2013. Unit I – Chapter 1

2. Dr. Kamlesh Lakhwani, Dr. Hemant Kumar Gianey, Joseph Kofi Wireko, Kamal Kant Hiran, "Internet of Things (IoT), Principles, Paradigms and Applications of IoT", BPB Publications, 2020, Unit II – Chapter 1, 2

3. Vinod Chandra S. S. and Anand Hareendran S. "Artificial Intelligence and Machine Learning", PHI Learning Pvt Ltd, 2014.   Unit III, IV – Chapter 1, 7

4. Chandramouli. S, Asha A George, Abhilash K A, and Meena Karthikeyan, "Blockchain Technology", Universities Press (India) Private Limited, Hyderabad-500029, 2021. Unit V – Chapter 1

Books for Reference

1. Joseph Ingeno , "Software Architect's Handbook", PacktPublishing,2018.

2. Stuart J. Russell and Peter Norvit, "Artifical Intelligence A Modern Approach", Third Edition, Pearson Education Limited 2016.

3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction". Princeton University Press, 2016.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
IV	21PCA4ES04A	DSE- 4: RECENT TRENDS IN COMPUTER SCIENCE									4	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	2	3	3	3	2	2	2.5	
CO-2	3	3	3	2	2	2	3	3	3	2	2.6	
CO-3	3	3	2	3	2	3	3	3	2	2	2.6	
CO-4	3	2	3	2	1	2	2	3	2	2	2.2	
CO-5	3	2	3	2	1	2	3	3	3	1	2.3	
									Mean Overall Score		2.44 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCA4ES04B	DSE- 4: BIG DATA ANALYTICS	5	4

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, student will be able to	
CO-1	acquire the knowledge on the basics of Big Data and its role in various Industry verticals	K1
CO-2	identify Big Data concepts and its implications in various business domains	K2
CO-3	explore the cutting-edge tools and technologies to analyze Big Data.	K3
CO-4	appreciate the Big Data Processing concepts and Data visualization techniques	K4
CO-5	analyze and propose the Big data solutions to corporate houses	K5 & K6

Unit-I   **(15 hours)**
Introduction: Concepts and Terminology – Big Data Characteristics- Different Types of Data-case study Background- Business goals and Obstacles- Business Motivations and Drivers for Big Data Adoption-Marketplace Dynamic- Business Architecture- Business process Management- Information and Communication Technology-Data Analytics and Data Science-Digitization.

Unit-II   **(15 hours)**
Big data Adoption and Planning Considerations-:Organization Prerequisites- Data Procurement - Privacy- Security- Provenance-Limited Realtime Support- Distinct Performance Challenges – Distinct Governance Requirements- Distinct Methodology-Clouds- Big Data Analytics-Data Identification- Data Acquisition and Filtering-Data Extraction- Data validation and cleansing-Data Aggregation and Representation- Data Analysis-Data Visualization-Utilization of Analysis Results.

Unit-III   **(15 hours)**
Enterprise Technologies and Big Data Business Intelligence-: Online Transaction and Processing (OLTP)-Online Analytical Processing (OLAP)- Extract Transform Load (ETL)-Data Warehouses-Data Marts-Traditional BI-Big Data BI-Big Data Storage Concepts-Clusters- File System and Distributed Systems- No SQL-Shading-Replication-ACID.

Unit-IV   **(15 hours)**
Big Data Processing Concepts: Introduction -Parallel Data Processing-Distributed Data Processing- Hadoop-Processing Workloads-Cluster- Processing in Batch Mode-Map-Combine-Partition- Shuffle and Sort—Processing in Real Time Mode- Speed Consistency Volume (SCV)-Event Stream Processing- Complex Event Processing- Realtime Big data Processing and SCV-Realtime Big Data Processing and MapReduce.

Unit-V   **(15 hours)**
Big Data Storage Technology: On-Disk Storage Devices-NoSQL Database- In-Memory Storage Device- Big Data Analytics Techniques-Quantitative Analysis- Qualitative Analysis-Data Mining- Statistical Analysis-A/B Testing-Correlation-Regression- Machin Learning-Semantic Analysis- Visual Analysis-Heat Maps-Time Series Plots-Network Graphs-Spatial Data Mapping.

