Annamalai University

(Accredited with 'A' Grade byNAAC)

Faculty of Science

Department of Computer and Information Science

M.Sc. COMPUTER SCIENCE
(2-Year)

Programme Code: SCIS21

Regulations, Curricula and Syllabi

(2019-20)

Annamalai University

Faculty of Science

DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE

M.Sc. COMPUTER SCIENCE

Programme Code: SCIS21

These rules and regulations shall govern the Two year post graduate studies leading to the award of degree of **Master of Science in Computer Science** in the Faculty of Science. These academic Regulations shall be called "**Annamalai University, Faculty of Science, Two year M.Sc. Computer Science Regulations 2019**". They shall come into force with effect from the academic year 2019 – 2020.

1. Definitions and Nomenclature

1.1 **University** refers to Annamalai University.

1.2 **Department** means any of the academic departments and academic centers at the University.

1.3 **Discipline** refers to the specialization or branch of knowledge taught and researched in higher education. For example, Computer Science is a discipline in the Mathematical Sciences, while Economics is a discipline in Social Sciences.

1.4 **Programme** encompasses the combination of courses and/or requirements leading to a Degree. For example, M.Sc., M.A.

1.5 **Course** is an individual subject in a programme. Each course may consist of Lectures/ Laboratory /Seminar/Project work/viva-voce etc. Each course has a course title and is identified by a course code.

1.6 **Curriculum** encompasses the totality of student experiences that occur during the educational process.

1.7 **Syllabus** is an academic document that contains the complete information about an academic programme and defines responsibilities and outcomes. This includes course information, course objectives, policies, evaluation, grading, learning resources and course calendar.

1.8 **Academic Year** refers to the annual period of sessions of the University that comprises two consecutive semesters.

1.9 **Semester** is a half-year term that lasts for a minimum duration of 90 days.

1.10 **Choice Based Credit System**: A mode of learning in higher education that enables a student to have the freedom to select his/her own choice of elective courses across various disciplines for completing the Degree programme.

1.11 **Core Course** is mandatory and an essential requirement to qualify for the Degree.

1.12 **Elective Course** is a course that a student can choose from a range of alternatives.

1.13 **Value-added Courses** are optional courses that complement the students' knowledge and skills and enhance their employability.

1.14 **Credit** refers to the quantum of course work in terms of number of class hours in a semester required for a programme. The credit value reflects the content and duration of a particular course in the curriculum.

1.15 **Credit Hour** refers to the number of class hours per week required for a course in a

semester. It is used to calculate the credit value of a particular course.

1.16 **Programme Outcomes** (POs) are statements that describe crucial and essential knowledge, skills and attitudes that students are expected to achieve and can reliably manifest at the end of a programme.

1.17 **Programme Specific Outcomes** (PSOs) are statements that list what the graduate of a specific programme should be able to do at the end of the programme.

1.18 **Learning Objectives** are statements that define the expected goal of a course in **Course Objectives**in terms of demonstrable skills or knowledge that will be acquired by a student.

1.19 **Course Outcomes** (COs) are statements that describe what students should be able to achieve/demonstrate at the end of a course. They allow follow-up and measurement of learning objectives.

1.20 **Grade Point Average** (GPA) is the average of the grades acquired in various courses that a student has taken in a semester. The formula for computing GPA is given in section 11.3

1.21 **Cumulative Grade Point Average** (CGPA) is a measure of overall cumulative performance of a student over all the semesters. Calculation of CGPA is given in section11.4.

1.22 **Letter Grade** is an index of the performance of a student in a particular course. Grades are denoted by the letters S, A, B, C, D, E, RA, and W.

2. **Programme Offered and Eligibility Criteria**:

The Department of Computer and Information Science offers a Two Year M.Sc. in Computer Science programme. A pass in B.Sc. Computer Science/B.Sc., Information Technology/B.Sc., Software Development/B.Sc., Software Engineering/B.C.A or an examination accepted by the syndicate as equivalent thereto are eligible for admission.

2.1 In the case of SC/ST and differently-abled candidates, a pass in minimum qualification for the above programme.

3. **Reservation Policy:** Admission to the various programmes will be strictly based on the reservation policy of the Government of Tamil Nadu.

4. **Programme Duration**

4.1 The Two Year Master's Programme consists of two academic years.

4.2 Each academic year is divided into two semesters, the first being from July to November and the second from December to April.

4.3 Each semester will have 90 working days (18 weeks).

5. **Programme Structure**

5.1 The Two Year Master's Programme consists of Core Courses, Elective Courses (Departmental & Interdepartmental), and Project.

5.2 **Core courses**

5.2.1 These are a set of compulsory courses essential for each programme.

5.2.2 The core courses include both Theory (Core Theory) and Practical (Core Practical) courses.

5.3 **Elective courses**

5.3.1 Departmental Electives (DEs) are the Electives that students can choose from a range of Electives offered within the Department.

5.3.2 Interdepartmental Electives (IDEs) are Electives that students can choose from amongst

the courses offered by other departments of the same faculty as well as by the departments of other faculties.

5.4 Experiential Learning

5.4.1 Experiential learning provides opportunities to students to connect principles of the discipline with real-life situations.

5.4.2 In-plant training/field trips/internships/industrial visits fall under this category.

5.5 Project

5.5.1 Each student shall undertake a Project and submit a dissertation as per guidelines in the final semester.

5.5.2 The Head of the Department shall assign a Research Supervisor to the student.

5.5.3 The Research Supervisor shall assign a topic for research and monitor the progress of the student periodically.

5.5.4 Students who wish to undertake project work in recognized institutions/industry shall obtain prior permission from the University. The Research Supervisor will be from the host institute.

5.6 Value added Courses (VACs)

5.6.1 Students may also opt to take Value added Courses beyond the minimum credits required for award of the Degree. VACs are outside the normal credit paradigm.

5.6.2 These courses impart employable and life skills. VACs are listed in the University website and in the Handbook on Interdepartmental Electives and VACs.

5.6.3 Each VAC carries 2 credits with 30 hours of instruction. Classes for a VAC are conducted beyond the regular class hours and preferably in the III Semester.

5.7 Online Courses

5.7.1 The Heads of Departments shall facilitate enrolment of students in Massive Open Online Courses (MOOCs) platform such as SWAYAM to provide academic flexibility and enhance the academic career of students.

5.7.2 Students who successfully complete a course in the MOOCs platform shall be exempted from one elective course of the programme.

5.8 Credit Distribution: The credit distribution is organized as follows:

	Credits
Core Courses	72
Elective Courses	15
Project	06
Constitution of India*	**02**
Total	**93**

5.9 Credit Assignment

Each course is assigned credits and credit hours on the following basis:

1 Credit is defined as,

1 Lecture period of one hour duration per week over a semester

1 Tutorial period of one hour duration per week over a semester

1 Practical/Project period of two hours duration per week over a semester.

6 Attendance

6.1 Each faculty handling a course shall be responsible for the maintenance of Attendance and Assessment Record for candidates who have registered for the course.

6.2 The Record shall contain details of the students' attendance, marks obtained in the Continuous Internal Assessment (CIA) Tests, Assignments and Seminars. In addition the Record shall also contain the organization of lesson plan of the Course teacher.

6.3 The record shall be submitted to the Head of the Department and Dean once a month for monitoring the attendance and syllabus coverage.

6.4 At the end of the semester, the record shall be placed in safe custody for any future verification.

6.5 The Course teacher shall intimate to the Head of the Department at least seven calendar days before the last instruction day in the semester about the attendance particulars of all students.

6.6 Each student shall have a minimum of 75% attendance in all the courses of the particular semester failing which he or she will not be permitted to write the End-Semester Examination. The student has to redo the semester in the next year.

6.7 Relaxation of attendance requirement up to 10% may be granted for valid reasons such as illness, representing the University in extracurricular activities and participation in NCC/NSS/YRC/RRC.

7 Mentor-Mentee System

7.1 To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach certain number of students to a member of the faculty who shall function as a Mentor throughout their period of study.

7.2 The Mentors will guide their mentees with the curriculum, monitor their progress, and provide intellectual and emotional support.

7.3 The Mentors shall also help their mentees to choose appropriate electives and value-added courses, apply for scholarships, undertake projects, prepare for competitive examinations such as NET/SET, GATE etc., attend campus interviews and participate in extracurricular activities.

8 Examinations

8.1 The examination system of the University is designed to systematically test the student's progress in class, laboratory and field work through Continuous Internal Assessment (CIA) Tests and End-Semester Examination (ESE).

8.2 There will be two CIA Tests and one ESE in each semester.

8.3 The Question Papers will be framed to test different levels of learning based on Bloom's taxonomy viz. Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation/Creativity.

8.4 Continuous Internal Assessment Tests

8.4.1 The CIA Tests shall be a combination of a variety of tools such as class tests, assignments and seminars. This requires an element of openness.

8.4.2 The students are to be informed in advance about the assessment procedures.

8.4.3 The setting of question paper will be decided by the respective faculty.

8.4.4 CIA Test-I will cover the syllabus of first two units while CI Test-II will cover the last three units.

8.4.5 CIA Tests will be for one or two hours duration depending on the quantum of syllabus.

8.4.6 A student cannot repeat the CIA Test-I and CIA Test-II. However, if for any valid reason, the student is unable to attend the test, the prerogative of arranging a special test lies with the teacher in consultation with the Head of the Department.

8.4.7 For the CIA Tests, the assessment will be done by the Course teacher

8.5 End Semester Examinations (ESE)

8.5.1 The ESE for the first and third semester will be conducted in November and for the second and fourth semester in May.

8.6 Candidates who failed in any course will be permitted to reappear in failed course in the subsequent examinations.

8.7 The ESE will be of three hours duration and will cover the entire syllabus of the course.

9 Evaluation

9.1 Marks Distribution

9.1.1 For each course, the Theory and Practical shall be evaluated for a maximum of 100 marks.

9.1.2 For the theory courses, CIA Tests will carry 25% and the ESE 75% of the marks.

9.1.3 For the Practical courses, the CIA Tests will carry 40% and the ESE 60% of the marks.

9.2 Assessment of CIA Tests

9.2.1 For the CIA Tests, the assessment will be done by the course instructor

9.2.2 For the Theory Courses, the break-up of marks shall be as follows

CIA for Theory	Marks
Test-I & Test-II	15
Seminar	05
Assignment	05
Total	25

9.2.3 For the Practical Courses (wherever applicable), the break-up of marks shall be as follows:

CIA for Practical	Marks
Test-I	15
Test-II	15
Viva-voce and Record	10
Total	40

9.3 Assessment of End-Semester Examinations

9.3.1 Evaluation for the ESE is done by internal examiner.

9.4 Assessment of Project/Dissertation

9.4.1 The Project Report/Dissertation shall be submitted as per the guidelines.

9.4.2 The Project Work/Dissertation shall carry a maximum of 100 marks.

9.4.3 CIA for Project work/dissertation will carry 25% and ESE 75%.

9.4.4 The Project Report evaluation and viva-voce will be conducted by a committee constituted by the Head of the Department.

9.4.5 The Project Evaluation Committee will comprise the Head of the Department, Project Supervisor, and a senior faculty.

9.4.6 **The marks shall be distributed as follows:**

Continuous Internal Assessment (25 Marks)		End Semester Examination (75 Marks)	
Review-I – 10	Review-II -15	Project / Dissertation Evaluation	Viva-voce
		50	25

9.5 Assessment of Value-added Courses

9.5.1 Assessment of VACs shall be internal. Two CIA Tests shall be conducted during the semester by the Department(s) offering VAC.

9.5.2 The grades obtained in VACs will not be included for calculating the GPA/CGPA.

9.6 Passing Minimum

9.6.1 A student is declared to have passed in each course if he/she secures not less than 50% marks in the ESE and not less than 50% marks in aggregate taking CIA and ESE marks together.

9.6.2 A candidate who has not secured a minimum of 50% of marks in a course (CIA + ESE) shall reappear for the course in the next semester/year.

10. Conferment of the Master's Degree

A candidate who has secured a minimum of 50% marks in all courses prescribed in the programme and earned the minimum required credits shall be considered to have passed the Master's Programme.

11. Marks and Grading

11.1 The performance of students in each course is evaluated in terms Grade Point (GP).

11.2 The sum total performance in each semester is rated by Grade Point Average (GPA) while Cumulative Grade Point Average (CGPA) indicates the Average Grade Point obtained for all the courses completed.

11.3 **The GPA** is calculated by the formula

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

where, $\boldsymbol{C_i}$ is the Credit earned for the Course $\boldsymbol{i}$ in any semester;

$\boldsymbol{G_i}$ is the Grade Point obtained by the student for the Course $\boldsymbol{i}$ and

$\boldsymbol{n}$ is the number of Courses passed in that semester.

11.4 **CGPA** is the Weighted Average Grade Point of all the Courses passed starting from the first semester to the current semester.

$$\text{CGPA} = \frac{\sum_{i=1}^{m} \sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{m} \sum_{i=1}^{n} C_i}$$

Where, C_i is the Credit earned for the Course i in any semester;

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

n is the number of Courses passed in that semester.

m is the number of semesters.

11.5 **Evaluation :**

11.5.1 **Performance of the student for each course will be rated as shown in the Table.**

Range of Marks	Grade Points	Letter Grade
90 and above	10	S
80-89	9	A
70-79	8	B
60-69	7	C
55-59	6	D
50-54	5	E
Less than 50	0	RA
Withdrawn from the examination	0	W

11.5.2 A ten point rating scale is used for evaluation of the performance of the student to provide overall grade for the Master's Programme.

CGPA	Classification of Final Result
8.25 and above	First Class with Distinction
6.5 and above but below 8.25	First Class
5.0 and above but below 6.5	Second Class
0.0 and above but below 5.0	Re-appear

11.6 **Classification of Results**. The successful candidates are classified as follows:

11.6.1 **For First Class with Distinction:** Candidates who have passed all the courses prescribed in the Programme in the first attempt with a CGPA of 8.25and above within the programme duration. Candidates who have withdrawn from the End Semester Examinations are still eligible for First Class with Distinction (See Section 12 for details).

11.6.2 **For First Class:** Candidates who have passed all the courses with a CGPA of 6.5and above.

11.6.3 **For Second Class:** Candidates who have passed all the courses with a CGPA between 5.0 and less than 6.5.

11.6.4 Candidates who obtain overall highest CGPA in all examinations in the first appearance itself are eligible for University Rank.

11.7 **Course-Wise Letter Grades**

11.7.1 The percentage of marks obtained by a candidate in a course will be indicated in a letter grade.

11.7.2 A student is considered to have completed a course successfully and earned the credits if he/she secures an overall letter grade other than RA.

11.7.3 A course successfully completed cannot be repeated for the purpose of improving the Grade Point.

11.7.4 A letter grade RA indicates that the candidate shall reappear for that course. The RA Grade once awarded stays in the grade card of the student and is not deleted even when he/she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the Odd/Even semester in which the candidate has appeared for clearance of the arrears.

