ANNAMALAI UNIVERSITY

FACULTY OF SCIENCE

DIVISION OF COMPUTER & INFORMATION SCIENCE

M.Sc. Computer Science
(2- Year)

Programme Code : SCIS21

Handbook

2019-2020

ANNAMALAI UNIVERSITY

FACULTY OF SCIENCE

DIVISION OF COMPUTER & INFORMATION SCIENCE

REGULATIONS FOR THE TWO-YEAR POST GRADUATE PROGRAMMES UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

These Regulations are common to all the students admitted to the Two-Year Master's Programmes in the Faculties of Arts, Science, Indian Languages, Education, Marine Sciences, and Fine Arts from the academic year 2019-2020 onwards.

1. Definitions and Nomenclature

1.1 University refers to Annamalai University.

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

1.3 Discipline refers to the specialization or branch of knowledge taught and researched in higher education. For example, Botany is a discipline in the Natural 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.A., M.Sc.

1.5 Course is an individual subject in a programme. Each course may consist of Lectures/Tutorials/Laboratory work/Seminar/Project work/Experiential learning/ Report writing/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. Each academic year is divided into two semesters.

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 also known as Course Objectives are statements that define the expected goal of a course in terms of demonstrable skills or knowledge that will be acquired by a student as a result of instruction.

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. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.

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

2.1 The Department of Computer and Information Science offers a **Two Year M.Sc. 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.

2.2 Reservation of seats for candidates belonging to ST/SCA/SC/MBC/DNC/BC/BC (Muslim) communities and Differently-abled will be made as per the rules and regulations of the Government of Tamil Nadu.

2.3 In the case of SC/ST and Differently - abled candidates, a pass is the minimum qualification for all the above Programmes.

3. Programme Duration

3.1 The Two Year Master's Programmes consist of two academic years.

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

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

4. Programme Structure

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

4.2 Core courses

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

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

4.3 Elective courses

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

4.3.2 **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.

4.3.3 Students shall take a combination of both DEs and IDEs.

4.4 Experiential Learning

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

4.4.2 In-plant training/field trips/internships/industrial visits (as applicable) fall under this category.

4.4.3 Experiential learning is categorized as Core.

4.5 Project

4.5.1 Each student shall undertake a Project in the final semester. The Head of the Department shall assign a Research Supervisor to the student.

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

4.5.3 Students who wish to undertake project work in recognised institutions/industry shall obtain prior permission from the University. The Research Supervisor will be from the host institute, while the Co-Supervisor shall be a faculty in the parent department.

4.6 Value added Courses (VACs)

4.6.1 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.

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

4.6.3 Each VAC carries 2 credits with 30 hours of instruction, of which 60% (18 hours) shall be Theory and 40% (12 hours) Practical.

4.6.4 Classes for a VAC are conducted beyond the regular class hours and preferably in the II and III Semesters.

4.7 Online Courses

4.7.1 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.

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

4.8 Credit Distribution

The credit distribution is organised as follows:

	Credits
Core Courses	65-75
Elective Courses	15
Project	6-8
Total (Minimum requirement for award of Degree)	**90-95***

**Each Department shall fix the minimum required credits for award of the Degree within the prescribed range of 90-95 credits.*

4.9 Credit Hours

Each course is assigned credits and credit hours on the following basis:
1 Credit is defined as
1 Lecture period of one hour per week over a semester
1 Tutorial period of one hour per week over a semester
1 Practical/Project period of two or three hours (depending on the discipline) per week over a semester.

5 Attendance

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

5.2 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 organisation of lesson plan of the Course Instructor.

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

5.4 At the end of the semester, the record shall be duly signed by the Course Instructor and the Head of the Department and placed in safe custody for any future verification.

5.5 The Course Instructor 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.

5.6 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.

5.7 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.

6 Mentor-Mentee System

6.1 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.

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

6.3 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.

7 Examinations

7.1 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).

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

7.3 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.

7.4 Continuous Internal Assessment Tests

7.4.1 The CIA Tests shall be a combination of a variety of tools such as class tests, assignments, seminars, and viva-voce that would be suitable to the course. This requires an element of openness.

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

7.4.3 The pattern of question paper will be decided by the respective faculty.

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

7.4.5 CIA Tests will be for two to three hours duration depending on the quantum of syllabus.

7.4.6 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.

7.5 End Semester Examinations (ESE)

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

7.5.2 A candidate who does not pass the examination in any course(s) of the first, second and third semesters will be permitted to reappear in such course(s) that will be held in April and November in the subsequent semester/year.

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

8 Evaluation

8.1 Marks Distribution

8.1.1. Each course, both Theory and Practical as well as Project/Internship/Field work/In-plant training shall be evaluated for a maximum of 100 marks.

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

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

8.2. Assessment of CIA Tests

8.2.1 For the CIA Tests, the assessment will be done by the Course Instructor

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

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

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

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

8.3 Assessment of End-Semester Examinations

8.3.1 Evaluation for the ESE is done by both External and Internal examiners (Double Evaluation).

8.3.2 In case of a discrepancy of more than 10% between the two examiners in awarding marks, third evaluation will be resorted to.