Book for Study

1. Paul Buhler, Wajid Khattak and Thomas Erl, "Big Data Fundamentals: Concepts, Drivers & Techniques", Prentice Hall Publications, January 2016.
    Unit 1: Chapters 1 and 2
    Unit 2: Chapter 3
    Unit 3: Chapters 4 and 5
    Unit 4: Chapter 6
    Unit 5: Chapters 7 and 8

Books for Reference

1. Soumendra Mohanty, Madhu Jagadeesh, and Harsha Srivatsa, "Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics", Published by Apress Media, 2013.
2. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, 2012.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credit
IV	21PCA4ES04B	DSE- 4: BIG DATA ANALYTICS								5	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	1	3	3	2	2	2	2.3
CO-2	2	3	2	3	2	2	3	2	3	3	2.5
CO-3	3	3	3	3	3	3	2	2	3	2	2.7
CO-4	3	3	3	1	2	3	3	3	1	2	2.4
CO-5	2	3	3	3	2	2	3	3	2	2	2.5
									Mean Overall Score		2.48 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCA4PW01	**PROJECT WORK & VIVA-VOCE**	25	24

CO No.	CO – Statements On successful completion of this course, students will be able to	Cognitive Levels (K- Levels)
CO-1	identify and analyse real world problems on their selected project domain	**K1**
CO-2	apply their skills and knowledge in design, coding and testing using appropriate technological tools and procedures	**K2**
CO-3	evaluate their work and results with proper documentation	**K3**
CO-4	demonstrate the developed application with appropriate personal, societal, and professional ethical standards.	**K4**
CO-5	combine the knowledge gained through various phases of project life cycle and adapt themselves to the software industry needs to engage in lifelong learning	**K5 & K6**

PROJECT

The fourth semester is allotted to do a project work in an organization with sufficient infrastructure to carry out the MCA project work. The students would choose an organization and submit the details of the organization to the project guide and HoD. The students should send a requisition letter from the HoD to the organization and should get the letter of acceptance from the organization. The students can send only one such requisition letter at a time. Only after non-acceptance of the company the student can request another organization for doing the project work. The guide and HoD have to approve the company / organization and in case of any change suggested by the guide or HoD, the student should change the organization. The change would be suggested by the guide &HoD if they find the company not having sufficient infrastructure for computing and an external guide in the organization with required educational qualification such as MCA or ME / MTech who can be external guides in the organization. Only upon the receipt of the acceptance letter, the student will be relieved from the College to join the company. They should submit the acceptance letter from the organization for having accepted the student for pursuing his/her MCA project work. The marks awarded by the external guide in the organization carries a weightage of ten percent.

The students would join the organization in the first week of December and send their joining report on or before the fixed date as fixed by the Department. The students will be supplied with all the details of what are to be done before and after joining the company. They should appear for first review mid-way and they will report the progress of their project work in the presence of their classmates and guide.

The students should send emails to their guides every fifteen days of their progress after joining the organization. Failure to submit the joining report and failure to be present for the first review (except under exempted circumstances by the Department of Computer Science due to long distance) will result in non-acceptance of their project work and such students would repeat the same procedure in the next academic year with the approval of the Principal, Controller of Examinations and the Department of Computer Science after the payment of the fees of the particular semester.

The students appear for the second review during the end semester examinations in the college along with the manuscript of the project work. The manuscript should be prepared

along the guidelines supplied to them by the Department; students should submit three volumes to the Department before the date stipulated by the Department. The viva-voce of the project work would be conducted by both the internal and the external examiners along with semester examinations of the College.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course							Hours	Credit
IV	21PCA4PW01		**PROJECT WORK & VIVA-VOCE**							25	24
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	3	1	3	3	3	3	3	2.8
CO-2	3	3	3	2	1	3	3	3	3	3	2.8
CO-3	3	3	3	2	1	3	3	3	3	3	2.8
CO-4	3	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	2	3	3	3	3	3	2.9
Mean Overall Score											2.86 (High)

Mandatory Bridge Course
(Non-computer Science Stream Students)

Semester	Course Code	Title of the Course	Hours	Credits
I	**21PCA1BC01**	**ADDL. CORE I:** **C PROGRAMMING**	**-**	**5**

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	recall algorithms and flowcharts for computing logic	**K1**
CO-2	summarize the basic knowledge to develop C programs	**K2**
CO-3	apply and implement programs for solving real world problems	**K3**
CO-4	examine and explore the use of memory allocation for application programs	**K4**
CO-5	design and develop alternate methods of solving variety of problems	**K5 & K6**

Unit-I

Algorithms – Flow charts – Developing algorithms and flowcharts for solving simple problems using sequential, selection and iterative programming Structures.