11.7.5 If a student secures RA grade in the Project Work/Field Work/Practical Work/Dissertation, he/she shall improve it and resubmit if it involves only rewriting/ incorporating the clarifications suggested by the evaluators or he/she can re-register and carry out the same in the subsequent semesters for evaluation.

12. Provision for Withdrawal from the End Semester Examination

12.1 The letter grade W indicates that a candidate has withdrawn from the examination.

12.2 A candidate is permitted to withdraw from appearing in the ESE for one course or courses in ANY ONE of the semesters ONLY for exigencies deemed valid by the University authorities.

12.3 Permission for withdrawal from the examination shall be granted only once during the entire duration of the programme.

12.4 Application for withdrawal shall be considered only if the student has registered for the course(s), and fulfilled the requirements for attendance and CIA tests.

12.5 The application for withdrawal shall be made ten days prior to the commencement of the examination and duly approved by the Controller of Examinations. Notwithstanding the mandatory prerequisite of ten days notice, due consideration will be given under extraordinary circumstances.

12.6 Withdrawal will not be granted for arrear examinations of courses in previous semesters and for the final semester examinations.

12.7 Candidates who have been granted permission to withdraw from the examination shall reappear for the course(s) when the course(s) are offered next.

12.8 Withdrawal shall not be taken into account as an appearance for the examination when considering the eligibility of the candidate to qualify for First Class with Distinction.

13. **Academic misconduct:** Any action that results in an unfair academic advantage/interference with the functioning of the academic community constitutes academic misconduct. This includes but is not limited to cheating, plagiarism, altering academic documents, fabrication/falsification of data, submitting the work of another student, interfering with other students' work, removing/defacing library or computer resources, stealing other students' notes/assignments, and electronically interfering with other students'/University's intellectual property. Since many of these acts may be committed unintentionally due to lack of awareness, students shall be sensitized on issues of academic integrity and ethics.

14. **Transitory Regulations:** Wherever there has been a change of syllabi, examinations based on the existing syllabus will be conducted for two consecutive years after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that, the students will have to take up their examinations in equivalent subjects,

as per the new syllabus, on the recommendation of the Head of the Department concerned.

15. Notwithstanding anything contained in the above pages as Rules and Regulations governing the Two Year Master's Programmes at Annamalai University, the Syndicate is vested with the powers to revise them from time to time on the recommendations of the Academic Council.

M.Sc. Computer Science (Two Year) Programme
Programme Code: SCIS21

CURRICULA AND SCHEME OF EXAMINATIONS
(For students admitted from the academic year 2019-2020)

Course Code	Course Title	Hours/Week			Credit	Marks		
		L	T	P	C	CIA	ESE	Total
Semester – I								
19PCSC101	Core 1: Design and Analysis of Algorithms	5	0	0	5	25	75	100
19PCSC102	Core 2: Advanced Web Technology	5	0	0	5	25	75	100
19PCSC103	Core 3: Compiler Design	5	0	0	5	25	75	100
19PCSC104	Core 4: Advanced Java Programming	5	0	0	5	25	75	100
19PCSP105	Core 5: Practical – I Algorithm Lab using Java	0	0	2	2	40	60	100
19PCSP106	Core 6: Practical - II Web Technology Lab	0	0	2	2	40	60	100
19XXXXXXX	Elective-I: Interdepartmental Elective	3	0	0	3	25	75	100
					27			
Semester – II								
19PCSC201	Core 7: Distributed Operating System	5	0	0	5	25	75	100
19PCSC202	Core 8: Dot Net Programming	5	0	0	5	25	75	100
19PCSC203	Core 9: Cryptography and Network Security	5	0	0	5	25	75	100
19PCSC204	Core 10: Advanced Database Management System	5	0	0	5	25	75	100
19PCSP205	Core 11: Practical – III – Dot Net lab	0	0	2	2	40	60	100
19PCSP206	Core 12: Practical – IV – RDBMS Lab	0	0	2	2	40	60	100
19XXXXXXX	Elective-II: Interdepartmental Elective	3	0	0	3	25	75	100
					27			
Semester – III								
19PCSC301	Core 13: Digital Image Processing	5	0	0	5	25	75	100
19PCSC302	Core 14: Internet of Things	5	0	0	5	25	75	100
19PCSC303	Core 15: Machine Learning	5	0	0	5	25	75	100
19PCSP304	Core 16: Practical – V - Image Processing Lab	0	0	2	2	40	60	100
19PCSP305	Core 17: Practical – VI - Machine Learning Lab	0	0	2	2	40	60	100
19PCSE30X	Elective-III: Department Elective	3	0	0	3	25	75	100
19PCSE30X	Elective-IV: Department Elective	3	0	0	3	25	75	100
19PSCI300	Constitution of India*	2	0	0	2	25	75	100
					25			
Semester – IV								
19PCSC401	Core 18: Software Project Management	5	0	0	5	25	75	100
19PCSE40X	Elective-V: Department Elective	3	0	0	3	25	75	100
19PCSD407	Dissertation and Viva Voce/In plant training	0	0	12	6	25	75	100
					14			
	Total Credits				**93**			
Value Added Courses								
Online Courses (SWAYAM or MOOC)								

L- Lectures; P- Practical; C- Credits; CIA- Continuous Internal Assessment; ESE- End-Semester Examination

***19PSCI300 = NON CREDIT COMPULSORY COURSE**

Note:

1. Students shall take both Department Electives (DEs) and Interdepartmental Electives (IDEs) from a range of choices available. The details of interdepartmental electives are given in the "**Handbook of Interdepartmental Electives-Two Year Programme**" and listed in the University website.

2. Students may opt for any Value-added Courses listed in the University website. The details of Value Added Courses are given in the "**Handbook of Value Added Courses**" and listed in the University website.

ELECTIVE COURSES

DEPARTMENT ELECTIVE COURSES

S. No.	Course Code	Course Title	Hours/ week			C	Marks		
			L	T	P		CIA	ESE	Total
1.	19PCSE306	Advanced Computer Networks	3	0	0	3	25	75	100
2.	19PCSE307	Web Services	3	0	0	3	25	75	100
3.	19PCSE308	Object Oriented System Development	3	0	0	3	25	75	100
4.	19PCSE309	Mobile Computing	3	0	0	3	25	75	100
5.	19PCSE310	Wireless Networks	3	0	0	3	25	75	100
6.	19PCSE311	Theory of Computation	3	0	0	3	25	75	100
7.	19PCSE312	Optimization Techniques	3	0	0	3	25	75	100
8.	19PCSE313	Embedded Systems	3	0	0	3	25	75	100
9.	19PCSE314	WAP and XML	3	0	0	3	25	75	100
10.	19PCSE402	Statistical Computing	3	0	0	3	25	75	100
11.	19PCSE403	Soft Computing	3	0	0	3	25	75	100
12.	19PCSE404	Data Mining	3	0	0	3	25	75	100
13.	19PCSE405	Cloud Computing	3	0	0	3	25	75	100
14.	19PCSE406	Data Science and Big Data Analytics	3	0	0	3	25	75	100

VALUE ADDED COURSES (VAC)(For students of other departments)

To be offered in FOURTH Semester

S. No.	Course Code	Course Title	Hours/ week			C	Marks		
			L	T	P		CIA	ESE	Total
1.	SCISVAC01	Web Development	3	0	0	3	25	75	100
2.	SCISVAC02	Fundamentals of Computing	3	0	0	3	25	75	100
3.	SCISVAC03	Advanced Web Development	3	0	0	3	25	75	100
4.	SCISVAC04	Internet and its Applications	3	0	0	3	25	75	100

ANNAMALAI UNIVERSITY

Department of Computer and Information Science

Pattern of question paper for END semester examinations

(Based on Revised Bloom's Taxonomy)

Year : I

Programme: M.Sc. Two Year PG Programme **Semester: I / II**

Course Code: **Course Name:**

Time: 3 Hrs **Max.Marks:100**

Part-A (Level-K1/ Level-K2) Marks: (10x2=20)

(Answer ALL of the questions)

1. Define……
2. Multiple Choices a. b. c. d.
3. Multiple Choices a. b. c. d.
4. Match the following i - a ii- b iii- c iv –d v - …..
5. Match the following i - a ii- b iii- c iv –d v - …..
6. Explain…….
7. Select…..
8. Describe……
9. Classify….
10. Elucidate….

Part-B (Level-K3/ Level-K4) Marks: (8x5=40)

(Answer any EIGHT of the questions)

11. Prepare…..
12. Solve…..
13. Apply……
14. Show…..
15. Categorize…
16. Analyze…
17. Distinguish….
18. Infer….
19. Compare….
20. Compute

Part-C (Level-K5) Marks: (3x10=30)

(Answer any THREE of the questions)

21. Discuss…
22. Summarize….
23. Evaluate…..
24. Disprove….

Part-D (Level-K6)*Marks: (1x10=10)

(Answer any ONE of the questions)

25. Design….
26. Develop…

ANNAMALAI UNIVERSITY

Department of Computer and Information Science

Year : II

Programme: M.Sc. Two Year PGProgramme **Semester: III / IV**

Course Code: **Course Name:**

Time: 3 Hrs **Max.Marks:100**

Part-A (Level-K1/ Level-K2) Marks: (10x2=20)

(Answer ALL of the questions)

1. Define……
2. Multiple Choices a. b. c. d.
3. Multiple Choices a. b. c. d.
4. Match the following i - a ii- b iii- c iv –d v - …..
5. Match the following i - a ii- b iii- c iv –d v - …..
6. Explain…….
7. Select…..
8. Describe…..
9. Classify….
10. Elucidate….

Part-B (Level-K3/ Level-K4)Marks: (6x5=30)

(Answer any SIX of the questions)

11. Apply……
12. Show…..
13. Prepare
14. Make use of….
15. Categorize…
16. Analyze…
17. Distinguish….
18. Simplify…..

Part-C (Level-K5) Marks: (3x10=30)

(Answer any THREE of the questions)

19. Discuss…
20. Recommend with
21. Evaluate…..
22. Justify….
23. Optimize…

Part-D (Level-K6)*Marks: (2x10=20)

(Answer any TWO of the questions)

24. Design….
25. Formulate …
26. Modify …..

M.Sc. Computer Science(TWO YEAR) Programme

[End Semester Examinations]

Bloom's Taxonomy - Questions Conforming to Levels K1 to K6

	I Year (Two year PG)					II Year (Two Year PG)			
	Level	Part	Questions & Marks	Total Marks		Level	Part	Questions & Marks	Total Marks
	K1	A	5 x 2	10		K1	A	5 x 2	10
	K2		5 x 2	10		K2		5 x 2	10
	K3	B	4 x5	20		K3	B	2 x 5	10
	K4		4 x5	20		K4		4 x 5	20
	K5	C	3 x 10	30		K5	C	3 x10	30
	K6	D	1 x 10	10		K6	D	2x 10	20
				100					100

ANNAMALAI UNIVERSITY

Department of Computer and Information Science

[Question Paper Pattern - INTERNAL TESTS I & II (CIA)]

(Based on Revised Bloom's Taxonomy)

Programme: M.Sc. Two Year PG Programme **Semester: All**

Time: 2 Hrs **Max.Marks:50**

Part-A (Level-K1) Marks: (6x2=12)

(Answer ALL of the questions)

1. Define /Choose/ Relate……
2. What / Why / How?
3. Multiple Choices a. b. c. d.
4. Multiple Choices a. b. c. d.
5. Match the following i - a ii - b iii - c iv - d v - …..
6. Match the following i - a ii - b iii - c iv - d v - …..

Part-B (Level-K2) **Marks: (3x5=15)**

(Answer any THREE of the questions)

7. Explain…..
8. Describe…..
9. Select……
10. Compare

Part-C (Level-K3/ Level-K4) Marks: (2x7=14)

(Answer any TWO of the questions)

11. Apply….
12. Calculate….
13. Categorize…

Part-D (Level-K5/ Level-K6) **Marks: (1x9=9)**

(Answer any ONE of the questions)

14. Discuss….
15. Summarize….

PROGRAMME OUTCOMES (POs)

After the successful completion of the M.Sc. Computer Science (2 year) Degree Programme, the graduates will be able to:

PO1:	Domain knowledge: Demonstrate knowledge of basic concepts, principles and applications of the specific science discipline.
PO2:	Resource Utilisation. Cultivate the skills to acquire and use appropriate learning resources including library, e-learning resources, ICT tools to enhance knowledge-base and stay abreast of recent developments.
PO3:	Analytical and Technical Skills: Ability to handle/use appropriate tools/techniques/equipment with an understanding of the standard operating procedures, safety aspects/limitations.
PO4:	Critical thinking and Problem solving: Identify and critically analyse pertinent problems in the relevant discipline using appropriate tools and techniques as well as approaches to arrive at viable conclusions/solutions.
PO5:	Project Management: Demonstrate knowledge and scientific understanding to identify research problems, design experiments, use appropriate methodologies, analyse and interpret data and provide solutions. Exhibit organisational skills and the ability to manage time and resources.
PO6:	Individual and team work: Exhibit the potential to effectively accomplish tasks independently and as a member or leader in diverse teams, and in multidisciplinary settings.
PO7:	Effective Communication: Communicate effectively in spoken and written form as well as through electronic media with the scientific community as well as with society at large. Demonstrate the ability to write dissertations, reports, make effective presentations and documentation.
PO8:	Environment and Society: Analyse the impact of scientific and technological advances on the environment and society and the need for sustainable development.
PO9:	Ethics: Commitment to professional ethics and responsibilities.
PO10:	Life-long learning: Ability to engage in life-long learning in the context of the rapid developments in the discipline.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

At the end of the programme, the student will be able to

PSO1	Adapt the acquired knowledge for solving current and emerging issues in Computer Science and involved in lifelong learning.
PSO2	Gain and apply the knowledge of computer science concepts in appropriate domain of interest.
PSO3	Ability to analyze the problem, identify the required computing facility and implement it to obtain solutions.
PSO4	Identify and formulate algorithmic principles, mathematical knowledge and theory of Computer Science in modeling and design of computer-based systems.
PSO5	Understand and choose the appropriate modern techniques and tools for the complex systems of various domains and understands the advantages and limitations.
PSO6	Ability to communicate effectively in the basis of presenting their research work and gain knowledge on documentation and reports writing in a professional way.
PSO7	Students can independently enable to acquire the innovative ideas as per the modern era and they can create a value and wealth for the futuristic world.
PSO8	Develop and deploy software and/or hardware systems with assured quality and efficiency.