8.4 Assessment of Project/Dissertation

8.4.1 The Project Report/Dissertation shall be submitted as per the guidelines laid down by the University.

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

8.4.3 CIA for Project will consist of a Review of literature survey, experimentation/field work, attendance etc.

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

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

8.4.6 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

8.5 Assessment of Value-added Courses

8.5.1 Assessment of VACs shall be internal.
8.5.2 Two CIA Tests shall be conducted during the semester by the Department(s) offering VAC.
8.5.3 A committee consisting of the Head of the Department, faculty handling the course and a senior faculty member shall monitor the evaluation process.
8.5.4 The grades obtained in VACs will not be included for calculating the GPA.

8.6 Passing Minimum

8.6.1 A minimum of 50% marks in each course is prescribed for a pass.

8.6.2 While a minimum of 40% marks in each course is essential for the End Semester Examinations, there is no passing minimum for CIA Tests.

8.6.3 A student is declared to have passed in each course if he/she secures not less than 40% marks in the End Semester Examination and not less than 50% marks in aggregate taking CIA and End Semester Examination marks together.

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

9. 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.

10 Marks and Grading

10.1 The performance of students in each course is evaluated in terms Grade Point (GP).
10.2 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 from the first semester to the current semester.

10.3 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.

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

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

where, $\boldsymbol{C_i}$ 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.

$\boldsymbol{m}$ is the number of semesters

10.4 Evaluation of the performance of the student will be rated as shown in the Table.

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

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

10.5.1 For **First Class with Distinction:** Candidates who have passed all the courses prescribed in the Programme *in the first attempt* with a CGPA of 8.25 or 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*).

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

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

10.5.4 Candidates who obtain highest marks in all examinations at the first appearance alone will be considered for University Rank.

10.6 Course-Wise Letter Grades

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

10.6.2 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.

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

10.6.4 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.

10.6.5 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.

11. Provision for Withdrawal from the End Semester Examination

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

11.2 A candidate is permitted to withdraw from appearing for the ESE for valid reasons. However, such permission is granted only once during the entire duration of the programme.

11.3 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.

11.4 Withdrawal is not granted for arrear examinations of courses in previous semesters and for the final semester examinations.

11.5 Candidates who have been granted permission to withdraw from the examination shall reappear for the courses in the subsequent semester/year.

11.6 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.

12 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 sensitised on issues of academic integrity and ethics.

13.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.

14. *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.*

Programme Structure
(For students admitted from the academic year 2019-2020)

Course Code	Course Title	Hours/ Week		C	Marks		
		L	P		CIA	ESE	Total
Semester-I							
19PCSC101	Core 1: Design and Analysis of Algorithms	4		5	25	75	100
19PCSC102	Core 2: Advanced Web Technology	4		5	25	75	100
19PCSC103	Core 3: Compiler Design	4		5	25	75	100
19PCSC104	Core 4: Advanced Java Programming	4		5	25	75	100
19PCSP105	Core 5: Practical – I		2	2	25	75	100
19PCSP106	Core 6: Practical - II		2	2	40	60	100
	Elective 1: Interdepartmental Elective	3		3	40	60	100
				27			
Semester-II							
19PCSC201	Core 7: Distributed Operating System	4		5	25	75	100
19PCSC202	Core 8: Dot Net Programming	4		5	25	75	100
19PCSC203	Core 9: Cryptography and Network Security	4		5	25	75	100
19PCSC204	Core 10: Advanced Database Management System	4		5	25	75	100
19PCSP205	Core 11: Practical - III	2		2	25	75	100
19PCSP206	Core 12: Practical - IV	2		2	40	60	100
	Elective 2: Interdepartmental Elective		3	3	40	60	100
				27			
Semester-III							
19PCSC301	Core 13: Digital Image Processing	4		5	25	75	100
19PCSC302	Core 14: Internet of Things	4		5	25	75	100
19PCSC303	Core 15: Machine Learning	4		5	25	75	100
19PCSP304	Core 16: Practical - V	2		2	25	75	100
19PCSP305	Core 17: Practical - VI	2		2	25	75	100
	Elective 3: Department Elective	3		3	40	60	100
	Elective 4: Department Elective	3		3	40	60	100
				25			
Semester-IV							
19PCSC401	Core 18: Software Project Management	5		5	25	75	100
19PCSP402	Dissertation and Viva Voce/In plant training	3		6	25	75	100
	Elective 5: Department Elective	3		3	25	75	100
				14			
	Total Credits			**93**			
	Value Added Courses						

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

Note:

1. **Students shall take both Department Electives (DEs) and Interdepartmental Electives (IDEs) from a range of choices available.**
2. **Students may opt for any Value-added Courses listed in the University website.**

Department Elective Courses

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

Inter Department Elective Courses

S. No	Course Code	Course Title	Department	L	P	Credits	Marks		
				Hrs			CIA	ESE	Total
1.	19SOSE107.1	Soft Skills	**English**	3	0	3	25	75	100
2.	19MATE207.1	Discrete Mathematics	**Mathematics**	3	0	3	25	75	100
3.	19MATE207.2	Numerical Methods		3	0	3	25	75	100
4.	19MATE207.3	Differential Equations		3	0	3	25	75	100
5.	19STSE207.4	Statistical Methods	**Statistics**	3	0	3	25	75	100
6.	19STSE207.5	Mathematical Statistics		3	0	3	25	75	100
7.	19STSE207.6	Bio-Statistics		3	0	3	25	75	100
8.	19PHYE207.7	Classical Mechanics and Special Theory of Relativity	**Physics**	3	0	3	25	75	100
9.	19PHYE207.8	Physics of the Earth		3	0	3	25	75	100
10.	19PHYE207.9	Bio-Medical Instrumentation		3	0	3	25	75	100
11.	19PHYE207.10	Energy Physics		3	0	3	25	75	100
12.	19BOTE207.11	Plant Tissue Culture	**Botany**	3	0	3	25	75	100
13.	19BOTE207.12	Plant Science – I		3	0	3	25	75	100
14.	19BOTE207.13	Gardening and		3	0	3	25	75	100