Unit-II

History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Control structures – Looping structures.

Unit-III

Arrays – Character Arrays and Strings – User defined functions.

Unit-IV

Pointers: Introduction – Pointer Expressions – Chain of Pointers –Pointers and Arrays – Array of Pointers – Pointers as function arguments – Function returning Pointers – Pointers to Functions – Function pointer – Pointers and Structures.

Unit-V

Structures: Introduction – Defining a structure – Declaration of structure – Accessing Structures members – Array of Structures – Structures within structures – Structures and functions – Structures and Pointers – Union. Files: Opening and closing files – Operations on files.

Books for Study

1. S. Jaiswal, "Information Technology Today", Galgotia Publications, New Delhi, Fourth Edition, 2009.

    Unit-I *Chapter 20 (Pages CL-3 – CL-26)*

2. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, New Delhi, Seventh Edition, 2016.

    Unit-II   *Chapter 1 (Sec:1.1-1.2,1.8), Chapter 2 (Sec:2.5 –2.7), Chapter 3, Chapter 5, Chapter 6*

    Unit-III   *Chapter 7, Chapter 8 (Sec: 8.2 – 8.8), Chapter 9*

    Unit-IV   *Chapter 11*

    Unit-V   *Chapter 10, Chapter 12 (Sec: 12.1 – 12.4)*

Books for Reference

1. Byron S. Gottfried, "Programming with C", Schaum's Outline Series, Tata-McGraw Hill Edtion, New Delhi, 1991.
2. E. Karthikeyan, "A Textbook on C Fundamentals, Data Structures and Problem Solving", Prentice-Hall of India Private Limited, New Delhi, 2008.
3. Yashavant Kanetkar, "Let us C", BPB Publications, Tenth Edition, New Delhi: 2010.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course						Hours	Credit
I	21PCA1BC01		ADDL. CORE I: C PROGRAMMING						-	5

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	1	3	3	3	2	1	2.3
CO-2	3	3	2	2	1	3	3	3	2	1	2.3
CO-3	3	3	3	2	1	3	3	3	2	1	2.4
CO-4	3	3	3	2	1	3	3	3	2	1	2.4
CO-5	3	3	3	2	1	3	3	3	2	1	2.4
									Mean Overall Score		2.36 (High)

Semester	Course Code	Title of the Course	Hours	Credit
I	21PCA1BC02	ADDL. CORE II : C PROGRAMMING LAB	-	5

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	relate the ways to solve simple programs	K1
CO-2	understand and trace the execution of programs using arrays	K2
CO-3	develop programs with functions and pointers	K3
CO-4	compare and contrast structures and unions	K4
CO-5	solve data handling problems using files	K5 & K6

List of Exercises
1. Simple Programs using Operators
2. Branching structures
3. Looping structures
4. Arrays
5. Strings
6. Functions
7. Pointers
8. Structures
9. Union
10. Files

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course						Hours	Credit
I	21PCA1BC02		ADDL. CORE II: C PROGRAMMING LAB						-	5

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	1	3	3	3	3	1	2.5
CO-2	3	3	3	2	1	3	3	3	2	1	2.4
CO-3	3	3	3	2	1	3	3	3	2	1	2.4
CO-4	3	3	3	2	1	3	3	3	2	1	2.4
CO-5	3	3	3	3	1	3	3	3	2	1	2.5
								Mean Overall Score			2.44 (High)

Semester	Course Code	Title of the Course	Hours	Credits
II	**21PCA2BC03**	**ADDL. CORE III: WEB DESIGN (HTML 5, JAVA SCRIPT & CSS)**	**-**	**5**