Semester	19PCSC101: Design and Analysis of Algorithms	L	T	P	C
I		5	0	0	5

Learning Objectives (LO):

LO1	To learn effective problem solving in Computing applications.
LO2	Analyze the algorithmic procedure to determine the computational complexity of algorithms.
LO3	Write rigorous correctness proofs for algorithms.
LO4	Demonstrate a familiarity with major algorithms and data structures.
LO5	Apply important algorithmic design paradigms and methods of analysis.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Apply design principles and concepts to algorithm design.
CO2	Acquire the mathematical foundation in analysis of algorithms.
CO3	Understand the different algorithmic design strategies.
CO4	Analyze the efficiency of algorithms using various Problems.
CO5	Understand about Divide and Conquer and Greedy Method.

Unit 1 - Introduction: Algorithm Definition – Algorithm Specification – Performance Analysis- Asymptotic Notations. Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues – Sets and Disjoint Set Union – Graphs.

Unit 2 - Divide and Conquer: The General Method – Defective Chessboard – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Selection - Strassen's Matrix Multiplication.

Unit 3 -The Greedy Method: General Method - Container Loading - Knapsack Problem - Tree Vertex Splitting – Job Sequencing With Deadlines - Minimum Cost Spanning Trees - Optimal Storage On Tapes – Optimal Merge Patterns - Single Source Shortest Paths.

Unit 4 - Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - Optimal Binary Search Trees - String Editing - 0/1 Knapsack - Reliability Design - The Traveling Salesperson Problem - Flow Shop Scheduling. Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS.

Unit 5 - Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: Least Cost search - 0/1 Knapsack Problem.

Text Book

1. Ellis Horowitz, SatrajSahni and Sanguthevar Rajasekaran, (2009),*Fundamentals of Computer Algorithms*, Universities Press, 2nd Ed.New York.

References

1. Langsam, Augenstien, Tenenbaum, *Data Structures Using C*,PHI,
2. V.Aho, Hopcropft, Ullman, *Data structures and Algorithms*, LPE
3. S.E. Goodman, ST. Hedetniem, *Introduction to design and Analysis of Algorithms*, TMH.
4. Carlos A.Coello Coello, Gary B.Lamont, David A.VanVeldhuizen, (2007),*Evolutionary Algorithms for Solving Multi-Objective Problems*, Springer 2nd Ed,.
5. Algorithms Design Techniques and Analysis M. H. Alsuwaiyel - E-book Link-https://www.pdfdrive.com/algorithms-design-techniques-and-analysis-e158201149.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	3	2	1	3	2			2	3		2	1	1			2	2
CO2			1	1			2	3	3	2	1		1	2	3	3	3	
CO3	2	3	3	1		2	2	2		3	3	3			2	3	3	2
CO4			3	3		2	3	2	3		3	3	3			3	3	
CO5	3	1	1	2	3	3		2	3	3	3			1	2	1	2	3

Semester	19PCSC102: Advanced Web Technology	L	T	P	C
I		5	0	0	5

Learning Objectives (LO):

LO1	Explore the backbone of web page creation by developing .NET skill
LO2	Enrich knowledge about HTML control and web control classes
LO3	Provide depth knowledge about ADO.NET
LO4	Understand the need of usability, evaluation methods for web services
LO5	Understand how to plan and conduct user research related to web usability

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Design a web page with Web form fundamentals and web control classes.
CO2	Recognize the importance of validation control, cookies and session.
CO3	Apply the knowledge of ASP.NET object, ADO.NET data access and SQL to develop a client server model.
CO4	Recognize the difference between Data list and Data grid controls in Accessing data.
CO5	Create fully functional website/web application with MVC architecture.

Unit 1 – Overview of ASP.NET - The .NET framework – Learning the .NET languages : Data types – Declaring variables- Scope and Accessibility- Variable operations- Object Based manipulation- Conditional Structures- Loop Structures- Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spaces and assemblies. Setting Up ASP.NET and IIS.

Unit 2 - Developing ASP.NET Applications - ASP.NET Applications: ASP.NET applications– Code behind- The Global.asax application file- Understanding ASP.NET Classes- ASP.NET Configuration. Web Form fundamentals: A simple page applet- Improving the currency converter- HTML control classes- The page class- Accessing HTML server controls. Web controls: Web Control Classes – Auto Post Back and Web Control events- Accessing web controls. Using Visual Studio.NET: Starting a Visual Studio.NET Project- Web form Designer- Writing code- Visual studio.NET debugging. Validation and Rich Controls: Validation- A simple Validation example- Understanding regular expressions- A validated customer form. State management - Tracing, Logging, and Error Handling.

Unit 3 - Working with Data -Overview of ADO.NET - ADO.NET and data management- Characteristics of ADO.NET-ADO.NET object model. ADO.NET data access : SQL basics– Select , Update, Insert, Delete statements- Accessing data- Creating a connection- Using a command with a DataReader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding with data bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML.

Unit 4 - Web Services - Web services Architecture : Internet programming then and now- WSDL–SOAP- Communicating with a web service-Web service discovery and UDDI. Creating Web services : Web service basics- The StockQuote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service- Using the proxy class- An example with Terra Service.

Unit 5 - Advanced ASP.NET -Component Based Programming: Creating a simple component – Properties and state- Database components- Using COM components.

Custom controls: User Controls- Deriving Custom controls. Caching and Performance Tuning: Designing and scalability– Profiling- Catching- Output catching- Data catching. Implementing security: Determining security requirements- The ASP.NET security model- Forms authentication- Windows authentication.

Current Streams of thought: adaptive streaming - video segmentation - high compression codecs - Accelerated Mobile Pages - Voice Search Optimization

Text Book

1. Mathew Mac Donald, (2005), *ASP.NET Complete Reference*, Tata McGrawHill, 1st Edition.

References

1. J. Crouch Matt, (2002), *ASP.NET and VB.NET Web Programming*, Addison Wesley, 2nd Edition.
2. J. Liberty, D. Hurwitz, (2006), *Programming ASP.NET*, O'REILLY, 3rd Edition.
3. Ebook: https://sites.google.com/a/ernor.site/petedenny/asp-net-and-vb-net-web-programming-1st-edition-by-crouch-matt-j-2002-taschenbuch-B011DB3NEO

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	2	3	3	3	3			3	2		3	1	2			3	3
CO2				2			3	3	3	1	3		1	2	3			
CO3	3	2	3	3		1	3	2		1		3			3	3		3
CO4			3				3	2			2	3	1			2	3	
CO5		3			2		1			2				3			1	

Semester	19PCSC103: Compiler Design	L	T	P	C
I		5	0	0	5

Learning Objectives (LO):

LO1	Discover principles, algorithms and techniques that can be used to construct various phases of compiler
LO2	Acquire knowledge about finite automata and regular expressions
LO3	Learn context free grammars, compiler parsing techniques

LO4	Explore knowledge about Syntax Directed definitions and translation scheme
LO5	Understand intermediate machine representations and actual code generation

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Apply the knowledge of lexical tool & YACC tool to develop a scanner & parser.
CO2	Design & conduct experiments for Intermediate Code Generation in compiler.
CO3	Design & implement a software system for backend of the compiler.
CO4	Design the Intermediate Code Generation
CO5	Learn the new code optimization techniques to improve the performance of a program in terms of speed & space.

Unit 1 - Lexical analysis - Language Processors, The Structure of a Compiler, Parameter passing mechanism – Symbol table - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – Finite automata - Regular expression to automata.

Unit 2 - Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers.

Unit 3 - Semantic Analysis - Inherited and Synthesized attributes – Dependency graphs – Ordering the evaluation of attributes – S-attributed definitions – L-attributed definitions – Applications of Syntax Directed translation – Syntax Directed translations schemes - Storage organization – Stack allocation of space.

Unit 4 - Intermediate Code Generation - Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements - Procedure calls.

Unit 5 - Code Generation and Code Optimization - Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peephole Optimization.

Text Book

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, (2009), *Compilers-Principles, Techniques and Tools*, Pearson Education, 2nd Ed , Asia.

References

1. S.Godfrey Winster, S.Aruna Devi, R.Sujatha, (2019), *Compiler Design*, yesdee Publishers, 3rd Reprint,
2. A.V. Aho, Ravi Sethi, J.D. Ullman, (2003), *Compilers - Principles, Techniques and Tools*, Addison- Wesley.
3. Kennath C.Louden,(2004),*Compiler Construction Principles and Practice*, Vikas publishing House,.
4. Allen I. Holub, (2001), *Compiler Design in C*, Prentice Hall of India,.
5. Fischer Leblanc, (1988),*Crafting Compiler*, Benjamin Cummings, Menlo Park,
6. Modern Compiler Design – 2nd Ed. Link – http://160592857366.free.fr/joe/ebooks/ShareData/Modern%20Compiler%20Design%202e.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3		3	2	3	2		1	3	3		2	3	2			3	1
CO2				3			1			3	2		3			2		
CO3	2	3	3	3		3	3	1		3		1			3	1		3
CO4			3		3	3	1	3			3	3	2				1	3
CO5	3	3	3	2		3	1	3			3	1	2		3	3		

Semester	19PCSC104: Advanced Java Programming	L	T	P	C
I		5	0	0	5

Learning Objectives (LO):

LO1	To deepen student's programming skills by analyzing the real world problem
LO2	In a programmer's point of view and implement the concepts in real time projects
LO3	To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming
LO4	To enhance the knowledge of students in advanced features of the Java language syntax and SDK
LO5	Understand how and when to apply object-oriented principles such as abstraction, polymorphism, and inheritance, etc.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Learn the Internet Programming, using Java Applets and create a full set of UI Widgets using Abstract Windowing Toolkit (AWT) & Swings.
CO2	Learn to access database through Java programs, using Java Data Base Connectivity (JDBC).
CO3	Create dynamic web pages using Servlets and JSP.
CO4	Invoke the remote methods and multitier application using Remote Method Invocation (RMI) and EJB.
CO5	Use the advanced features of the Java language to build and compile robust enterprise-grade applications.

Unit-1 - Design Patterns: Introduction to Design patterns - Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern- Adapter Pattern- Proxy Pattern- Decorator Pattern- Command Pattern- Template Pattern- Mediator Pattern-Collection Framework – Array List class – Linked List class – Array List vs. Linked List - List Iterator interface - Hash Set class- Linked Hash Set class-Tree Set class Priority Queue class - Map interface-Hash Map class- Linked Hash Map class –Tree Map class - Comparable interface - Comparator interface-Comparable vs. Comparator.

Unit-2 - Applet Fundamentals- Applet Class - Applet lifecycle- Steps for Developing Applet Programs- Passing Values through Parameters- Graphics in Applets- GUI Application **-** Dialog Boxes - Creating Windows - Layout Managers – AWT Component classes – Swing component classes- Borders – Event handling with AWT components - AWT Graphics classes - File Choosers - Color Choosers – Tree – Table –Tabbed panels–Progressive bar - Sliders.

Unit-3 - JDBC -Introduction - JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database and Table with JDBC - Working with Database Metadata; Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and Inet address classes.

Unit–4 - Servlet: Advantages over Applets - Servlet Alternatives - Servlet Strengths - Servlet Architecture - Servlet Life Cycle – Generic Servlet, Http Servlet - First Servlet - Invoking Servlet - Passing Parameters to Servlets - Retrieving Parameters - Server-Side Include – Cookies- JSP Engines - Working with JSP - JSP and Servlet - Anatomy of a JSP Page- Database Connectivity using Servlets and JSP.

Unit-5 - Lambda Expressions- Method Reference- Functional Interface- Streams API, Filters- Optional Class- Nashorn- Base 64 Encode Decode- JShell (RPEL)- Collection Factory Methods- Private Interface Methods- Inner Class Diamond Operator- Multi resolution Image API.

Current Streams of thought: Modularity Design Principle - IoT Application Development - Development of Custom Big Data Solutions - Kotlin for Android App Development

Textbooks

1. Bert Bates, Karthy Sierra, Eric Freeman, Elisabeth Robson, (2014), *Head First Design Patterns*, O'REILLY Media Publishers, 2nd Edition. (1st-Unit)
2. Herbert Schildt, (2017), *Java: A Beginner Guide*, Oracle Press, 7th Edition. (2nd and 3rd Unit).
3. Murach's, (2018), *Java Servlets and JSP*, Mike Murach& Associates Publishers, 3rd Edition. (4th Unit).
4. Warburton Richard, (2014), *Java 8 Lambdas*, Shroff Publishers & Distributors Pvt Ltd, 1st Edition. (5th Unit).

References

1. Paul Deitel and Harvey Deitel, (2012), *Java: How to Program*, Prentice Hall Publishers, 9th Edition.
2. Jan Graba, (2013), *An Introduction to Network Programming with Java-Java 7 Compatible*, Springer, 3rd Edition.
3. http://enos.itcollege.ee/~jpoial/allalaadimised/reading/Advanced-java.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	2	1	3	2	1			3	2		3	2	3			3	3
CO2			3	1			3	3		1	3		2	3	2	3	3	
CO3	1	3		2		3	1	3			3	2			3	3		2
CO4			2	3		1		3	2			3	2			3	2	
CO5	2				3				1	3				1				

Semester	19PCSP105: Algorithm Lab (Using Java)	L	T	P	C
I		0	0	2	2

Learning Objectives (LO):

LO1	Design and implement various algorithms in JAVA
LO2	Employ various design strategies for problem solving
LO3	Measure and compare the performance of different algorithm
LO4	Compute and calculate various types of sorting algorithm
LO5	Design and implement the real time applications in java

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Design algorithms using appropriate design techniques (greedy, dynamic programming, etc.)
CO2	Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.
CO3	Analyze and compare the performance of algorithms using language features.
CO4	Apply and implement the learned algorithm design techniques.
CO5	Understand the data structures to solve real world problems.

List of Exercises

1. Create a Java class called **Student** with the following details as variables within it.
   (i) USN
   (ii) Name
   (iii) Branch
   (iv) Phone
   Write a Java program to create *n Student* objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.
2. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
3. Design a super class called **Staff** with details as Staff Id, Name, Phone, Salary. Extend this class by writing three subclasses namely **Teaching** (domain, publications), **Technical**(skills), and **Contract**(period). Write a Java program to read and display at least 3 *staff* objects of all three categories.

4. Write a Java class called **Customer** to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".

5. Sort a given set of ***n*** integer elements using **Quick Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.

6. Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.

7. Implement in Java, the **0/1 Knapsack** problem using (a) Dynamic Programming method (b) Greedy method.

8. Write a Java program to implement **Travelling Sales Person problem** using Dynamic programming.

9. Design and implement in Java to find all **Hamiltonian Cycles** in a connected undirected Graph G of *n* vertices using backtracking principle.