		Horticulture							
15.	19BOTE207.14	Plant Science – II		3	0	3	25	75	100
16.	19ZOOE207.15	Animal Culture Techniques	**Zoology**	3	0	3	25	75	100
17.	19ZOOE207.16	Environmental Science		3	0	3	25	75	100
18.	19GEOE207.17	Environmental Geosciences	**Earth Sciences**	3	0	3	25	75	100
19.	19GEOE207.18	Applied Geophysics		3	0	3	25	75	100
20.	19BIOE207.19	Basic Biochemistry	**Biochemistry & Biotechnology**	3	0	3	25	75	100
21.	19BIOE207.20	Basic Biotechnology		3	0	3	25	75	100
22.	19BIOE207.21	Biochemical Techniques		3	0	3	25	75	100
23.	19BIOE207.22	Immunology		3	0	3	25	75	100
24.	19MIBE207.23	Microbiology	**Microbiology**	3	0	3	25	75	100

Electives Offered to Other Departments

S. No.	Course Code	Course Title	Hours/week		C	Marks		
			L	P		CIA	ESE	Total
1.	19CSE215.1	R Programming	3	0	3	25	75	100

Value Added Course

S. No.	Course Code	Course Title	Hours /week		C	Marks		
			L	P		CIA	ESE	Total
1.	CISA215	Web Development	3		0	25	75	100
2.	CISA415	Advanced Web Development	3		0	25	75	100

Programme Outcomes

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

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 life long 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-I 19PCSC101: Design and Analysis of Algorithms Credits: 5
Hours: 4

Learning Objectives (LO):

To learn effective problem solving in Computing applications and analyze the algorithmic procedure to determine the computational complexity of algorithms.

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 searchhod - 0/1 Knapsack Problem.

Text Book

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009.

References

1. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcropft, Ullman , LPE
3. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem- TMH.
4. Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen, "Evolutionary Algorithms for Solving Multi-Objective Problems", Springer 2nd Edition, 2007.

Course Outcomes

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.

Outcome Mapping

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

Semester-I 19PCSC102: Advanced Web Technology **Credits: 5**
Hours: 4

Learning Objectives (LO):

- Explore the backbone of web page creation by developing .NET skill.
- Enrich knowledge about HTML control and web control classes
- Provide depth knowledge about ADO.NET
- Understand the need of usability, evaluation methods for web services.

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 PostBack 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 TerraService.

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.

Text Book

1. Mathew Mac Donald, “ASP.NET Complete Reference”, TMH 2005.

References

1. Crouch Matt J, “ASP.NET and VB.NET Web Programming”, Addison Wesley 2002.

2. J.Liberty, D.Hurwitz, "Programming ASP.NET", Third Edition, O'REILLY, 2006.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

Semester-I 19PCSC103: Compiler Design **Credits: 5**
Hours : 4

Learning Objectives (LO):

- Discover principles, algorithms and techniques that can be used to construct various phases of compiler.
- Acquire knowledge about finite automata and regular expressions
- Learn context free grammars, compiler parsing techniques.
- Explore knowledge about Syntax Directed definitions and translation scheme
- Understand intermediate machine representations and actual code generation

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, "Compilers-Principles, Techniques and Tools", Second Edition, Pearson Education Asia, 2009.

References

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools, Addison- Wesley, 2003.
2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.
3. Kennath C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.
5. S.Godfrey Winster, S.Aruna Devi, R.Sujatha, "Compiler Design", yesdee Publishers, Third Reprint 2019.

Course Outcomes

On successful completion of the course, the students 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: Learn the new code optimization techniques to improve the performance of a program in terms of speed & space.

Outcome Mapping

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

Semester-I 19PCSC104: Advanced Java Programming **Credits: 5**
Hours : 4

Learning Objectives (LO):

- To deepen student's programming skills by analyzing the real world problem
- in a programmer's point of view and implement the concepts in real time projects
- To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming and how it impacts the social and economic development of society.

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- Multiresolution Image API.

Textbooks

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

References

1. Paul Deitel and Harvey Deitel, “Java: How to Program”, Prentice Hall Publishers; 9th Edition.
2. Jan Graba, “An Introduction to Network Programming with Java-Java 7 Compatible”, 3rd Edition, Springer.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

Semester-I 19PCSP105: Algorithm Lab (Using Java) **Credits: 2**
Hours : 2

Learning Objectives (LO):
This course will enable students to,

- Design and implement various algorithms in JAVA
- Employ various design strategies for problem solving.
- Measure and compare the performance of different algorithm.

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 *nStudent* 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 superclass called **Staff** with details as StaffId, 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.

Course Outcomes

On successful completion of the course, the students 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 learned algorithm design techniques and data structures to solve real world problems.

Outcome Mapping

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

Semester-I 19PCSP106: Advanced Web Technology Lab **Credits: 2**
Hours : 2

Learning Objectives(LO):

- To understand the concept of web technologies.
- To creating web pages by using HTML Tags.
- To understand the importance of cascade style sheets in creating a web application.
- To understand the importance of Java Script in creating a web Application
- To understand the use of XML in Document type Definition.
- To know about PHP scripts and create adaptive web pages.