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	recall the knowledge on the features of HTML and Java Script.	**K1**
CO-2	understand the design of web pages using HTML tags and CSS	**K2**
CO-3	utilize skills to implement HTML and JavaScript Programming within web pages	**K3**
CO-4	analyze and choose the appropriate HTML and Java Script techniques for designing web pages	**K4**
CO-5	interpret the events and develop the cookies in Java Script for web pages.	**K5 & K6**

Unit-I
Introduction to HTML: HTML Tags - Structure of an HTML Program - Text Formatting-Emphasizing material - Text-Styles

Unit-II
HTML: Tables – Linking documents – Frames – Form and its elements.

Unit-III
Introduction to Cascading Style Sheets: CSS Basics-Style Inclusion Methods – CSS Strings and Keywords – CSS Selectors – Miscellaneous CSS Constructors.

Unit-IV
JavaScript: Introduction to JavaScript – JavaScript in web pages–writing JavaScript with HTML – Basic programming techniques – operators and expressions – conditional checking – loops – functions – user defined functions – dialog boxes.

Unit-V
JavaScript: JavaScript DOM: JSSS DOM – understanding objects in HTML – browser objects – web page object hierarchy – Handling events – The form object – Built-in objects – User defined objects –Cookies – Setting a cookie.

Books for Study
1. Wendy G.Lehnert, "Internet 101 - A Beginners Guide to the Internet and the World Wide Web", Addison Wesley, 1999.
      Unit I   - Chapters 2 and 3
      Unit II   - Chapters 5 to 7 and 10

2. Powell and Thomas, "HTML & CSS: The Complete Reference", McGraw Hill, 2010.
      Unit III   - Chapter 4 (Sec. 4.1.1)

3. Ivan N. Bayross, "Web enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP", 4th Revised Edition, BPB Publications, New Delhi, 2010.

        Unit IV   - Chapter 8

        Unit V   - Chapters 9 to 11

Books for Reference

1. Chuck Musciano& Bill Kennedy, "HTML - The Definitive Guide", Shroff Publishers & Distributors Pvt. Ltd., Calcutta - 1999.
2. Raj Kamal, "Internet and Web Technologies", TMH, New Delhi, 2017.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	**21PCA2BC03**	**ADDL. CORE III: WEB DESIGN (HTML 5, JAVA SCRIPT & CSS)**									**-**	**5**
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO-1	3	2	2	2	3	3	3	2	2	3	2.5	
CO-2	2	3	3	2	2	3	3	3	3	3	2.7	
CO-3	1	2	3	3	3	3	3	2	3	2	2.5	
CO-4	2	2	2	3	1	2	3	2	2	3	2.2	
CO-5	2	3	2	3	3	1	3	3	3	3	2.6	
									Mean Overall Score		**2.5 (High)**	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCA2BC04	ADDL. CORE IV: WEB DESIGN (HTML 5, JAVA SCRIPT & CSS) LAB	-	5

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	relate the ability to design simple web pages with basic HTML tags	K1
CO-2	illustrate the use of CSS in web pages	K2
CO-3	apply the skill set to analyze the HTML and Java Script for web design	K3
CO-4	evaluate the usage of HTML and Java Script in designing web pages	K4
CO-5	construct web site using HTML and Java Script for real time applications	K5 & K6

List of Exercises
HTML
1. Web Page with Headings and Formatting Tags
2. Web Page with Ordered and Unordered Lists
3. HTML file to demonstrate Tables
4. HTML file to demonstrate Forms
5. HTML file to demonstrate Frames

CSS
6. CSS Background and Text Styles
7. CSS Id and Class
Java Script
8. Java Script Loops
9. Java Script Functions
10. Java Script Form Validation

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course							Hours	Credit
II	21PCA2BC04		ADDL. Core IV: WEB DESIGN (HTML 5, JAVA SCRIPT & CSS) LAB							-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	2	1	3	3	2	2	3	2.3
CO-2	2	3	3	2	2	3	3	3	3	3	2.7
CO-3	2	2	3	3	3	3	3	2	3	2	2.6
CO-4	2	2	2	3	2	2	3	2	2	2	2.2
CO-5	2	3	3	3	1	2	3	3	3	3	2.6
Mean Overall Score											2.48 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3BC05	ADDL. CORE V: WEB GRAPHICS	-	5