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3		2		3				2	3		1	2	3			3	3
CO2			3	2	3	2	3	1		3				3		2	3	
CO3	1	3		3		2	3	1			3	1			3			2
CO4			2	3		1		3	2	3		1	3			1	3	
CO5		3		2	3		3		2	1	3			3		1		1

Semester	19PCSP106: Web Technology Lab	L	T	P	C
I		0	0	2	2

Learning Objectives (LO):

LO1	To understand the concept of web technologies
LO2	To understand the importance of cascade style sheets in creating a web application
LO3	To understand the importance of Java Script in creating a web Application
LO4	To understand the use of XML in Document type Definition
LO5	To know about PHP scripts and create adaptive web pages

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Develop to build a complete website using HTML.
CO2	Create web pages using DHTML and Cascading Style Sheets.
CO3	Able to include JavaScript for form validations and email validations.
CO4	Develop a simple web application using server side PHP programming and Database Connectivity using MySQL.
CO5	Able to create a complete Web Application with all the required modules

List of Exercises

- Write a HTML Program for using Image, Link and Formatting tags.
- Write a HTML Program to using table tag of your class Time table.
- Write a Forms in Html
- Write a HTML program to illustrate Frame tag..
- Write a HTML program to describe the cascade style sheet.
- Write a program to Document Type Definition in XML.
- Write a program For Validation using JavaScript.
- Write a Calculator program in Java script.
- Write a program for Multiplication table using Java script.
- Connection in My sql with php
- Insert record in mysql with php
- Create, Insert, Delete, Edit in mysql with php

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3		2		3				3	2		3	3	1			3	1
CO2			3	2	3	1	3	1		3				2		3	1	
CO3	1	3		2		3	1	3			3	1			3			2
CO4			3	3		3		1	3	2		3	2			3	2	
CO5			1	3		3		3	2	3		2	3			3	1	

Semester	19PCSC201: Distributed Operating Systems	L	T	P	C
II		5	0	0	5

Learning Objectives (LO):

LO1	To study distributed operating system concepts
LO2	To understand hardware, software and communication in distributed OS
LO3	To learn the distributed resource management components
LO4	Able to design and implement fault tolerant distributed systems
LO5	Practices to learn concepts of OS and Program the principles of Operating Systems

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Clear understanding on several resource management techniques like distributed shared memory and other resources.
CO2	Knowledge on mutual exclusion and Deadlock detection of Distributed operating system.
CO3	Able to design and implement algorithms of distributed shared memory and commit Protocols.
CO4	Able to design and implement fault tolerant distributed systems.
CO5	Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system.

Unit 1 - Introduction – Operating System Definition – Functions of Operating System – Types of Advanced Operating System – Design Approaches – Synchronization Mechanisms – concepts of a Process – Critical Section Problem – Process Deadlock – Models of Deadlock – Conditions for Deadlock – System with single-unit requests, Consumable Resources , Reusable Resources.

Unit 2 - Distributed Operating Systems: Introduction- Issues – Communication Primitives – Inherent Limitations –Lamport's Logical Clock , Vector Clock, Global State , Cuts – Termination Detection – Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport's Algorithm - Token Based Algorithms –Distributed Deadlock Detection – Distributed Deadlock Detection Algorithms – Agreement Protocols.

Unit 3 - Distributed Resource Management – Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed shared Memory – Architecture – Algorithm – Protocols – Design Issues – Distributed Scheduling – Issues – Components – Algorithms.

Unit 4 - Failure Recovery and Fault Tolerance – Concepts – Failure Classifications – Approaches to Recovery – Recovery in Concurrent Systems – Synchronous and Asynchronous Check pointing and Recovery –Check pointing in Distributed Database Systems – Fault Tolerance Issues – Two-Phase and Non blocking Commit Protocols – Voting Protocols – Dynamic Voting Protocols.

Unit 5 - Multiprocessor and Database Operating Systems –Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory management – Reliability/Fault Tolerance – Database Operating Systems – concepts – Features of Android OS, Ubuntu, Google Chrome OS and Linux operating systems.

Current Streams of thought: Process synchronization - Resource management - Fault tolerance - Error recovery

Text Books

1. Mukesh Singhal N.G.Shivaratri, (2008), *Advanced Concepts in Operating Systems*, Tata McGraw Hill, 2nd Edition.

2. Andrew S.Tanenbaum, (2002), *Distributed Operating Systems*, Pearson Education, 2nd Edition.

Reference Books

1. Abraham Silberschatz, Peter B.Galvin, (2005), Gagne. G, *Operating Concepts*, Addison Wesley publications, 7th Edition.
2. Andrew S.Tanenbaum, (2012), *Modern Operating Systems*, Addison Wesley, 4th Edition.
3. Ebook: https://www.cs.swarthmore.edu/~newhall/readings/p419-tanenbaum.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3		2		3		1		3	2		3	3	2			3	3
CO2			2		3	1	1			3			3	2		3	2	
CO3	3	1		3		3		3		1	3				3			2
CO4			3	1		3		3	2			2	3			3		
CO5	3	2	3			3		3	2			1	3			3		3

Semester	19PCSC202: Dot Net Programming	L	T	P	C
II		5	0	0	5

Learning Objectives (LO):

LO1	To explore the backbone of web page creation by developing .NET skill
LO2	To Familiar with Application, session and view state management
LO3	To Provide depth knowledge about ADO.NET
LO4	To Understand the need of usability, evaluation methods for web services
LO5	To acquire knowledge on the usage of recent platforms in developing web applications

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Learn major programming paradigms and techniques involved in design and implementation of modern programming languages.
CO2	Learn about Microsoft .NET framework.
CO3	By the end students can develop, implement and creating Applications with C#. VB.NET and ASP.NET.
CO4	Creating ASP.Net applications using standard .net controls.
CO5	An ability to use current techniques, skills, and tools necessary for computing practice.

Unit – 1 - The .NET Framework - Learning the .NET languages - Introduction - Net revolution - .Net framework and its architecture – CLR – What is Assembly – Components of Assembly – DLL hell and Assembly Versioning- O Objects and Namespaces - Setting Up ASP.NET and IIS.

Unit – II - Developing VB.NET Applications - Introduction to VB.Net, The .Net Frame work and Common language runtime, Building VB. Net Application, VB IDE, forms, properties, events, VB language-console application and 46 windows application, data type, declaring variable, scope of variable, operators and statements - Windows Applications-forms, adding controls to forms, handling events, MsgBox, Input Box, multiple forms, handling mouse and Keyboard events, object oriented programming creating and using classes and objects, Handling Exceptions- on Error Goto.

Unit – III - Developing - ASP.NET Applications - ASP.NET Applications – Understanding ASP.NET Controls - Overview of ASP.NET framework, Web Form fundamentals - Web control classes – Using Visual Stdio.NET - Validation and Rich Controls -State management – Tracing, Logging, and Error Handling.

Unit – IV - Developing C#.NET Applications - Introducing C# - overview of C# - Literals, Variables- Data Types, -Operators, -checked and unchecked operators – Expressions – Branching -Looping-*Object Oriented Aspects Of C#:* Class – Objects - Constructors and its types- inheritance, properties, indexers, index overloading – polymorphism - sealed class and methods - interface, - abstract class, operator overloading, - delegates, events, errors and exception - Threading.

Unit – V - ADO.NET - Overview of ADO.NET - ADO.NET data access – Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, Command Class Data binding – Data list – Data grid – Repeater – Files, Streams and Email – Using XML.

Current Streams of thought: Cloud Service - Blazor Framework - ML.NET 1.4 - Absolutely Secure Platform

Text Books

1. James Holmes, (2007), *Struts: The Complete Reference*, Tata McGraw Hill Professional, 2nd Edition.
2. Mathew Mac Donald, (2005), *ASP.NET Complete Reference*, Tata McGraw Hill, 1st Edition.
3. Herbert Schildt, (2012), *The Complete Reference: C# 4.0*, Tata McGraw Hill, 2nd Edition.
4. Christian Nagel et al., (2012), *Professional C# 2012 with .NET 4.5*, Wiley India, 1stEditon.
5. Steven Holzner, (2005), *Visual Basic .NET Programming Black Book*, Dream tech Press, 1st Edition.

Reference Books

1. Jesse Liberty, (2010), *Programming C#*, O'Reilly Media, 6th Edition.
2. Mario Szpuszta, Matthew MacDonald, (2010), *Pro ASP.NET 4 in C# 2010: Includes Silver light* , A press, 3rd Edition.
3. J. Liberty, D. Hurwitz, (2008), *Programming ASP.NET*, O'REILLY, 4th Edition.

4. Ebook: https://ptgmedia.pearsoncmg.com/images/9780735643383/samplepages/9780735643383.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1			3		2		2		3	3		2		3			3	
CO2			3		3		1			3			2	1		3	1	
CO3	3			1		3		2		3	2		3		3			3
CO4		2		3		3		2	3			3	2			3		
CO5	1		3		1	3		2	3		1	2	3			3		2

Semester	19PCSC203: Cryptography and Network Security	L	T	P	C
II		5	0	0	5

Learning Objectives (LO):

LO1	To understand Cryptography Theories, Algorithms and Systems
LO2	To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks
LO3	To know about the malicious software & firewalls
LO4	To be able to secure a message over insecure channel by various means
LO5	To learn about how to maintain the Confidentiality, Integrity and Availability of a data

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities.
CO2	Apply the different cryptographic operations of symmetric cryptographic Algorithms.
CO3	Apply the different cryptographic operations of public key cryptography.
CO4	Apply the various Authentication schemes to simulate different applications.
CO5	Understand various Security practices and System security standards.

Unit I - Introduction - Security trends – Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

Unit II - Symmetric Encryption and Message Confidentiality -Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4 , Chipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. Public-key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures, Key Management.

Unit III - Authentication Applications - Kerberos, x.509 Authentication Service, Public-Key Infrastructure. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.

Unit IV - IP Security - IP Security Over view, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations. Web Security: Web Security Considerations, Secure Socket Layer(SSL) and Transport Layer Security(TLS), Secure Electronic Transaction(SET).Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3.

Unit V - Intruders - Intruders, Intrusion Detection, Password Management. **Malicious Software:** Virus and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. **Firewalls:** Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

Current Streams of thought: Quantum Cryptography - Biometric Encryption - Wearable Two-Factor Authentication - Search Engines With Free VPNs

Text books

1. Behrouz A. Ferouzan, (2007), *Cryptography & Network Security*, Tata McGraw Hill, 2nd Edition.
2. William Stallings, (2013), *Cryptography and Network Security - Principles and Practice*, Pearson Education, 6th Edition.
3. William Stallings, (2008), *Network Security Essentials Applications and Standards*, Pearson Education, 3rd Edition.

References

1. Man Young Rhee, (2003), *Internet Security: Cryptographic Principles*, *Algorithms And Protocols*, Wiley Publications, 2nd Edition.
2. Charles P. fleeger, (2006), *Security In Computing,* Prentice Hall Of India, 4th Edition.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, (2002), *Network Security*, *Private communication in public world*, PHI, 2nd Edition.
4. William Stallings, (2017), *Cryptography and Network Security - Principles and Practice*, Pearson Education, 7th Edition.
5. Ebook: http://www.inf.ufsc.br/~bosco.sobral/ensino/ine5680/material-cripto-seg/2014-1/Stallings/Stallings_Cryptography_and_Network_Security.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3				3		2		3			1		3			3	
CO2			3		2		3			2			3	1		3	3	
CO3	3			2		3		3		1	3		2		3			
CO4		3		2				3	2		3	1	3			3		
CO5	1		3	2		3		1	3		1	3	1		3	2		

Semester	19PCSC204: Advanced Database Management System	L	T	P	C
II		5	0	0	5

Learning Objectives (LO):

LO1	To Acquire Knowledge of Database Models
LO2	To understand distributed database architecture
LO3	To learn the concepts of spatial database
LO4	To familiar with temporal database
LO5	To give depth information about system implementation techniques, data storage, representing data elements and database system architecture

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Know about the Various data models.
CO2	Works on Database Architecture.
CO3	Analyze data patterns.
CO4	Handle object oriented databases.
CO5	Apply acquired knowledge for developing holistic solutions based on database systems/database techniques.

Unit-I- Relational and parallel Database Design: Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF,4NF and 5NF. Architecture ,I/O Parallelism, Inter query Parallelism, Intra query Parallelism, Intra operation Parallelism, Interoperation Parallelism.

Unit-II - Distributed and Object based Databases: Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.

Unit-III - Spatial Database: Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing.

Unit-IV-XML Databases: XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments.

Unit-V- Temporal Databases: Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

Current Streams of thought: Bridge SQL and No SQL - Cloud computing - Graph databases - Augmented Data Management

Text Book

1. Abraham Silberschatz, Henry F Korth, S. Sudarshan, (2011), *Database System Concepts*, Tata McGraw-Hill International, 6th Edition.
2. C.J. Date, A. Kannan, S. Swamynathan, (2016), *An Introduction to Database Systems*, Pearson Education Reprint, 8th Edition.

Reference Books

1. Ramez Elmasri, Shamkant B Navathe, (2016), *Fundamental of Database Systems*, Pearson Education, 7th Edition.
2. Thomas Connolly, Carolyn Begg, (2014), *Database Systems: A practical approach to Design, Implementation and Management*, Pearson Education, 6th Edition.
3. Ebook: https://ebooks.wileyindia.com/product/advanced-database-management-system50005115

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3				3		3		2			3		2			3	
CO2	1	3	3				3			3			1	3			1	3

CO3	3			3		3		2		3	2		3		1	3	3	
CO4		3		2		3	2	3	1		3					3		
CO5		1			3					2		3			3			1

Semester	19PCSP205: Dot Net Lab	L	T	P	C
II		0	0	2	2

Learning Objectives (LO):

LO1	To impart basic knowledge of different control statements and array associated with C # programming
LO2	To learn various C# elements and OOPS concepts
LO3	To learn interface, delegates, event and error handling concepts in C#
LO4	To impart knowledge on networking including socket programming and reflection
LO5	To acquire a working knowledge of windows and web based applications

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Develop correct, well-documented C# programs using control statements.
CO2	Develop object oriented programming using C# classes and objects.
CO3	Handle the exception and event-driven programs.
CO4	Perform network based programming including chat applications.
CO5	Develop windows and web based applications.