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

Course Outcomes

On successful completion of the course, the students 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 programing and Database Connectivity using MySQL.

CO5: Able to create a complete Web Application with all the required modules.

Outcome Mapping

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

Semester-II 19PCSC201: Distributed Operating System **Credits: 5**
Hours: 4

Learning Objectives (LO):

1. To study distributed operating system concepts
2. To understand hardware, software and communication in distributed OS
3. To learn the distributed resource management components.
4. Practices to learn concepts of OS and Program the principles of Operating Systems

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 Nonblocking 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.

Text Books

1. Mukesh Singhal N.G.Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill 2000.
2. Distributed Operating System – Andrew S. Tanenbaum, PHI.

Reference Books

1. Abraham Silberschatz, Peter B.Galvin, G.Gagne, "Operating Concepts", 6th Edition Addison Wesley publications 2003.
2. Andrew S.Tanenbaum, "Modern Operating Systems", 2nd Edition Addison Wesley 2001

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

Semester-II 19PCSC202: Dot Net Programming **Credits: 5**
Hours: 4

Learning Objectives (LO):

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

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 programmingcreating 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.

Text Books

1. Struts: The Complete Reference,James Holmes 2nd Edition 2007 McGraw Hill Professional
2. Mathew Mac Donald, "ASP.NET Complete Reference", TMH 2005
3. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
4. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012
5. ASP.NET Unleashed, C# programming – Wrox publication
6. Visual Basic. NET Black Book, by Steven Holzner

Reference Books

1. Jesse Liberty , 'Programming C#, " , 4th Edition, O'Reilly Media.
2. Mario Szpuszta, Matthew MacDonald , "Pro ASP.NET 4 in C# 2010: Includes Silverlight
2,"Apress, Third Edition
3. J.Liberty, D.Hurwitz, "Programming ASP.NET", Third Edition, O'REILLY, 2006.
4. Visual Basic. Net programming in easy steps by Tim Anderson,

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

Semester-II 19PCSC203: Cryptography and Network Security **Credits: 5**
Hours: 4

Learning Objectives (LO):

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- To know about the malicious software & firewalls.

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.

Text books

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007, Reprint 2015.
2. Stallings William, "Cryptography and Network Security - Principles and Practice 2017.
3. William Stallings, "Network Security Essentials Applications and Standards "Third Edition, Pearson Education, 2008.

References

1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms And Protocols", Wiley Publications, 2003.
2. Charles Pfleeger, "Security In Computing", 4th Edition, Prentice Hall Of India, 2006.
3. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
4. Charlie Kaufman And Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication In Public World", PHI 2002.
5. Bruce Schneier And Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
6. Douglas R Simson "Cryptography – Theory And Practice", First Edition, CRC Press, 1995.
7. Http://Nptel.Ac.In/.

Course Outcomes

On successful completion of the course, the students 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

Outcome Mapping

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

Semester-II 19PCSC204: Advanced Database Management System Credits: 5
Hours : 4

Learning Objectives (LO):

- To Acquire Knowledge of Database Models.
- To understand distributed database architecture.
- To learn the concepts of spatial database.
- To familiar with temporal database.

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, Interquery Parallelism, Intraquery Parallelism, Intraoperation 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.

Text Book

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

Reference Books

1. Ramez Elmasri, Shamkant B Navathe, "Fundamental of Database Systems", Pearson, 7th edition 2016.
2. Thomas Connolly, Carolyn Begg., "Database Systems a practical approach to Design, Implementation and Management ", Pearson Education, 2014.

Course Outcomes

On successful completion of the course, the students 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

Outcome Mapping

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

Semester-II 19PCSP205: Dot Net Programming Lab **Credits: 2**
Hours : 2

Learning Objectives (LO):

1. To impart basic knowledge of different control statements and array associated with C # programming.
2. To learn various C# elements and OOPS concepts.
3. To learn interface, delegates, event and error handling concepts in C#.
4. To impart knowledge on networking including socket programming and reflection.
5. To acquire a working knowledge of 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

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

Semester-II 19PCSP206: RDBMS Lab **Credits: 2**
Hours : 2

Learning Objectives (LO):

- Keep abreast of current developments to continue their own professional development.
- To engage themselves in lifelong learning of Database management systems theories and technologies this enables them to purse higher studies.
- 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.
- Develop team spirit, effective work habits, and professional attitude in written and oral forms, towards the development of database applications.

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

Course Outcomes

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

CO1: In drawing the ER, EER, and UML Diagrams.
CO2: In analyzing the business requirements and producing a viable model for the implementation of the database.
CO3: In converting the entity-relationship diagrams into relational tables.
CO4: To develop appropriate Databases to a given problem that integrates ethical, social, legal, and economic concerns.

Outcome Mapping

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

Semester-III 19PCSC301:Digital Image Processing **Credits: 5**
Hours : 4

Learning Objectives (LO):

To provide complete knowledge on Digital Image Processing methods, such as image processing methods in Spatial domain and Frequency domain, Edge detection, Compression, Segmentation, and Morphological concepts, which enable the students to understand the concepts and implement them empirically.

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 basedcoding; 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.

Text Books

1. Rafael Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, PHI/Pearson Education, 2013.
2. A. K. Jain, Fundamentals of Image Processing, Second Ed., PHI, New Delhi, 2015.