CO No.	CO Statements On successful completion of this course, students will be able to	Cognitive Levels (K- Levels)
CO-1	recall the existing Multimedia tools	K1
CO-2	illustrate various tools using GIMP	K2
CO-3	develop and design using basic Synfig tools	K3
CO-4	examine the knowledge of advanced tools in Animation	K4
CO-5	appraise presentation package using multimedia	K5 &K6

Unit-I
Introduction to Multimedia Definition – Components of Multimedia – Multimedia and Hypermedia – World Wide Web – Various overview of Multimedia software Tools - Multimedia Authoring and Tools: Multimedia Authoring – VRML – Popular File Formats.

Unit-II
GIMP environment – Layers and work path – Image editing – channels, masks and actions - filters – rollovers and animations.

Unit-III
Synfig: Introduction – drawing and coloring tools.

Unit-IV
Synfig: Animation – tweening – interactive elements.

Unit-V
Inkscape: Interface – working with shapes – layers – blend, path and mask.

Books for Study
1. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", Pearson Education, Inc., 2004
2. Phillip Whitt "Beginning Photo Retouching & Restoration Using GIMP", Apress, 2014.
3. http://wiki.synfig.org/category - Manual. 21-Jun-2016.
4. Bethany Hiitola, Packt Publishing Limited, "Inkscape Starter", ISBN- 10.1849517568

Books for Reference
1. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols, and Standards", Pearson Education, Inc.2001.
2. Jason Van Gumster and Robert Shimonski, "GIMP Bible", Wiley, 2010.
3. Jesse Russell, Ronald Cohn, "Synfig", 2012.
4. Bethany Hiitola,"Inkscape Beginner's Guide", Packt Publishing,2012.

Unit-I   *Chapter 1 (Page no. 3-23), Chapter 3 (page no. 69-80)*
Unit-II   *Chapter 7, to 10 and 11*
Unit-III, IV   *Manual*
Unit-V   *Chapters 1,2,4,5 and 6*

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course								Hours	Credit
III	21PCA3BC05		ADDL. CORE V: WEB GRAPHICS								-	5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	2	2	3	2	3	2	2	2.4	
CO-2	3	2	2	1	3	2	2	3	2	2	2.2	
CO-3	3	2	3	2	3	2	3	3	2	2	2.5	
CO-4	2	3	2	3	2	2	2	3	2	2	2.3	
CO-5	2	3	3	2	2	2	3	3	2	2	2.4	
									Mean Overall Score		2.3 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCA3BC06	**ADDL. CORE VI: WEB GRAPHICS LAB**	-	5

CO No.	Course Outcomes	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	recall and design images using multimedia	K1
CO-2	demonstrate various tools in photo editing	K2
CO-3	apply the knowledge of animation	K3
CO-4	compare and choose the necessary tools to design a project	K4
CO-5	determine animation works using bitmap images	K5 & K6

List of Exercises
1. Design ID card, Pamphlets and Advertisement using GIMP.
2. Design an invitation for a seminar or conference.
3. Design a greeting card
4. Create text effects using text tools
5. Apply various Layer Effects to Images.
6. Apply Filter effects on images.
7. Develop a slide show of Photos with transition.
8. Design brushed outlines for an image using Synfig
9. Create an Animation for bouncing ball.
10. Using Time line Adapt motion tweening Animation.
11. Creating logo using Inkscape.
12. Creating Calligraphic text effects using inkscape.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code		Title of the Course						Hours	Credit
III	21PCA3BC06		**ADDL. Core VI: Web Graphics Lab**						-	5
Course Outcomes↓	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	2	2	2	3	2	2	3	2	2.4
CO-2	3	2	2	1	3	2	2	3	2	2	2.2
CO-3	3	2	3	2	3	2	3	3	2	2	2.5
CO-4	2	2	3	3	2	3	2	2	2	2	2.3
CO-5	2	3	3	2	2	2	3	3	2	2	2.4
								Mean Overall Score			2.3 (High)