List of Exercises

1. Finding Prime number using Classes and Objects
2. Separating Odd/Even Number into Different Arrays
3. String Manipulations
4. Jagged Array manipulation

5. Implementing ‘ref’ and ‘out’ keywords
6. Implementing ‘Params’ keyword
7. Boxing and Unboxing
8. Constructor Overloading
9. Implementing property
10. Implementing indexer
11. Implementing Multiple inheritance using Interface
12. Implementing Abstract Class
13. Exception Handling Using Try, Catch, and Finally
14. Demonstrating multicast Delegates
15. Implementing the Concept of Reflection
16. Socket Programming
17. Simple Calculator-A Window Application
18. Student Profile-A Window Application
19. Palindrome-A Web Application
20. Formatting Text-A Web Application

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3		2		3	3	1		3	2		3		3			3	1
CO2			3	2	3	2	3	3		2				3		3	1	
CO3		3		3		3		2				3			2			3
CO4			3	2		3		2	3	1			2			3		
CO5	3					3		2	3			1	2				3	3

Semester	19PCSP206: RDBMS Lab	L	T	P	C
II		0	0	2	2

Learning Objectives (LO):

LO1	Keep abreast of current developments to continue their own professional development
LO2	To engage themselves in lifelong learning of Database management systems theories and technologies this enables them to purse higher studies
LO3	Recognize and identify the use of indexing technique used in database design
LO4	To interact professionally with colleagues or clients located abroad and the ability to overcome challenges that arises from geographic distance, cultural differences, and multiple languages in the context of computing
LO5	Develop team spirit, effective work habits, and professional attitude in written and oral forms, towards the development of database applications

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	In analyzing the business requirements and producing a viable model for the implementation of the database.
CO2	In converting the entity-relationship diagrams into relational tables
CO3	Design and implement a database schema for a given problem-domain
CO4	To develop appropriate Databases to a given problem that integrates ethical, social, legal, and economic concerns
CO5	Perform PL/SQL programming using concept of Cursor Management, Error Handling, Package and Triggers

List of Exercises

Cycle – I (Simple SQL)

1. Employee Management System Using SQL Commands.
2. Students Management System Using SQL Commands.
3. Bank Management System Using SQL Commands.
4. Index Creation.
5. Implementation of SQL queries for route database.

6. Implementation of SQL queries for route database - part I.
7. Implementation of SQL queries for route database - Part II.
8. Creating view using SQL commands.
9. Creation of Table Partition.
10. Default trigger procedure and drop command
11. Report creation.

Cycle – II (PL/SQL)

12. Factorial of number
13. Checking whether a number is prime or not
14. Fibonacci series
15. Reversing the string
16. Swapping of two numbers
17. Odd or even number
18. Duplication of records

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1			3		2	3	2		3			3		3			3	1
CO2			3	1		3		2		3				3		3	2	
CO3		1		3				3				3			2			3
CO4			3	1		3		2	3	3							3	
CO5				1		3		3		3	2			3		3	2	

Semester	19PCSC301: Digital Image Processing	L	T	P	C
III		5	0	0	5

Learning Objectives (LO):

LO1	To understand the concepts of Digital Image Processing.
LO2	To study the Spatial domain and Frequency domain image processing methods.
LO3	To learn the techniques of Edge detection and Morphological operations.
LO4	The classification of image compression and segmentation techniques
LO5	To apply the concepts to solve computer vision problems of different fields.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the fundamental concepts of a digital image processing system.
CO2	Students will get insight into the frequency domain using various transforms.
CO3	Gain knowledge on image enhancement and image restoration techniques.
CO4	Understand the categorize various compression techniques.
CO5	Gain knowledge on image segmentation and representation techniques.

UNIT–I - Fundamentals: Image Sensing and Acquisition, Image Sampling and Quantization, relationship between Pixels; Random noise; Gaussian Markov Random Field, σ-field, Linear and Non-linear Operations; Image processing models: Causal, Semi-causal, Non-causal models.
Color Models: Color Fundamentals, Color Models, Pseudo-color Image Processing, Full Color Image Processing, Color Transformation, Noise in Color Images.

UNIT–II- Spatial Domain: Enhancement in spatial domain: Point processing; Mask processing; Smoothing Spatial Filters; Sharpening Spatial Filters; Combining Spatial Enhancement Methods.
Frequency Domain: Image transforms: FFT, DCT, Karhunen –Loeve transform, Hotlling's T^2 transform, Wavelet transforms and their properties. Image filtering in frequency domain.

UNIT–III - Edge Detection: Types of edges; threshold; zero-crossing; Gradient operators: Roberts, Prewitt, and Sobel operators; residual analysis based technique; Canny edge detection. Edge features and their applications.

UNIT–IV Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory. Error Free Compression: Huff-man coding; Arithmetic coding; Wavelet transform based coding; Lossy Compression: FFT; DCT; KLT; DPCM; MRFM based compression; Wavelet transform based; Image Compression standards.

UNIT–V - Image Segmentation: Detection and Discontinuities: Edge Linking and Boundary Deduction; Threshold; Region-Based Segmentation. Segmentation by Morphological watersheds. The use of motion in segmentation, Image Segmentation based on Color.
Morphological Image Processing: Erosion and Dilation, Opening and Closing, Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology.

Current Streams of thought: Recent applications of image processing in various fields of agricultural, medical, robotics and remote sensing.

Text Books

1. Rafael Gonzalez, Richard E. Woods (2018), "Digital Image Processing", Pearson Education,Fourth Edition.
2. A. K. Jain(2015), Fundamentals of Image Processing, Second Ed., PHI, New Delhi, 2015.

References

1. Aditi Majumder and M. Gopi(2018),"Introduction to visual computing core concepts in computer vision, Graphics, and Image Processing ",CRC Press.
2. Todd R.Reed(2015), "Digital Image Sequence Processing, Compression, and Analysis", CRC Press.
3. https://dl.ebooksworld.ir/motoman/Digital.Image.Processing.4th.Edition.www.EBooksWorld.ir.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1			3		3	2	3		2			3		3			1	1
CO2			3	2		3		3		2				3		3	3	
CO3		3		2				3				2			1			2
CO4			2	3		1		3	1	3							3	
CO5																		

Semester	19PCSC302: Internet of Things	L	T	P	C
III		5	0	0	5

Learning Objectives (LO):

LO1	To provide an understanding of the technologies and the standards relating to the Internet of Things
LO2	To develop skills on IoT technical planning.
LO3	To Implement Data and Knowledge Management and use of Devices in IoT Technology.
LO4	To Understand State of the Art IoT Architecture.
LO5	To study Real World IoT Design Constraints, Industrial Automations in IoT.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Gain the basic knowledge about IoT and related products in real life.
CO2	Students will get insight into the mechanism on physical resources and started to do their work smarter.

CO3	Understand the technology and standards relating to IoTs.
CO4	Understand the critical parts of the ICT ecosystem required to mainstream IoTs.
CO5	Gain the basic knowledge on developing enterprise level technical strategies.

UNIT I – Introduction to IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels and Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

UNIT II - IoT Architecture: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.

UNIT III - IoT Protocols: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP– Security.

UNIT IV - Web of Things: Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

UNIT V - Applications: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.

Current Streams of thought: Characterizing the IoT, Privacy, Control – Disrupting Control, Crowd sourcing; Environment – Physical thing, Electronics, Internet service; Solutions – The IoT as a part of the solution, cautious optimism, the open IoT definition.

Text Books

1. Arshdeep Bahga, Vijay Madisetti (2015), “Internet of Things – A hands-on approach”, Universities Press.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (2011), “Architecting the Internet of Things”, Springer.
3. Olivier Hersent, David Boswarthick(2012), Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, Second Edition.

References:

1. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Aves and David Boyle(2014), "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier.
2. http://alvarestech.com/temp/Industry4.0/2019/Dimitrios%20Serpanos,Marilyn%20Wolf%20(auth.)%20-%20%20Internet-

ofThings%20(IoT)%20Systems_%20Architectures,%20Algorithms,%20Methodologies-Springer%20International%20Publishing%20(2018).pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1		3			3	3			2	3	3	1		3			3	
CO2			3	1		3		2				3		2		3	1	
CO3	3	3		2				3				3		1				3
CO4				3		3		3	1	3							3	
CO5	3	2	3			1			3	2						2		3

Semester	19PCSC303: Machine Learning	L	T	P	C
III		5	0	0	5

Learning Objectives (LO):

LO1	To Learn about Machine Intelligence and Machine Learning applications.
LO2	To implement and apply machine learning algorithms to real-world applications.
LO3	To identify and apply the appropriate machine learning techniques
LO4	To Classification of pattern recognition, optimization and decision problems.
LO5	To understand how to perform evaluation of learning algorithms and model selection.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CO2	Understand the strengths and weaknesses of many popular machine learning approaches.
CO3	Gain knowledge of genetic algorithms and Computational Learning methods
CO4	Students will get knowledge of mathematical relationships with in Machine

	Learning algorithms and the paradigms of supervised and un-supervised learning.
CO5	Understand the design and implement various machine learning algorithms in a range of real-world applications.

Unit I – Introduction-Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

Unit II – Neural Networks and Genetic Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

Unit III – Bayesian and Computational Learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

Unit IV – Instant based Learning: K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Unit V - Advanced Learning: Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

Current Streams of thought: Advanced Projects in Machine Learning – Google Car – Robert Bosses – Chatbot – Traffic Signals – Space Recognition – biometric verification.

Text Books

1. Tom M. Mitchell(2013),Machine Learning, McGraw-Hill Education (India) Private Limited.
2. Anuradha Srinivasa raghavan and VincyJoseph (2019), Machine Learning, Wiley.

References

1. SaikatDutt , Subramanian Chandramouli and Amit Kumar Das (2018)," Machine Learning" ,Pearson Publisher, First Edition
2. https://www.pdfdrive.com/machine-learning-step-by-step-guide-to-implement-machine-learning-algorithms-with-python-e158324853.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1					3	3			1	3		1		3			3	
CO2			2	2		3		2		3	2	3		1		3	2	
CO3	3			3	2	3		1				3			2			3
CO4	3	2	3	2		3		2	3	1						3		3
CO5		1					3				3		2		1		3	

Semester	19PCSP304: Image Processing Lab	L	T	P	C
III		0	0	2	2

Learning Objectives (LO):

LO1	To impart skills on the processing the digital images.
LO2	To learn the transform of the image from spatial domain to frequency domain.
LO3	To perform edge deduction techniques.
LO4	To gain knowledge on compressing the images using suitable techniques.
LO5	To study the segmentation methods.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the read and display the image.
CO2	Understand the transform the domain from spatial to frequency.
CO3	Apply suitable operators to detect the edge.
CO4	Students will get knowledge of compression and segmentation methods.
CO5	Gain knowledge on morphological operations.

List of Exercises

1. To perform linear and non linear operations on images.
2. To perform smoothing operations on an image in spatial domain.

3. To perform sharpening operations on an image in spatial domain.
4. To transform the image into DCT, FFT and wavelet.
5. To implement canny edge deduction.
6. To study the performance of gradiant operators.
7. To implement huff-man coding technique.
8. To perform DCT compression method.
9. To implement image segmentation based on color.
10. To implement erosion and dilation.

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	3	3		2	3			3			2					3	1
CO2	3		1			3		3		3		2		1		1	3	
CO3	3			2	3	2		1				3			3			
CO4	1		3	1		1		3		2	3					3		2
CO5		3			1		3		2		1		3	2				

Semester	19PCSP305: Machine Learning Lab	L	T	P	C
III		0	0	2	2

Learning Objectives (LO):

LO1	To expose the students in emerging technologies in the areas of machine learning.
LO2	To make use of Data sets in implementing the machine learning algorithms
LO3	To implement the machine learning concepts and algorithms.
LO4	To develop a basic understanding of the principles of machine learning
LO5	To derive practical solutions using predictive analytics.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand components of a machine learning algorithm.
CO2	Students will get insight the machine learning tools to build and evaluate predictors
CO3	Gain knowledge on how machine learning uses computer algorithms to search for patterns in data.
CO4	Understand the data patterns to make decisions and predictions with real-world.
CO5	Gain knowledge on how to use the various algorithm to solve the real time problem.

List of Exercises

1. Reading and writing into .csv files
2. Implement the Find –S algorithm.
3. Implement the Candidate-Elimination algorithm.
4. Classify a sample using ID3 algorithm.
5. Build an artificial neural network by implementing backpropagation algorithm.
6. Construct the naïve Bayesian classifier for classification.
7. Construct a naïve Bayesian classifier and evaluate the classifier with accuracy, precision, and recall metrics
8. Applying EM algorithm for clustering using K-means algorithm.
9. Implement the k-Nearest Neighbor algorithm to classify the data set.
10. Implement the non-parametric Locally Weighted Regression algorithm.

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	3	3		2	3			2			3					3	1
CO2	2		3			3		1		3		1		3		3	2	
CO3	3			3	2	3		1				3			3			
CO4	1		3	2		3		1		3	1					3		2
CO5		3			1		3		2		2			2			1	

Semester	19PCSC401: Software Project Management	L	T	P	C
IV		5	0	0	5

Learning Objectives (LO):

LO1	Understand the framework of project management.
LO2	Learn to monitor and control the project.
LO3	Know the sound knowledge in Agile method.
LO4	Know the team, cost, quality and resource management.
LO5	Identify and control the risk in the projects.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.
CO2	Students will get the knowledge of project to the organization's strategic plans and business justification throughout its life cycle.
CO3	Understand the project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.
CO4	Gain knowledge on project management, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.
CO5	Understand the projects response and issues that arise internally and externally.

Unit I - Project Management Framework: Introduction: Project - Project management - Relationship among Project, Program and Portfolio management - Project and operations management- Role of project manager - Project management body of knowledge - Enterprise Environmental factors. Project life cycle and Organization: Overview of project life cycle - Projects vs Operational Work - Stakeholders - Organizational influences on project management. **The Standard for Project Management of a Project**: Project management processes for a project: Common project management process interactions - Projects management process groups - Initiating process group - planning process group - Executing process group - Monitoring and controlling process group - Closing process group.

Unit II - Choosing Methodologies and Technologies – Software Processes and Process Models – Choice of Process Models – The Waterfall Model– Prototyping – other ways of categorizing prototype - **Agile Methods** – Extreme Programming Selecting the Most

Appropriate Process Model- Need of Agile - Iterative vs Incremental-Agile Manifesto and Mindset – Lean, Scrum and Kanban methods-uncertainty, Risk, and lifecycle selection-Scrum Elements overview-5 levels of planning-Scrum Process overview-Agile Team-roles and responsibilities- Epic-feature-User Stories-PBI-The Sprint.

Unit III - The Project Management Knowledge Areas: Project integration management: Develop project charter - Develop project management plan - Direct and manage project execution - Monitor and control project work - Perform integrated change control - Close project or phase. Project scope management: Collect requirements - Define Scope - Create WBS - Verify Scope - Control Scope. Project team management: Define activities - Sequence activities - Estimate activity resources - Estimate Activity Durations - Develop Schedule - Control Schedule.

Unit IV - Project cost management: Estimate costs - Determine budget - Control costs. Project Quality Management: Plan quality - perform quality assurance - Perform quality control. Project Human Resource Management: Develop human resource plan - Acquire project team - Develop project team - Manage project team. Project Communications Management: Identify stakeholders - Plan communications - Distribute information - Manage stakeholder expectations - report performance.

Unit V - Project Risk Management: Plan risk management - Identify risks - Perform qualitative risk analysis - Perform quantitative risk analysis - plan risk responses - Monitor and control risks. Project Procurement Management: Plan - Conduct - Administer - Close procurements.