References

1. B. Chan la, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.
2. Nick Elford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.
3. Todd R.Reed, "Digital Image Sequence Processing, Compression, and Analysis", CRC Press, 2015.
4. L.Prasad, S.S.Iyengar, "Wavelet Analysis with Applications to Image Processing", CRC Press, 2015.

Course Outcomes

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

CO1: Review the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms.

CO2: Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques.

CO3: Interpret Image compression standards, and Interpret image segmentation and representation techniques.

CO4: Gain idea to process various image used in various fields such as weather forecasting, Diagnosis of various diseases using image such as tumor, cancer etc.

Outcome Mapping

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

Semester-III 19PCSC302 : Internet of Things **Credits: 5**
Hours: 4

Learning Objectives(LO):
In order to gain knowledge on bases of Internet of Things (IoT), IoT Architecture, and the Protocols related to IoT; and understand the concept of the Web of Thing and the relationship between the IoT and WoT.

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.

Text Books

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

Course Outcomes

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

CO1: Gain the basic knowledge about IoT and they will be able to use IoT related products in real life.
CO2: It helps to rely less 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 Acquire skills on developing their own national and enterprise level technical strategies.

Outcome Mapping

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

Semester-III 19PCSC303 : Machine Learning **Credits: 5**
Hours : 4

Learning Objectives (LO):

- To Learn about Machine Intelligence and Machine Learning applications.
- To implement and apply machine learning algorithms to real-world applications.
- To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.
- To understand how to perform evaluation of learning algorithms and model selection.

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.

Text Book

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

References

1. EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and
Machine Learning), The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, "Genetic Algorithms and Genetic Programming", CRC Press Taylor and Francis Group.

Course Outcomes

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

CO1: Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.

CO2: Have an understanding of the strengths and weaknesses of many popular machine learning approaches.

CO3: Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

CO4: Be able to design and implement various machine learning algorithms in a range of real-world applications.

Outcome Mapping

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

Semester-III 19PCSP304 : Image Processing Lab **Credits: 5**
Hours: 4

Learning Objectives (LO):

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

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List of Exercises

- To perform linear and non linear operations on images.
- To perform smoothing operations on an image in spatial domain.
- To perform sharpening operations on an image in spatial domain.
- To transform the image into DCT, FFT and wavelet.
- To implement canny edge deduction.
- To study the performance of gradiant operators.
- To implement huff-man coding technique.
- To perform DCT compression method.
- To implement image segmentation based on color.
- To implement erosion and dilation.

Course Outcomes

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

CO1: Read and display the image.

CO2: Transform the domain from spatial to frequency.

CO3: Apply suitable operators to detect the edge.

CO4: Perform compression and segmentation methods.

Outcome Mapping

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

Semester-III 19PCSP305 : Machine Learning Lab **Credits: 5**
Hours : 4

Learning Objectives (LO):

- To expose the students in emerging technologies in the areas of machine learning.
- To make use of Data sets in implementing the machine learning algorithms
- To implement the machine learning concepts and algorithms.
- To develop a basic understanding of the principles of machine learning
- To derive practical solutions using predictive analytics.
- To Understand which techniques are more appropriate for which problems.
  .

List of Exercises

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

Course Outcomes

On successful completion of the course, the students will be able to,
CO1: Read and display the image.
CO2: Transform the domain from spatial to frequency.
CO3: Apply suitable operators to detect the edge.
CO4: Perform compression and segmentation methods.

Outcome Mapping

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

Semester-IV 19PCSP401 : Software Project Management Credits: 5
Hours : 4

Learning Objectives(LO):

- This course will enable students to:
- Understand the framework of project management
- Learn to monitor and control the project
- Know the sound knowledge in Agile method
- Know the team, cost, quality and resource management
- Identify and control the risk in the projects

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.

Text Books

1. "A guide to the Project management Body of Knowledge (PMBOK Guide)" Fouth Edition, Project Management Institute, Pennsylvania, 2008
2. BOB Huges, Mike Cotterell, Rajib Mall “Software Project Management”, McGraw Hill, Fifth Edition,2011.
3. Emerson, "Agile Handbook," Philosophie

Reference books

1. Futrell, “Quality Software Project Management”, Pearson Education India.

2. Royce, “Software Project Management”, Pearson Education India.
3. C.Ravindranath Pandian, “Applied Software Risk Management-A Guide for Software Project Managers”, Auerbach Publications, 2015.
4. Benjamin A. Lieberman, “The Art of Software Modeling”, Auerbach Publications, 2010.

Course Outcomes

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

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

Outcome Mapping

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

Department Elective Courses

19PCSE306.1:Advanced Computer Networks **Credits: 3**
Hours : 3

Learning Objectives(LO):

- To study communication network protocols, different communication layer structure
- To learn security mechanism for data communicaton

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.

Text Book

1) A. S. Tanenbaum, 2011, Computer Networks, Fifth Edition, Pearson Education, Inc.

Reference Books

1) B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, New Delhi.
2) F. Halsall, 1995, Data Communications, Computer Networks and Open Systems, Addison Wessley.
3) D. Bertsekas and R. Gallagher, 1992, Data Networks, Prentice hall of India, New Delhi.
4) Lamarca, 2002, Communication Networks, Tata McGraw Hill, New Delhi.
5) Teresa C.Piliouras, "Network Design Management and Technical Perspectives, Second Edition", Auerbach Publishers, 2015.