Current Streams of thought: **Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.**

Text Books

1. Chandramouli (2015)," Software Project Management Paperback", Pearson Education
2. C.Ravindranath Pandian (2015), "Applied Software Risk Management-A Guide for Software Project Managers", Auerbach Publications.

Reference books

1. Hughes(2017),"Software Project Management", McGraw Hill Education, Fifth Edition.
2. https://www.pdfdrive.com/software-project-management-for-dummiespdf-e33424748.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	2	3		2	3			3			3	1	3			2	3
CO2	3		3					3		1		3		1		2	3	
CO3	3			1	3	2		3				2	3	3	1		3	2
CO4	2		3			1		3		2	3					3		3
CO5	2	1		3		3		1		3	2					3		1

ELECTIVES

Semester	19PCSE306: Advanced Computer Networks	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	Study the advanced concepts of the computer networking and enumerate the layers and TCP/IP model.
LO2	Acquire knowledge of Wireless communication and Data link layer
LO3	Understand the data links and protocols.
LO4	Gain core knowledge of Network layer routing protocols and IP addressing.
LO5	Study the transport layer and network security

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the terminology and concepts of the OSI reference model
CO2	Student will get the knowledge of protocols, network interfaces, and design issues in local area networks and wide area networks.
CO3	Understand wireless networking concepts, and be familiar with contemporary issues in networking technologies.
CO4	Gain knowledge the network tools and network programming.
CO5	Understand the Establishing and Releasing a connection in transport layer.

Unit 1 - Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP models – Example networks: Internet, 3G Mobile phone networks, Wireless LANs –RFID and sensor networks - Physical layer – Theoretical basis for data communication - guided transmission media

Unit-2 -Wireless transmission - Communication Satellites – Digital modulation and multiplexing - Telephones network structure – local loop, trunks and multiplexing, switching. Data link layer: Design issues – error detection and correction.

Unit 3-Elementary data link protocols- sliding window protocols – Example Data Link protocols – Packet over SONET, ADSL - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols.

Unit 4-Network layer- design issues - Routing algorithms - Congestion control algorithms – Quality of Service – Network layer of Internet- IP protocol – IP Address – Internet Control Protocol.

Unit 5-Transport layer – transport service- Elements of transport protocol - Addressing, Establishing & Releasing a connection – Error control, flow control, multiplexing and crash recovery - Internet Transport Protocol – TCP - Network Security: Cryptography.

Current Stream of Thoughts: Type of Threads, A Model for Network Security, Network Security for LAN- Levels of Security, Data Encryption Standard, Public Key Encryption, ISO Security Recommendations.

Text Book

1. Andrew S Tanenbaum(2018),"Computer Networks", Low price Edition, Fourth Edition.

Reference Books

1. Teresa C.Piliouras (2015), "Network Design Management and Technical Perspectives", Auerbach Publishers, Second Edition.

2. https://www.pdfdrive.com/advanced-computing-networking-and-informatics-volume-1-advanced-computing-and-informatics-proceedings-of-the-second-international-conference-on-advanced-computing-networking-and-informatics-icacni-2014-e174550006.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1			3		2	3			2	2	3	2	3	1		3		
CO2				1	3	2		3		2		3		2		3	3	
CO3	3			3		3		2		1	3	2	3		3		1	3
CO4	3		3	2	2	3		1		3	2					3		3
CO5		3					3		2			2		2			2	

Semester	19PCSE307: Web Services	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To enable the student to be familiar with distributed services, XML and web services
LO2	To study the use of web services in B2C and B2B applications
LO3	Provide depth knowledge about SOAP
LO4	Provide depth knowledge about SOAP
LO5	Understand the need of usability, evaluation methods for web services

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the design principles and application of SOAP and REST based web services.
CO2	Design collaborating web services according to a specification.
CO3	Implement an application that uses multiple web services in a realistic business scenario.
CO4	Use industry standard open source tools such as Apache Axis2, Tomcat, Derby and Eclipse to build, test, deploy and execute web services and web applications that consume them.
CO5	Create fully functional website/web services with MVC architecture.

Unit – I - Overview of Distributed Computing. Introduction to web services – Industry standards, Technologies and concepts underlying web services – their support to web services. Applications that consume web services.

Unit – II- XML – its choice for web services – network protocols to back end databases-technologies – SOAP, WSDL – exchange of information between applications in distributed environment – locating remote web services – its access and usage. UDDI specification – an introduction.

Unit – III - A brief outline of web services – conversation – static and interactive aspects of system interface and its implementation, work flow – orchestration and refinement, transactions, security issues – the common attacks – security attacks facilitated within web services quality of

services – Architecting of systems to meet users requirement with respect to latency, performance, reliability, QOS metrics, Mobile and wireless services – energy consumption, network bandwidth utilization, portals and services management.

Unit – IV- Building real world enterprise applications using web services – sample source codes to develop web services – steps necessary to build and deploy web services and client applications to meet customer s requirement – Easier development, customization, maintenance, transactional requirements, seamless porting to multiple devices and platforms.

Unit - V - Deployment of Web services and applications onto Tomcat application server and axis SOAP server (both are free wares) – Web services platform as a set of enabling technologies for XML based distributed computing.

Current Stream of Thoughts:. ASP .NET MVC(Model View Controller) - Overview of MVC – MVC Architecture – ASP .NET MVC Life Cycle – Building a Simple MVC Application with Visual Studio - Introduction to Controllers - Working with Controllers - Working with MVC Actions – MVC Filters – Types of Filters - Key Benefits of ASP .NET MVC.

Textbooks

1. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services : An Architects Guide , Prentice Hall, Nov 2003.
2. Heather Williamson, “XML: The Complete Reference “,Tata McGraw-Hill Education India.

Reference

1. Martin Kalin, “Java Web Services: Up and Running”, O’Reilly Publishers.
2. Ebook : http://www.nortonaudio.com/Ficheiros/Web.services...principles.and.technology.pdf

.**Outcome Mapping**

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	2	3		2	3				2	3	1	1	3		3	3	2
CO2	3	2		3	2	3		3		3				1		2	3	
CO3	3			3		3		3			1		2		3		1	3
CO4	3		1		3			3		2	3					2		3
CO5		3		1			3		2			2			3			

Semester	19PCSE308: Object Oriented Systems Development	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	Understand the fundamentals of OOSD life cycle.
LO2	Study object-oriented model, classes and it notations
LO3	To learn the practice UML in order to express the design of software projects.
LO4	Understand Specify, analyze and design the use case driven requirements for a particular system.
LO5	Gain knowledge about DBMS, designing classes and object oriented testing.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Students will get the differs from the traditional approach to systems analysis and design.
CO2	Understand Analyze, design, document the requirements through use case driven approach.
CO3	Gain knowledge UML represents on object-oriented system using a number of modeling views.
CO4	Understand the difference between various object relationships: inheritance, association and aggregation.
CO5	Gain knowledge of test cases, testing strategies and test plans in developing object- oriented software.

Unit – I - Fundamentals of OOSD - Overview of Object Oriented Systems Development : Two orthogonal view of the software - OOSD methodology - Why an object Object orientation. Object basics: Object Oriented Philosophy- Objects – Attributes – Object respond to messages – Encapsulation and information hiding – class hierarchy – Polymorphism – Object relationship and associations. OOSD life cycle : Software development process – OOSD Use case Driven Approach – Reusability.

Unit – II - Methodology, Modeling and UML - Object Oriented Methodologies: Rumbaugh et al.'s object modeling technique – The Booch methodology – The Jacobson et al. methodology – Patterns – Frameworks - The Unified approach. Unified Modeling Language : Static and dynamic models – Why modeling - UML diagrams – UML class diagram – Use case diagram - UML dynamic modeling – packages and model organization.

Unit – III - Object Oriented Analysis - Object Oriented Analysis process : Business Object Analysis - Use case driven object oriented analysis – Business process modeling – Use-Case model – Developing effective documentation . Classification : Classifications theory – Approaches for identifying classes – Noun phrase approach – Common class patterns approach – Use-Case Driven approach – Classes, Responsibilities, and Collaborators - Naming classes. Identifying object relationships, attributes, and methods : Association – Super-Sub class relationship – Aggregation – Class responsibility – Object responsibility.

Unit – IV - Object Oriented Design -Object Oriented Design Process and Design Axioms - OOD process- OOD axioms – Corollaries – Design patterns. Designing classes : Designing classes – Class visibility – Refining attributes – Designing methods and protocols – Packages and managing classes. Access layer: Object Store and persistence – DBMS – Logical and physical Database Organization and access control – Distributed Databases and Client Server Computing –– Multidatabase Systems – Designing Access layer classes. View Layer : Designing view layer classes – Macro level process – Micro level process – The purpose of view layer interface – Prototyping the user interface.

Unit – V - Software Quality - Software Quality Assurance : Quality assurance tests – Testing strategies – Impact of Object Orientation on Testing - Test Cases- Test Plan – Continuous testing. System Usability and Measuring User satisfaction: Usability Testing – User satisfaction test – A tool for analyzing user satisfaction. System Usability and Measuring User satisfaction : Introduction – Usability Testing.

Current Stream of Thoughts: Designing objects with responsibilities – Creator – Information expert – Low Coupling –Controller – High Cohesion – Designing for visibility - Applying GoF design patterns – adapter, singleton, factory and observer patterns. UML

Text Book

1. Ali Bahrami (2017), "Object Oriented Systems Development", McGraw Hill Education

References

1. Brahma Dathan, Sarnath Ramnath, "Object Oriented Analysis, Design and Implementation", Universities Press, 2010.

2. Rachita Misra, Chhabi Rani Panigrahi, Bijayalaxmi Panda, “Principles of Software Engineering and System Design”, Yesdee Publishing 2019.
3. https://www.pdfdrive.com/systems-analysis-and-design-an-object-oriented-approach-with-uml-e185445863.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1		3	2		3	2	3	3	3		3	2	1	3		3	3	2
CO2	3	3		3	2	3		3		3				3		2	3	
CO3	2		3	1		3		2	2	3	3		2		2		3	2
CO4	1		3		3			3		2	3					3		3
CO5	3		3		1		3	2		3	1					3		3

Semester	19PCSE309: Mobile Computing	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	Understand the basic concepts of mobile
LO2	Understand and familiar with GPRS Technology
LO3	System be exposed to Ad-Hoc networks
LO4	Gain knowledge about different mobile platforms and application development
LO5	To understand the platforms and protocols used in the mobile environment

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Show how the object-oriented approach differs from the traditional approach to systems analysis and design.
CO2	Analyze, design, document the requirements through use case driven approach.
CO3	Explain the importance of modeling and how the Unified Modeling Language (UML) represents an object-oriented system using a number of modeling views
CO4	Recognize the difference between various object relationships: inheritance, association and aggregation.
CO5	Show the role and function of test cases, testing strategies and test plans in developing object- oriented software

Unit 1- Basics of mobile - Mobile device profiles - Middleware and gateways - Wireless Internet - Smart clients - Three-tier Architecture- Design considerations for mobile computing-– Mobility and Location based services.

Unit -2 - Mobile computing through Internet - Mobile-enabled Applications - Developing Mobile GUIs – VUIs and Mobile Applications – Characteristics and benefits -Multichannel and Multi modal user interfaces – Synchronization and replication of Mobile Data - SMS architecture – GPRS – Mobile Computing through Telephony.

Unit -3 - Mobile Application Development - Android- wi-fi –GPS – Camera – Movement – orientation - event based programming – iOS/ windows CE - Blackberry – windows phone – M-Commerce- structure – pros & cons – Mobile payment system - J2ME

Unit -4 - ADHOC Wireless Network - Ad Hoc Wireless Network –MAC protocol – Routing protocols - Transport Layer Protocol - QoS – Energy Management – application design – work flow – composing applications – Dynamic linking – Intents and Services – Communication via the web.

Unit -5 - Security and Hacking –Password security – Network security – web security – Database security **-** Wireless Sensor Network - Architecture and Design – Medium Access Control – Routing – Transport Layer – Energy model.

Current Streams of thoughts: The growing adoption of smart mobile devices, such as smart phones and tablets, is fundamentally changing the way how business is conducted - The mobile computing paradigm has been used in various contexts, often interchangeably with ubiquitous and pervasive computing - Confusion surrounds how mobile computing should be delimited from these related but conceptually different notions, suitable levels of analysis, and appropriate research methods - to reduce this confusion and to guide future research on mobile computing.

Text Books

1. Jochen Schiller,(2012),*Mobile Communications*, 2nd Ed,
2. William Stallings,(2009), *Wireless & Networks*, Pearson Education.

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References

1. C.Siva Ram Murthy, B.S. Manoj,(2004), *Ad Hoc Wireless Networks – Architectures and Protocols*, Pearson Education ,2ndEd.
2. Ashok K Talukder, Roopa R Yavagal, (2005), *Mobile Computing*, Tata McGraw Hill.
3. Jochen Burkhardt Dr.HorstHenn, Klaus Rintdoff, Thomas Schack, (2009), *Pervasive Computing*, Pearson,.
4. FeiHu ,Xiaojun Cao, (2010), *Wireless Sensor Networks Principles and Practice*, CRC Press,.
5. E-book Link :https://www.pdfdrive.com/mobile-applications-development-with-android-technologies-andalgorithms-d158062290.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3		2		3	2	3	2	3		2	3	1	3			3	2
CO2	1	3		3		1		3		3				2		3	2	
CO3	2		3	1		2		3		2	1		3		3			3
CO4	3		3		1	2	3	1		2	3					2		3
CO5	1		3		2		3	2			3							3

Semester	19PCSE310: Wireless Networks	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To Study about Wireless Networks
LO2	To Study about Fundamentals of 3G Services
LO3	To Study about Evolution of 4G Networks
LO4	Understand the need of usability, evaluation Network Management

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Conversant With The Latest 3G/4G And WiMAX Networks And Its Architecture.
CO2	Design and Implement Wireless Network Environment For Any Application Using Latest Wireless Protocols And Standards.
CO3	Implement Different Type Of Applications For Smart Phones And Mobile Devices With Latest Network Strategies.
CO4	Create fully functional of network management architecture.

Unit 1- Wireless LAN - Introduction-WLAN Technologies: Infrared, UHF Narrowband, Spread Spectrum -IEEE802.11: System Architecture, Protocol Architecture, Physical Layer, MAC Layer,

802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Manager Protocol, Security – IEEE802.16-WIMAX: Physical Layer, MAC, Spectrum Allocation For WIMAX

Unit 2 – Mobile Network Layer - Introduction – Mobile IP: IP Packet Delivery, Agent Discovery, Tunneling And Encapsulation, IPV6-Network Layer In The Internet- Mobile IP Session Initiation Protocol – Mobile Ad-Hoc Network: Routing, Destination Sequence Distance Vector, Dynamic Source Routing.

Unit 3 – Mobile Transport Layer - TCP Enhancements For Wireless Protocols – Traditional TCP: Congestion Control, Fast Retransmit/Fast Recovery, Implications Of Mobility – Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time Out Freezing, Selective Retransmission, Transaction Oriented TCP – TCP Over 3G Wireless Networks.

Unit 4 – Wireless Wide Area Network - Overview Of UTMS Terrestrial Radio Access Network-UMTS Core Network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High Speed Downlink Packet Access (HSDPA)- LTE Network Architecture And Protocol.

Unit 5 -4G Networks - Introduction – 4G Vision – 4G Features And Challenges – Applications Of 4G – 4G Technologies: Multicarrier Modulation, Smart Antenna Techniques, OFDM-MIMO Systems, Adaptive Modulation And Coding With Time Slot Scheduler, Cognitive Radio.

Current Stream of Thoughts:. Network Management Goals and Functions , Network Management Architecture, Simple Network Management Protocol(SNMP), Network Management Tools, Network Management Applications.

Text book

1. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg , “Wireless Communications And Networking”, First Edition, Elsevier 2014.(Unit IV,V)

References

1. Erik Dahlman, Stefan Parkvall, Johan Skold And Per Beming, “3G Evolution HSPA And LTE For Mobile Broadband”, Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy Kuri, “Wireless Networking”, First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, First Edition, Pearson Education 2013.
4. David G. Messerschmitt, “Understanding Networked Applications”, Elsevier, 2010.
5. https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxhd2ttYmNzMm5kfGd4OjU1YjI3YmE0ZTQ3OTliNmI

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1			3		2	3	2	3			3	3	1	3			1	3
CO2	2	3		3		3		3		2		3	3	2		3	2	
CO3	3	2	3	1		3		3		3			1		3			3
CO4			1		3		2		1		2					2		

Semester	19PCSE311: Theory of Computation	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To introduce students to the mathematical foundations of computation including automata theory
LO2	The theory of formal languages and grammars
LO3	The notions of algorithm, decidability, complexity, and computability.
LO4	To understand enhance/develop students' ability
LO5	To enhance/develop students' ability to conduct mathematical proofs for computation and algorithms

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars
CO2	Demonstrate their the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving
CO3	Prove the basic results of the Theory of Computation, state and explain the relevance of the Church-Turing thesis
CO4	Solve computational problems regarding their computability and complexity
CO5	Prove the basic results of the theory of computation

Unit 1 - Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.

Unit 2 - Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

Unit 3 - Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata-Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata.

Unit 4 - Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM. A language that is not Recursively Enumerable (RE).

Unit 5 - An undecidableproblem RE – Undecidable problems about Turing Machine – Post's Correspondence Problem – The classes P and NP.

Textbook

1. Peter Linz, (2005), *An Introduction to Formal Languages and Automata*, 3rd Ed ,Narosa,
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, (2007), *Introduction to Automata Theory, Languages and Computations,* Pearson Education, 2nd Ed.

Reference Books

1. H.R. Lewis and C.H. Papadimitriou,(2003), *Elements of the theory of Computation*, , Pearson Education,2nd Ed.
2. Thomas A. Sudkamp, (2007*), An Introduction to the Theory of Computer Science, Languages and Machines*, Pearson Education, 3rd Ed.
3. Raymond Greenlaw an H.James Hoover, (1998), *Fundamentals of Theory of Computation, Principles and Practice,* Morgan Kaufmann Publishers.
4. Micheal Sipser, (1997), *Introduction of the Theory and Computation*, Thomson Brokecole,.
5. J. Martin, (2007), *Introduction to Languages and the Theory of computation,* Tata McGraw Hill,3rd Ed.
6. E-book Link : https://www.pdfdrive.com/introduction-to-languages-and-the-theory-of-computation-4th-d6565068.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	3			3	3	2	3			3	2		3			1	3
CO2	3	1	3	3		3		1				3	3	2		3	2	
CO3	3	3	3	1		3		2		3	1	3	2		3			
CO4		3		2	3	1		3		2	3		1	3		3	1	
CO5	2		3		3		2	3			3	1		3		3	1	

Semester	19PCSE312: Optimization Techniques	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To understand the concept of optimization
LO2	To develop mathematical model of real life cases
LO3	To study Optimization algorithms.
LO4	To Know the basics of different evolutionary models and algorithms
LO5	To Study different optimization techniques to solve various models

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Describe clearly a problem, identify its parts and analyze the individual functions. Feasibility study for solving an optimization problem.
CO2	Evaluate and measure the performance of an algorithm, Discovery, study and solve optimization problems.
CO3	Understand optimization techniques using algorithms, and Investigate, study, develop, organize and promote innovative solutions for various applications.
CO4	Apply the theoretical concepts of computer Science and practical knowledge in analysis, design, and development of computing systems and applications.
CO5	Applying computer science principles and management practices.

Unit – I - Linear Programming Problem (LPP): Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem. Simplex method, Two phase simplex method

Unit – II - Duality in LPP- dual problem to primal- primal to dual problem-duality simplex method-Revised simplex method-revised simplex algorithm-revised simplex method versus simplex method

Unit – III - Transportation Model: North West corner Method, Least cost method, and vogel's approximation method. Determining Net evaluation-Degeneracy in TP- Assignment Model : Hungarian assignment model – Travelling sales man problem.

Unit – IV - Replacement Problem: Replacement policy for equipment that deteriorate gradually, Replacement of item that fail suddenly-Individual and group replacement, Problems in mortality and staffing.

Unit – V - Project Scheduling PERT/CPM Networks – Fulkerson's Rule – Measure Of Activity – PERT Computation – CPM Computation – Resource Scheduling.

Textbooks

1. Kanti Swarup, P.K. Gupta & Manmohan,(1996), *Operation Research.*
2. S.Kalavathy, *Operations Research*,Vikas Publishing House Pvt.Ltd.,2nd Ed.
3. S.Godfrey Winster, S. Aruna Devi, R.Sujatha, *Compiler Design*, Yesdee Publishing.

References

1. D.Shanthi, N.Uma Maheswari, S.Jeyanthi, *Theory of Computation*, Yesdee Publishing.
2. John W.Chinneck, (2015), *Feasibility and Infeasibility in Optimization-Algorithms and Computatonal Methods*, Springer.
3. Ebook link: https://www.pdfdrive.com/introduction-to-languages-and-the-theory-of-computation-4th-d6565068.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	2			3	2			1	3	3	3		2			2	3
CO2	3	3	3	1		3		3		3	1	3	3	2		1	3	
CO3		3		1		3		2		3	3	3	3		2	3	1	2
CO4		3				3		3		2	1	3	3	2		3	1	
CO5	3		3					2		3		1	3	2		3		3

Semester	19PCSE313: Embedded Systems	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system
LO2	Describe the hardware software co-design and firmware design approaches
LO3	Know the RTOS internals, multitasking, task scheduling, task communication and synchronization
LO4	Learn the development life cycle of embedded system
LO5	To understand embedded-system programming and apply that knowledge to design and develop embedded solutions

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
CO2	Become aware of interrupts, hyper threading and software optimization.
CO3	Design real time embedded systems using the concepts of RTOS.
CO4	Develop programming skills in embedded systems for various applications.
CO5	Acquire knowledge about Life cycle of embedded design and its testing.

Unit I - Introduction to Embedded system - Embedded system Vs General computing systems - History - Classification - Major Application Areas - Purpose of Embedded systems - Smart running shoes: The innovative bonding of lifestyle with embedded technology. Characteristics and Quality Attributes of Embedded systems.

Unit II - Elements of an Embedded system - core of the embedded system: General purpose and domain specific processors, ASICs, PLDs, COTS - Memory - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces - Embedded Firmware - Reset circuit, Brown-out protection circuit, Oscillator unit, Real-time clock, and Watchdog timer - PCB and Passive Components.

Unit III - Embedded Systems - Washing machine: Application-specific - Automotive: Domain specific. Hardware Software Co-Design - Computational Models - Embedded Firmware Design Approaches - Embedded Firmware Development Languages - Integration and testing of Embedded Hardware and firmware.

Unit IV - RTOS based Embedded System Design: Operating System Basics - Types of operating Systems - Tasks, process and Threads - Multiprocessing and Multitasking - Task Scheduling- Task Communication - Task Synchronisation - Device Drivers - choosing an RTOS.

Unit V - Components in embedded system development environment, Files generated during compilation, simulators, emulators and debugging - Objectives of Embedded product Development Life Cycle - Different Phases of EDLC - EDLC Approaches - Trends in Embedded Industry - Case Study: Digital Clock.

Current Streams of thought: Latest Technology in Embedded System and Applications Embedded system and applications are severely increased -The latest technology in Embedded System and Applications such as - Artificial Intelligence- Augmented Reality and Virtual Reality-

Text Book

1. K. V. Shibu, (2009), *Introduction to embedded systems*, TMH education Pvt.Ltd..

Reference Books

1. Raj Kamal, (2009), *Embedded Systems: Architecture, Programming and Design*, TMH. 2nd Ed.
2. Frank Vahid, Tony Givargis, (2006), *Embedded System Design*, John Wiley,3rd Ed.

3. Cliff Young, Faraboschi Paolo, and Joseph A. Fisher, (2005), *Embedded Computing: A VLIW Approach to Architecture, Compilers and Tools*, Morgan Kaufmann Publishers, An imprint of Elsevier,.
4. David E. Simon,(1999), *An Embedded Software Primer,* Pearson Education,
5. Lee and Seshia – *Introduction to Embedded systems,* ebook link- https://www.pdfdrive.com/embedded-systems-lee-and-seshia-introduction-to-embedded-d6263456.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	2			3		2	3	1	3	2	3		3			1	3
CO2	3	1	3	3		2		3		3			3	2		3	1	
CO3		3		1		2		3		2	3	3	1		3	2	1	3
CO4	3	3		1		2		3	1	2	3	3	1	2	3			3
CO5	3	2	1	3			2	3			3	3	1		3	2	1	

Semester	19PCSE314: WAP and XML	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	The purpose of the course is to impart knowledge on eXtensible Markup Language (XML)
LO2	To achieve secured, messaging through web services
LO3	Understand the need of usability of WML and WML script.
LO4	The purpose of the course is to impart knowledge on eXtensible Markup Language (XML) and to achieve secured, messaging through web services

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Apply XML concepts to develop Web application.
CO2	Develop SOA application using XML and Web Services.
CO3	Extract information from the web sites using XML programming.
CO4	Create fully functional of WAP architecture.

Unit I - Overview of WAP: WAP and the wireless world – WAP application architecture – WAP internal structure – WAP versus the Web – WAP 1.2 – WTA and push features. Setting up WAP: Available software products – WAP resources – The Development Toolkits.

Unit II - WAP gateways: Definition – Functionality of a WAP gateway – The Web model versus the WAP model – Positioning of a WAP gateway in the network – Selecting a WAP gateway Basic WML: Extensible markup language – WML structure – A basic WML card – Text formatting – navigation – Advanced display features.

Unit III - Interacting with the user: Making a selection – Events – Variables – Input and parameter passing. WML Script: Need for WML script – Lexical Structure – Variables and literals – Operators – Automatic data type conversion – Control Constructs Functions – Using the standard libraries – programs – Dealing with Errors.

Unit IV - XML: Introduction XML: An Eagle's Eye view of XML – XML Definition – List of an XML Document – Related Technologies – An introduction to XML Applications – XML Applications – XML for XML – First XML Documents Structuring Data: Examining the Data XMLizing the data – The advantages of the XML format – Preparing a style sheet for Document Display.

Unit V - Attributes, Empty Tags and XSL: Attributes – Attributes Versus Elements – Empty Tags – XSL – Well formed XML documents – Foreign Languages and Non Roman Text – Non Roman Scripts on the Web Scripts, Character sets, Fonts and Glyphs – Legacy character sets– The Unicode Character set – Procedure to Write XML Unicode.

Current Stream of Thoughts:. XSLT introduction – XSLT elements and Attributes – XSLT conditional processing - XPATH- XPATH Expression - XSL-FO.

Text Books

1. For Unit I, II, III - Charles Arehart and Others, (2000) "Professional WAP with WML, WML script, ASP, JSP, XML, XSLT, WTA Push and Voice XML" Shroff Publishers and Distributers Pvt. Ltd
2. For Unit IV & V -liotte Rusty Harlod, (2000) ,"XML TM Bible", Books India (P) Ltd.

References

1. Heather Williamson, "XML: The Complete Reference ",Tata McGraw-Hill Education India.
2. Ebook : https://www.cse.iitb.ac.in/~sri/talks/wap01.pdf
3. Ebook: https://faculty.kfupm.edu.sa/ics/adam/ICS541/L03-xml-basics.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	2		3	1		2	3	3	2	3	3		3			2	3
CO2	3	1	3	3		3		3		2	3	3	2	3		2	3	
CO3		3		1		3		2		3	2	2	3		2	3	2	3
CO4	1		2		3		3		2						1			2

Semester	19PCSE402: Statistical Computing	L	T	P	C
IV		3	0	0	3

Learning Objectives (LO):

LO1	To understand the applications of various correlation methods
LO2	To understand the Regression Analysis
LO3	To study and model the sampling concept
LO4	To study Probability Distribution and mathematical Expectation
LO5	To acquire knowledge on Hypotheses test

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Acquire the basic concepts in mathematical logic and theory of inferences.
CO2	Data analytics from a database formed from the real world problem.
CO3	Predict the exact reason for the real time issues.
CO4	Develop mathematical thinking
CO5	Apply mathematical knowledge and be able to solve mathematical problems using technology

Unit-I - Correlation - Definition of Correlation- Scatter Diagram- Kari Pearson's Coefficient of Linear Correlation- Coefficient of Correlation and Probable Error of r- Coefficient of Determination **-** Merits and Limitations of Coefficient of Correlation- Spearman's Rank Correlation

Unit-II - Regression Analysis - Regression and Correlation(Intro)- Difference between Correlation and Regression Analysis- Linear Regression Equations -Least Square Method- Regression Lines- Properties of Regression Coefficients- Standard Error of Estimate.

Unit-III - Probability Distribution and mathematical Expectation- Random Variable- Defined - Probability Distribution a Random Variable- Expectation of Random Variable- Properties of Expected Value and Variance.

Unit-IV - Sampling and Sampling Distributions - Data Collection- Sampling and Non-Sampling Errors – Principles of Sampling-- Merits and Limitations of Sampling- Methods of Sampling- Parameter and Statistic- Sampling Distribution of a Statistic- Examples of Sampling Distributions- Standard Normal, Student's *t,* Chi-Square (x^2) and Snedecor's F- Distributions.

Unit-V- Statistical Inference- Estimation and Testing of Hypothesis - Statistical Inference- Estimation- Point and interval- Confidence interval using normal, *t* and x^2Distributions- Testing of Hypothesis- Significance of a mean - Using *t* Distribution.