Website, E-learning resources:

http://peasonhighered.com/tanenbaum

Course Outcomes

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

CO1: To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.

CO2: To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks.

CO3: To be familiar with wireless networking concepts, and be familiar with contemporary issues in networking technologies.

CO4: To be familiar with network tools and network programming.

Outcome Mapping

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

19PCSE306.2:Web Services **Credits: 3**
Hours : 3

Learning Objectives(LO):

- To enable the student to be familiar with distributed services, XML and web services
- To study the use of web services in B2C and B2B applications

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.

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.

References

1. Martin Kalin, "Java Web Services: Up and Running", O'Reilly Publishers.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE306.3:Object Oriented Systems Development **Credits: 3**
Hours : 3

Learning Objectives (LO)

- Introduce the concept of Object-oriented design and understand the fundamentals of OOSD life cycle.
- Familiar with evolution of object-oriented model, classes and it notations
- Practice UML in order to express the design of software projects.
- Specify, analyze and design the use case driven requirements for a particular system.
- Enrich knowledge about DBMS, designing classes and object oriented testing.

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.

Text Book

1. Ali Bahrami, "Object Oriented Systems Development using UML", McGraw-Hill, 2008

References

1. Booch Grady, Rumbaugh James, Jacobson Ivar, "The Unified modeling Language – User Guide, Pearson Education, 2006
2. Brahma Dathan, Sarnath Ramnath, "Object Oriented Analysis, Design and Implementation", Universities Press, 2010.
3. Mahesh P.Matha, "Object-Oriented Analysis and Design Using UML", PHI Learning Private Limited, 2012.
4. Rachita Misra, Chhabi Rani Panigrahi, Bijayalaxmi Panda, "Principles of Software Engineering and System Design", Yesdee Publishing 2019.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE306.4 : Mobile Computing **Credits: 3**
Hours : 3

Learning Objectives (LO):

- Understand the basic concepts of mobile
- Be familiar with GPRS Technology
- system Be exposed to Ad-Hoc networks
- Gain knowledge about different mobile platforms and application development

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.

Text Books

1. Jochen Schiller, Mobile Communications, Second Edition,2012.
2. William Stallings,"Wireless Communications & Networks", Pearson Education, 2009.

References

1. C.Siva Ram Murthy, B.S. Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", 2nd Edition, Pearson Education. 2004

2. Ashok K Talukder, Roopa R Yavagal, “Mobile Computing”, Tata McGraw Hill, 2005.
3. Jochen Burkhardt Dr.Horst Henn, Klaus Rintdoff,Thomas Schack, “Pervasive Computing”, Pearson, 2009.
4. Fei Hu , Xiaojun Cao, “ Wireless Sensor Networks Principles and Practice “ CRC Press, 2010.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE307.1 : Wireless Networks **Credits: 3**
Hours : 3

Learning Objectives (LO):

- To Study about Wireless Networks, Protocol Stack and Standards.
- To Study about Fundamentals of 3G Services, Its Protocols and Applications.
- To Study about Evolution of 4G Networks, its Architecture and Applications.

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.

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.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE307.2 : Theory of Computation **Credits: 3**
Hours: 3

Learning Objectives (LO):

The learning objectives of this course are to introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability. To enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

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 undecidable problem RE – Undecidable problems about Turing Machine – Post's Correspondence Problem – The classes P and NP.

Textbook

1. Peter Linz, "An Introduction to Formal Languages and Automata", Third Edition ,Narosa, 2005
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", second Edition, Pearson Education, 2007.

Reference Books

1. H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education, 2003.
2. Thomas A. Sudkamp," An Introduction to the Theory of Computer Science,Languages and Machines", Third Edition, Pearson Education, 2007.
3. Raymond Greenlaw an H.James Hoover, " Fundamentals of Theory of Computation, Principles and Practice", Morgan Kaufmann Publishers, 1998.
4. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.
5. J. Martin, "Introduction to Languages and the Theory of computation," Third Edition, Tata Mc Graw Hill, 2007.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE307.3:Optimization Techniques **Credits: 3**
Hours : 3

Learning Objectives (LO):

- To understand the concept of optimization
- To develop mathematical model of real life cases
- To study Optimization algorithms

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/CPMNetworks – Fulkerson's Rule – Measure Of Activity – PERT Computation – CPMComputation – Resource Scheduling.

Textbooks

1. KantiSwarup, P.K. Gupta &Manmohan – Operation Research 1996.
2. S.Kalavathy: Operations Research – Second Edition – Vikas Publishing House Pvt.Ltd.,
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, "Feasibility and Infeasibility in Optimization-Algorithms and Computatonal Methods ", Springer, 2015.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE307.4 : Embedded Systems **Credits: 3**
Hours : 3

Learning Objectives (LO):

This course will enable students to:

- Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Describe the hardware software co-design and firmware design approaches

- Know the RTOS internals, multitasking, task scheduling, task communication and synchronization.
- Learn the development life cycle of embedded system

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.

Text Book

1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 2009.

Reference Books

1. Raj Kamal, “Embedded Systems: Architecture, Programming and Design”, TMH. Second Edition 2009
2. Frank Vahid, Tony Givargis, “Embedded System Design”, John Wiley. Third Edition 2006
3. Cliff Young, Faraboschi Paolo, and Joseph A. Fisher, "Embedded Computing: A VLIW Approach to Architecture, Compilers and Tools", Morgan Kaufmann Publishers, An imprint of Elsevier, 2005.
4. David E. Simon, “An Embedded Software Primer” Pearson Education, 1999

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE307.5 : WAP and XML **Credits: 3**
Hours : 3

Learning Objectives (LO):
The purpose of the course is to impart knowledge on eXtensible Markup Language (XML) and to achieve secured, messaging through web services.

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.

Text Books

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

References

1. Heather Williamson, "XML: The Complete Reference ",Tata McGraw-Hill Education India.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE403.1:Statistical Computing **Credits: 3**
Hours : 3

Learning Objectives(LO):

- To understand the applications of various correlation methods
- To study and model the sampling concepts
- To acquire knowledge on Hypotheses test

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(7.1-7.9.4).

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.(8.1-8.8)

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(12.2-12.4).

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(14.1-14.16).

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(15.1-15.10.2).

Textbook

1. K.L. Sehgal, "Quantitative Techniques and Statistics", First Edition, Himalaya Publishing House, 2011.

References

1. N. P. Bali, P. N. Gupta, C. P. Gandhi, "A Textbook of Quantitative Techniques", First Edition, Laxmi Publications, 2008.
2. U. K. Srivastava, G. V. Shenoy, S. C. Sharma, "Quantitative Techniques for Managerial Decisions", Second Edition, New Age International Publishers, 2005.
3. David Makinson, "Sets, Logic and Maths for Computing", Springer, 2011.
4. Christopher Chatfield,"Statistics for Technology- A Course in Applied Statistics, Third Edition", CRC Press, 2015.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE403.2 : Soft Computing **Credits: 3**
Hours : 3

Learning Objectives (LO):

- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- Introduce students to artificial neural networks and fuzzy theory from an engineering perspective.

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.

Text Book

1. S.N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, Wiley India, 2007.

Reference Book

1. S. Rajasekaran, G.A.V. Pai, “Neural Networks, Fuzzy Logic, Genetic Algorithms”, Prentice Hall India, 2004.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE403.3 : Data Mining **Credits: 3**
Hours : 3

Learning Objectives (LO):

To introduce the fundamental concepts of Data Mining Techniques and various Algorithms used for Information Retrieval from Datasets.

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.

Text Books

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques (The Morgan Kaufmann Series in Data Management Systems) 3rd Edition, July 6, 2011.
2. Ian H. Witten, Eibe Frank, Mark A. Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Elsevier; Third edition, 2014.

References

1. Margret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2003.
2. M. Awad, Latifur Khan, Bhavani Thuraisingham, Lei Wang, "Design and Implementation of Data Mining Tools", CRC Press-Taylor & Francis Group, 2015.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining-Instructor's Solution Manual", Pearson Education, First Edition, 2016.
4. Mohammed J.Zaki, Wagner Meira JR, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge India, 2016.

Course Outcomes

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

CO1: Basic data mining concepts for solving real world problems.
CO2: Understand the concepts of data mining.
CO3: Analyze the feasibility of data mining solution.
CO4: Apply basic statistical to evaluate the results of data mining models.
CO5: Develop data mining application to solve problems.

Outcome Mapping

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

19PCSE403.4 : Cloud Computing **Credits: 3**
Hours : 3

Learning Objectives (LO):

The objective of this course is to provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations. Another objective is to expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

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 Plastforms- 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.

Text Books

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

References

1. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2016.
2. Michael Miller "Cloud Computing Web based application that change the way you work and collaborate online". Pearson edition, 2008.
3. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile,Security and More, Jones & Bartlett Learning, 2012.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

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

19PCSE403.5 : Data Science and Big Data Analytics **Credits: 3**
Hours : 3

Learning Objectives(LO):

The course provides grounding in basic and advanced methods to big data technology and tools, including MapReduce and Hadoop and its ecosystem.

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 Befor 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 Regrression 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 - Na'ive Bayes – Bayes Theorem – Naïve Bayes Clasifier – 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: MapReduce and Hadoop : Analytics for Unstructured Data .- *UseCases* - *MapReduce* - 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

Text Book

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services Published by John Wiley & Sons, Inc. 2015

Reference Books

1. Noreen Burlingame , "The little book on Big Data", New Street publishers, 2012.
2. Anil Maheshwari, " Data Analytics", McGraw Hill Education, 2017.
3. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design",No Starch Press; 1 edition , 2011.
4. Sandip Rakshit, "R for Beginners", McGraw Hill Education, 2017
5. http://www.johndcook.com/R_language_for_programmers.html.
6. http://bigdatauniversity.com/.
7. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction.

Course Outcomes

On successful completion of the course, the students 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.

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1		✓	✓	✓	✓		✓	✓		✓	✓	✓		✓			✓	✓
CO2	✓		✓	✓		✓		✓		✓		✓		✓		✓	✓	
CO3		✓		✓	✓	✓	✓			✓		✓					✓	
CO4		✓		✓		✓		✓			✓		✓		✓			✓
CO5	✓	✓	✓	✓	✓					✓	✓	✓			✓			✓

Inter Department Elective Courses Offered to Other Departments

19CSE215.1 - Programming in R

Learning Objectives (LO):

- To provide an overview of a new language R used for data science and to introduce students to the R programming environment and related eco-system and thus provide them with an in demand skill-set, in both the research and business environments.
- To introduce the extended R ecosystem of libraries and packages.
- To demonstrate usage of as standard Programming Language.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R and enable students to use R

Unit-I: Overview and Preliminaries - What is R - Back to R - Basic Features of R - Design of the R System-Limitations of R – Installation – Rstudio - Getting started with the R interface - Entering Input - R Objects – Attributes - Creating Vectors - Mixing Objects – Matrices – Lists – Factors - Data Frames.