Textbook

1. K.L. Sehgal, (2011), *Quantitative Techniques and Statistics*, Himalaya Publishing House, 1st Ed.

References

1. N. P. Bali, P. N. Gupta, C. P. Gandhi, (2008), *A Textbook of Quantitative Techniques*, Laxmi Publications, 1st Ed.
2. U. K. Srivastava, G. V. Shenoy, S. C. Sharma,(2005),*Quantitative Techniques for Managerial Decisions*, New Age International Publishers, 2nd Ed.
3. David Makinson, (2011), *Sets, Logic and Maths for Computing*, Springer,.
4. Christopher Chatfield, (, 2015), *Statistics for Technology- A Course in Applied Statistics*,, CRC Press, 3rd Ed.
5. Ebook Link: https://www.pdfdrive.com/probability-and-statistics-for-computer-scientists-d33435043.html

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
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CO2	3	2	1	3		2		3		3		3		3		3	2	
CO3		3		3	2	3		2		1	3	3	2		3	1	2	3
CO4	3		1	3	2	3	1	3		1	3		2	3				3
CO5	1	2		3		2	1	3			3			3	3	1		3

Semester	19PCSE403: Soft Computing	L	T	P	C
IV		3	0	0	3

Learning Objectives (LO):

LO1	To develop the skills to gain a basic understanding of neural network theory
LO2	Introduce students to fuzzy systems, fuzzy logic and its applications.
LO3	Introduce students to artificial neural networks and fuzzy theory from an engineering perspective
LO4	To improve skills in genetic algorithms, machine learning, and expert systems
LO5	Introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world problems.

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
CO2	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.
CO3	To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations.
CO4	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
CO5	Reveal different applications of these models to solve engineering and other problems.

UNIT I - Introduction: Soft Computing Constituents – Soft Computing Vs Hard Computing – Characteristics - Applications - Artificial Neural Network (ANN): Fundamental Concept – Application Scope - Basic Terminologies – Neural Network Architecture – Learning Process – Basic Models of ANN: McCulloch-Pitts Model – Hebb Network – Linear Separability.

UNIT II - Supervised Learning Networks: Perceptron Networks – Adaline and Madaline Networks – Back Propagation Network – Radial Basis Function Network. Associative Memory Networks – BAM - Hopfield Network - Boltzmann Machine. Unsupervised Learning Networks: Kohonen Self Organizing Network – Counter Propagation Network – ART Network.

UNIT III - Fuzzy Sets: Basic Concept – Crisp Set Vs Fuzzy Set - Operations on Fuzzy Set – Properties of Fuzzy Sets – Fuzzy Relations: Concept – Fuzzy Composition – Fuzzy Equivalence and Tolerance Relation - Membership Functions: Features – Fuzzification – Methods of Membership value assignments – Defuzzification – Methods.

UNIT IV - Fuzzy Arithmetic – Extension Principle – Fuzzy Measures – Fuzzy Rules and Fuzzy Reasoning: Fuzzy Propositions – Formation of Rules – Decomposition of Rules – Aggregation of Rules – Approximate Reasoning – Fuzzy Inference and Expert Systems – Fuzzy Decision Making – Fuzzy Logic Control Systems.

UNIT V - Genetic Algorithm: Fundamental Concept – Basic Terminologies – Traditional Vs Genetic Algorithm - Elements of GA - Encoding - Fitness Function – Genetic Operators: Selection – Cross Over - Inversion and Deletion - Mutation – Simple and General GA – The Schema Theorem - Classification of Genetic Algorithm – Genetic Programming – Applications of GA.

Current Streams of thought: Perception-based modeling - Integrated systems - Universal role of intelligent agents - Swarm intelligence-based process control

Text Book

1. S.N. Sivanandam, S.N. Deepa, (2007), *Principles of Soft Computing*, Wiley India, 3rd Edition.

Reference Books

1. S. Rajasekaran, G.A.V. Pai, (2004), *Neural Networks, Fuzzy Logic, Genetic Algorithms*, Prentice Hall India, 1st Edition.
2. Snehashish Chakraverty, Deepti Moyi Sahoo, Nisha Rani Mahato, (2019), *Concepts of Soft Computing*, Springer, 1st Edition.
3. Ebook: https://go-pdf.online/neural-network-by-vijayalakshmi-pai.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3		2	3	2		3	3		2	3	1		3			3	3
CO2	3	2	1	3		2				3		3		2		3	3	
CO3		3		3		3		1		3		2	3		2		3	2
CO4		3		2	1	3		2		3	2	3	3		2	2	3	3
CO5	3	3	1	2	3	3		1		3	3	2	3		2	2	3	3

Semester	19PCSE404: Data Mining	L	T	P	C
IV		3	0	0	3

Learning Objectives (LO):

LO1	To identify the scope and necessity of Data Mining & Warehousing.
LO2	To understand various tools of Data Mining
LO3	To develop ability to design various algorithms based on data mining tools.
LO4	Gain knowledge on Clustering Techniques.
LO5	To design Data Warehousing system for an enterprise

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Understand the basic data mining concepts for solving real world problems.
CO2	Understand the concepts of data warehousing.
CO3	Student will get knowledge of analyze the feasibility of data mining solution.
CO4	Understand the statistical to evaluate the results of data mining models.
CO5	Gain knowledge on develop data mining web application to solve problems.

Unit I - Data Mining And Data Preprocessing: Data Mining – Motivation – Definition – Data Mining on Kind of Data –Functionalities – Classification – Data Mining Task Primitives – Major Issues in Data Mining – Data Preprocessing – Definition – Data Clearing – Integration and Transformation – Data Reduction.

Unit II - Data Warehousing: Multidimensional Data Model –Data Warehouse Architecture – Data Warehouse Implementation –From data Warehousing to Data Mining – On Line Analytical Processing - On Line Analytical Mining.

Unit III - Frequent Patterns, Associations And Classification: The Apriori Algorithm – Definition of Classification and Prediction – Classification by Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Lazy Learners – K-Nearest Neighbor – Other Classification Methods.

Unit IV - Cluster Analysis: Definition – Types of data in Cluster Analysis – Categorization of major Clustering Techniques – Partitioning Methods – Hierarchical Clustering – BIRCH - ROCK – Grid Based Methods – Model Based Clustering Methods – Outlier Analysis.

Unit V - Spatial, Multimedia, Text And Web Data: Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web – Data Mining Applications – Trends in Data Mining.

Current Streams of thought: Web Mining, Terminologies, Categories of Web Mining – Web Content Mining, Web Structure Mining, Web Usage Mining, Applications of Web Mining, and Agent based and Data base approaches, Web mining Software.

Text Book

1. Ian H. Witten, Eibe Frank, Mark A. Hall(2014), “Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier; Third edition.

References

1. Pang-Ning Tan, Michael Steinbach, VipinKumar(2016), “Introduction to Data Mining- Instructor’s Solution Manual”, Pearson Education, First Edition.
2. Mohammed J.Zaki, Wagner MeiraJR(2016), “Data Mining and Analysis: Fundamental Concepts and Algorithms”, Cambridge India.
3. https://textbooks.elsevier.com/manualsprotectedtextbooks/9780123814791/Instructor's_manual.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
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CO2	3	3	3	2		3		2	3	1		3		3		2	3	
CO3		3		2		3		2		3		3	3		1		3	3
CO4		3		3		3		2		3	2		3		2	2	3	1
CO5	3	3	3		2	3		1		3	2	3	2		2			3

Semester	19PCSE405: Cloud Computing	L	T	P	C
IV		3	0	0	3

Learning Objectives (LO):

LO1	To provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts
LO2	To provide students with the fundamentals and essentials of Cloud Computing
LO3	To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios
LO4	To enable students exploring some important cloud computing driven commercial systems and applications
LO5	To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Apply different cloud programming model as per need.
CO2	Introduce the broad perceptive of cloud architecture.
CO3	Learn the economics of outsourcing IT to the Cloud.
CO4	Explore some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.
CO5	Learn how DNS works, and how it can be used for service discovery using cloud.

UNIT – I- Computing Basics - Cloud computing definition- Characteristics- Benefit-Challenges- Distributed Systems- Virtualization-Service-oriented computing- Utility-oriented computing- Building Cloud Computing environments- computing platforms & technologies - Cloud Models – Cloud Service Examples - Cloud Based Services & Applications - Cloud concepts and Technologies.

UNIT– II – Virtualization, Cloud Services and Platforms- Virtualization: Virtualization- Characteristics- taxonomy-types- Pros and Cons- Examples Architecture: Reference model- types of clouds- Compute Service - Storage Services - Cloud Database Services - Application

Services - Content Delivery Services - Analytics Services - Deployment And Management Service - Identity And Access Management Services - Open Source Private Cloud Software.

UNIT – III-Cloud Application Design and Development - Design consideration- Reference Architecture for Cloud Application - Cloud Application Design Methodologies - Data Storage Approaches- Development in Python: Design Approaches – Application: Image Processing - Document Storage - Map Reduce - Social Media Analytics.

UNIT – IV- Python for Cloud - Introduction- Installing Python- Data types & Data Structures- Control Flow- Functions- Modules- Packages- File Handling-Date/Time Operations – Classes- Python for Cloud: Amazon Web Services –Google Cloud Platform - Windows Azure –Map Reduced –Packages of Interest – Designing a Restful Web API.

UNIT – V- Big Data Analytics, Multimedia Cloud & Cloud Security - Big Data Analytics: Clustering Big data - Classification of Big Data – Recommendation systems. Multimedia Cloud: Case Study: Live Video Stream App - Streaming Protocols – Case Study: Video Transcoding App-Cloud Security: CSA Cloud Security Architecture - Authentication - Authorization - Identity and Access management - Data Security - Key Management- Auditing- Cloud for Industry, Healthcare & Education.

Current Streams of thought: Serverless Computing - Omni-Cloud - Quantum Computing - Kubernetes - Digital Natives

Text Books

1. Buyya, Vecciola and Selvi, (2013), *Mastering Cloud Computing: Foundations and Applications Programming*, Tata McGraw Hill, 1st Edition.
2. ArshdeepBahga, Vijay Madisetti, (2016), *Cloud Computing: A Hands – On Approach,* Universities press (India) Pvt. limited, 2nd Edition.

References

1. Rittinghouse and Ransome, (2016), *Cloud Computing: Implementation, Management, and Security*, CRC Press, 1st Edition.
2. Michael Miller, (2008), *Cloud Computing Web based application that change the way you work and collaborate online,* Pearson Education, 1st Edition.
3. Kris Jamsa, (2012), *Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More*, Jones & Bartlett Learning, 1st Edition.
4. Ebook: https://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
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CO2	1	3	2	3		2		3	3	3		1		3		2	3	
CO3		3		3				3		2		3	3				2	3
CO4		3		3		3		1			3		3		2	3		3
CO5	3	2	3	2	3		3	3	2	3	2	3			2			3

Semester	19PCSE406: Data Science and Big Data Analytics	L	T	P	C
IV		3	0	0	3

Learning Objectives (LO):

LO1	The course provides grounding in basic and advanced methods to big data technology and tools
LO2	To understand Basic Data Analytic Methods Using R
LO3	To study Advanced Analytical Theory and Methods
LO4	Study and analyse different classifications with examples
LO5	The Study including Map Reduce and Hadoop and its ecosystem

Course Outcomes (CO):

At the end of the course, the student will be able to

CO1	Apply Hadoop eco system components.
CO2	Participate data science and big data analytics projects.
CO3	Identify the characteristics of datasets for various applications.
CO4	Select environment for the applications.
CO5	Solve problems associated with big data characteristics.

Unit I :Introduction to Big Data Analytics : Big Data Overview – Data Structures – Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – Big Data Ecosystem - Data Ana lytics Lifecycle – Data Discovery – Data Preparation – Model Planning – Model Building – Communicate Results – Operationalize.

Unit II :Basic Data Analytic Methods Using R : Introduction to R programming – R Graphical User Interfaces – Data Import and Export – Attribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables Data Exploration Versus Presentation — Statistical Methods of Evaluation : Hypothesis Testing – Difference of Means – Wilcoxon Rank-Sum Test – Type I and Type II Errors – Power and Sample Size – ANOVA.

Unit III :Advanced Analytical Theory and Methods: Clustering – K Means – Use Cases – Overview – Determining number of clusters – Diagnostics – Reasons to choose and cautions – Additional Algorithms - Association Rules : A Priori Algorithm – Evaluation of Candidate Rules – Applications of Association Rules – Validation and Testing – Diagnostics. Regression : Linear Regression and Logistic Regression :– Use cases – Model Description – Diagnostics - Additional Regression Models.

Unit IV :Classification : Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Naive Bayes – Bayes Theorem – Naïve Bayes Classifier – Smoothing – Diagnostics – Naïve Bayes in R – Diagnostics of

Classifiers – Additional Classification Methods - Time Series Analysis : : Overview – Box – Jenkins Methodology – ARIMA Model – Autocorrelation Function – Autoregressive Models – Moving Average Models – ARMA and ARIMA Models – Building and Evaluating and ARIMA Model - Text Analysis : Text Analysis Steps – Example – Collecting – Representing Term Frequency – Categorizing – Determining Sentiments – Gaining Insights.

Unit V :Advanced Analytics-Technology and Tools: Map Reduce and Hadoop : Analytics for Unstructured Data .- *Use Cases* - *Map Reduce* - Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase – Manout – NoSQL - Tools in Database Analytics : SQL Essentials – Joins – Set operations – Grouping Extensions – In Database Text Analysis - Advanced SQL – Windows Functions – User Defined Functions and Aggregates – ordered aggregates- MADiib - Analytics Reports Consolidation – Communicating and operationalizing and Analytics Project – Creating the Final Deliverables : Developing Core Material for Multiple Audiences – Project Goals – Main Findings – Approach Model Description – Key points support with Data - Model details – Recommendations – Data Visualization.

Current Streams of thought: Data volumes will continue to increase and migrate to the cloud - The majority of big data experts agree that the amount of generated data will be growing exponentially in the future - Fast data and actionable data will come to the forefront - Deep and Machine learning will continue to change the landscape of Data Science and Big Data Analytics.

Text Book

1. EMC Education Services,(2015),*Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data*, John Wiley & Sons, Inc.

Reference Books

1. Noreen Burlingame ,(2012), *The little book on Big Data*, New Street publishers,.

2. Anil Maheshwari, (2017), *Data Analytics*, McGraw Hill Education,.

3. Norman Matloff,,(2011), *The Art of R Programming: A Tour of Statistical Software Design*, No Starch Press,1st Ed.

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Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1		3	2	3	1		3	3		3	2	3		2			3	3
CO2	3		3	1		3		3		3		2		3		2	3	
CO3		3		2	3	3	1			3		3					3	
CO4		3		2		3		1			3		3		2			3
CO5	1	3	2	3	3					2	3	3			2			3