Unit-II: Input, Output, Reading and Subsetting - Reading Data Files - Reading in Larger Datasets - Calculating Memory Requirements - File Connections - Reading Lines of a Text File - Reading From a URL Connection - Subsetting a Vector - Subsetting a Matrix - Subsetting Lists - Subsetting Nested Elements of a List - Extracting Multiple Elements of a List - Partial Matching.

Unit-III: Date, Time and Managing Data Frames - Dates in R - Times in R - Operations on Dates and Times - Data Frames - The dplyr Package - Installing the dplyr package – select – filter – arrange – rename – mutate - group_by - pipeline operater.

Unit-III: Control Structures and Loop Functions - If-else - for Loops - Nested for loops - while Loops - repeat Loops - next, break - Looping on the Command Line - lapply() - sapply() - split() - Splitting a Data Frame – tapply - apply() - Col/Row Sums and Means - mapply() - Vectorizing a Function.

Unit-IV: Statistics functions - Debugging, Profiling - Mean of the numbers in vector - Median of the numbers in vector - Estimated variance of the population - Estimated standard deviation - Standard scores – Sort – Rank – summary function - Debugging Tools in R - traceback() - debug() - recover() - Using system.time() - Timing Longer Expressions - The R Profiler - Using summaryRprof().

Unit-V: Simulation and Graphs - Generating Random Numbers - Setting the random number seed - Simulating a Linear Model - Loading and Processing the Raw Data – Creating a Graph - density plots - dot plots, bar charts - line charts - pie charts - box plots - Scatter plots.

Reference and Text Book

1. Roger D. Peng, “R Programming for Data Science”, Lean Publishing, (2015), ISBN: 9781365056826, 1365056821.
2. Winston Chang, “R Graphics Cookbook”, O'Reilly Media, Inc., (2012), ISBN: 9781449363086.

Course Outcomes

CO1. Install and use R for simple programming tasks.
CO2. Extend the functionality of R by using add-on packages and extract data from files and other sources and perform various data manipulation tasks on them.
CO3. Code statistical functions in R and use R Graphics and Tables to visualize results of various statistical operations on data.
CO4. Apply the knowledge of R gained to data Analytics for real life applications to conduct analytics on large real life datasets.

Value Added Courses

CISA215 - Web Development

Learning Objectives (LO):

- To learn about HTML, DHTML concepts.
- To implement a variety of presentation effects in HTML.
- To know about appropriate client-side applications.
- To gain the Knowledge of XML and its applications.
- To know about java scripts and create adaptive web pages.

UNIT – I - Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups. Links and Navigation: Basic Links, Creating Links with the <a> Element, Advanced E- mail Links. Images, Audio, and Video: Adding Images Using the <img> Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages.

UNIT – II - Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables. Forms: Introducing Forms, Form Controls, Sending Form Data to the Server. Frames: Introducing Frameset, <frame> Element, Creating Links Between Frames, Setting a Default Target Frame Using <base> Element, Nested Framesets, Inline or Floating Frames with <iframe>.

UNIT – III - Cascading Style Sheets: Introducing CSS, Where you can Add CSS Rules. CSS Properties: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model. More Cascading Style Sheets: Links, Lists, Tables, Outlines, The :focus and :activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout wit, Page Layout CSS , Design Issues.

UNIT – IV - Java Script: How to Add Script to Your Pages, Variables and Data Types – Statements and Operators, Control Structures, Conditional Statements, Loop Statements – Functions - Message box, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes.

UNIT – V - Working with JavaScript: Practical Tips for Writing Scripts, JavaScript Objects: Window Object - Document object - Browser Object - Form Object - Navigator object Screen object - Events, Event Handlers, Forms – Validations, Form Enhancements, JavaScript Libraries.

Text Books

1. Jon Duckett, Beginning HTML, XTML, CSS and Java script **,** Wiley Publishing

Reference Books

1.Chris Bates, “Web Programming”, Wiley Publishing 3d Edition.

2. M. Srinivasan, "Web Technology: Theory and Practice", Pearson Publication.

Course Outcomes

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

CO1. Develop a dynamic webpage by the use of java script and DHTML.

CO2. Create web pages using DHTML and Cascading Styles sheets.

CO3. Build dynamic web pages using JavaScript (client side programming)

CO4. Write a well formed / valid XML document.

CISA415 – Advanced Web Development

Learning Objectives (LO):

- Explore the backbone of web page creation by developing .NET skill.
- Enrich knowledge about HTML control and web control classes
- Provide depth knowledge about ADO.NET
- Understand the need of usability, evaluation methods for web services

Unit – I - 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 – II - 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 PostBack 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 – III - 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 – IV-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 TerraService.

Unit – V - 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.

Text Book

1 Mathew Mac Donald, “ASP.NET Complete Reference”, TMH 2005.

References

1. Crouch Matt J, “ASP.NET and VB.NET Web Programming”, Addison Wesley 2002.
2. J.Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O’REILLY, 2006.

Course Outcomes

On the successful completion of this course, Students 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.